Decision Support Methods within the spatial-infrastructural planning process

A research towards the added value of Decision Support Methods within the first part of the exploratory phase of MIRT projects in the Netherlands

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Master thesis

May 2017

TU Delft Delft University of Technology

Witteveen + Bos

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Master thesis submitted to Delft University of Technology in partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE

in **SYSTEMS ENGINEERING, POLICY ANALYSIS AND MANAGEMENT**

Faculty of Technology, Policy and Management

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Submitted on Thursday May 25, 2017

To be defended in public on Friday June 9, 2017

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Preface

This report is the outcome of my thesis to fulfil the master Systems Engineering, Policy Analysis and Management of the Delft University of Technology. This research project is conducted for Witteveen+Bos and the Technology, Policy and Management faculty of the Delft University of Technology, from September 2016 until May 2017.

This research would not have been possible without the help of a lot of people. First, I would like to thank my graduation committee. I would like to express my gratitude to my first supervisor Niek Mouter, I really appreciated our discussions, which helped me to come up with new and useful insights. Anne Nobel, thank you for always being available. Your comments were always very appreciated and it helped me to remain focused on what was important within my research. Next to that, special thanks to my professor Willem Korthals Altes and to my second supervisor Aad Correljé for providing the academic support and the feedback that helped me to increase the scientific relevance of my research. Next to my graduation committee, I would like to thank my supervisors Jan van Donkelaar, Gerra Witting and Gido van der Linde. Your practical perspective helped me to increase the relevance of my research for practice. Your contacts helped a lot throughout the process and your trust and support were highly appreciated.

Moreover, I would like to express my gratitude to my colleagues from Witteveen+Bos, especially Marije Schilder and Ingrid Bolier who were always willing to help me and who supported me with their interest in my thesis. Last but not least, I am very grateful for the unconditional support from my friends and family. Their encouragement and their comments helped me to accomplish this master thesis.

Fransje Oudshoorn

Den Haag, May 2017

Summary

The Meerjarenprogramma Infrastructuur Ruimte en Transport (MIRT) is a long-term investment program to realise effective, efficient and coherent infrastructural and spatial investments together with the government, decentralised governments and other parties. This program has been successful for the last twenty years, but adjustments are necessary to eliminate problems and to consider current trends. Several problems are observable. Spatial projects with focus on the area as a whole are little considered, projects have a narrow scope and often focus on infrastructure and road modalities, which do not always result in the most efficient outcomes. Cooperation between public and private parties is expected to incorporate a broad set of interests, which leads to better project outcomes. The MIRT guidelines describe the process of how to achieve a successful project outcome. These guidelines have been recently adjusted and follow the trends from the renewal of the MIRT. However, little is written on how this will work in practice. There are few concrete actions and adjustments in the guidelines on how to achieve these improvements. It is desirable to take a broader perspective and consider other modalities that lead to improved efficiency. However, there are currently no methods in the guidelines to apply this broad perspective. Additionally, a broad perspective is likely to lead to political discussions, as decision makers have to choose between modalities. These trade-offs will be advantageous for some, but disadvantageous for others. Another dilemma between objectives is observable. The renewal of the MIRT aims to improve and apply a custom approach, while the guidelines aim to guarantee a certain uniformity to justify the spending. It is expected that the decision making process could be delayed by political tensions and custom trends, while practice desires to work towards a decision efficiently.

This research aims to bring theoretical ambitions from the renewal of the MIRT and practical implementation of these ambitions closer together. This increases insights for literature (concerning Decision Support Methods and added value) and it helps improve the practice of spatial planning in the Netherlands. The objective of this research is to see if and how Decision Support Methods (DSM) can implement these ambitions in the exploratory phase of the MIRT. Analysing the added value of Decision Support Methods leads to the following research question: '*how can Decision Support Methods add value to the first part of the exploratory phase of the MIRT?*' The exploratory phase is the first official phase of the MIRT, during which irreversible decisions are made.

This research contains three components of the research question. First, the exploratory phase is explained and analysed with interviews, since understanding the context of the MIRT is fundamental to successfully apply interventions. Second, because various people can consider added value differently, added value is defined based on literature, practice and ambitions of the renewal of the MIRT. Third, five Decision Support Methods are analysed with literature to see if and how they can add value to the exploratory phase. These outcomes are tested with experts who use Decision Support Methods in practice.

This research applies a rational, an organisational and a political perspective to configure a theoretical framework. These three perspectives highlight different elements in a decision making process. From a rational perspective, a successful outcome of an exploratory phase is a project alternative with the highest level of efficiency and effectiveness. From an organisational perspective, a successful outcome aims to consider all organisations' interests. From a political perspective, a successful outcome is the result of optimisation of personal preferences. These three perspectives together provide a more complete view of the decision making process in the exploratory phase. Next to that, these perspectives are applied to highlight different aspects of a successful MIRT exploratory process and the added value of Decision Support Methods.

Analysing how the exploratory phase currently takes place leads to the selection of case studies N65 Vught – Haaren and InnovA58. These two case studies are selected as they recently finished their exploratory phase and they both have an objective in improving the road infrastructure. Twelve semi-structured interviews are used to retrieve information about their exploratory phases. The rational, organisational and political lenses highlight different elements of the exploratory phases, where some perspectives are better applicable than others. For the N65 Vught – Haaren case, the organisational and political perspectives are well applicable. The resolution of a political lobby led to the initiation of the project. The stakeholders had different interests, which led to limited flexibility to come up with a preferred alternative. Personal emotions led to tensions in the process and the project had a direct impact on liveability of the residents. The Cost Benefit Analysis had a negative outcome but the project continued. The InnovA58 exploratory phase can be explained using the rational perspective. The project started based on accessibility problems. All stakeholders experienced advantages of a capacity expansion and the alternative fitted well within the budget. This led to a positive outcome of the Cost Benefit Analysis. However, innovative aspects were little considered due to high uncertainties. Despite the various differences of both cases, project organisations did not consider these projects as exceptional. A political cause can lead to the start of a project and some projects contain more involvement from stakeholders. These observations show that guidelines cannot guarantee a uniform and successful process, as other factors such as stakeholder involvement and the context of the project also have an influence on a successful outcome of a project.

The two case studies also show that Decision Support Methods, such as Cost Benefit Analysis, Multi Criteria Decision Analysis (as a part of the *plan mer*) and Value Engineering, are currently being applied in the exploratory phase. In the N65 Vught – Haaren project, Decision Support Methods were considered from a rational perspective. The methods optimised project alternatives by increasing their problem solving ability and by decreasing their costs. Both Cost Benefit Analysis and Value Engineering were applied twice to improve the outcomes and to increase the cost efficiency of the projects. In the InnovA58 case, Decision Support Methods were used to improve cooperation between stakeholders (organisational perspective) and to justify that the predefined project alternative was most promising (political perspective). These observations show that Decision Support Methods are not uniformly applied and the added value of the method depends on the characteristics of the project.

Also literature shows that Decision Support Methods can add value in different ways. From a rational perspective, Decision Support Methods can improve insights of the project alternatives. This helps improve the process, improve the project alternatives, improve comparison between project alternatives and improve project prioritisation. An organisational perspective shows improvements in cooperation and communication. Better understanding in mutual interests increases consensus. It also improves the accessibility of information, which makes the decision more transparent. From a political perspective, Decision Support Methods can increase the support of personal preferences or justify political interests.

Regarding the added value of Decision Support Methods to improve the MIRT exploratory phase, six criteria are identified. This leads to the following criteria: (1) improve generating alternatives, (2) improve identifying effects early in the process, (3) involve a broad set of interests, (4) improve communication and cooperation, (5) improve transparency and (6) ability to consider political influences. Decision Support Methods can fulfil two functions. Practice and literature often focus on a converging function, while experiences from practice show that a broad perspective is desirable to consider interests and other modalities. Therefore, the diverging function is also considered in this research.

This research considers five Decision Support Methods, which fulfil a converging or diverging function. Value Engineering, EffectenArena, Adaptive Plan Development, Multi Criteria Decision Analysis and a

quick and global Cost Benefit Analysis are considered to be of added value. None of these methods are promising on all criteria. Value Engineering and EffectenArena are well applicable to improve cooperation and communication and improve the incorporation of broad interests. Furthermore, Value Engineering is useful in analysing and generating project alternatives. A quick and global Cost Benefit Analysis, Multi Criteria Decision Analysis and EffectenArena are useful when it is desirable to have early insights in the effects or to improve transparency of the decision.

The outcomes of the previous results are validated with the Best-Worst Method. For this method, nine experts who use Decision Support Methods in practice have filled in a survey. The experiences of the experts agree with the outcomes stated above. Adaptive Plan Development is not considered as a promising method. This is possible as the method is relatively new and still being developed. The outcome of the validation shows that the current situation is often undesirable. It also shows that there is not one best method, as each method fulfils another function. In other words, the added value of a Decision Support Method differs per situation. Besides, it is not possible to uniformly apply the method to different situations. MIRT projects can be different and therefore each project requires a different approach. Which Decision Support Method to apply should be based on the context of the process.

Answering the research question concerning the added value of Decision Support Methods, improvement of the exploratory phase lies not within a new, all-encompassing method. Value Engineering and Cost Benefit Analysis are currently applied and are also promising in the (renewed) exploratory phase. However, this research also shows that the current situation is undesirable. This leads to the conclusion that the context, in which the method is applied, is of higher influence on the success than the Decision Support Method itself. In some situations applying the main concept of a method can be more useful than using the method step by step. Besides, it is important to consider who applies or facilitates the method, in which phase the method is used and what the preferred outcome is. This goes against the wish to apply a uniform method, but it is in line with the desire to apply a custom approach. This requires a balance between applicability and uniformity of Decision Support Methods.

This research leads to several practical recommendations for practitioners. First, Decision Support Methods should not be considered as a silver bullet in the planning process. Second, it is recommended to consider the three perspectives altogether. Practitioners often apply their own familiar lens, which leads to an incomplete understanding of the situation. Third, the process of identifying and generating alternatives and possibly involving stakeholders in this phase requires improvement. Fourth, differences in interests and expectations of organisations need to be considered. As differences will always exist, it is important to accept these differences and manage the mutual expectations appropriately. Fifth, it is necessary to consider in which way the assumptions of the renewal of the MIRT will influence stakeholder behaviour. Keeping a close eye on the behaviour of stakeholders in projects will accommodate and compensate behavioural effects.

This leads to recommendations for future scientific research. During this research, it is experienced that information concerning Decision Support Methods is limited available and information is retrieved from documents that advocate the method. Research spends limited attention to the diverging function of Decision Support Methods. It would be interesting to see if and how other countries apply Decision Support Methods to come up with project alternatives. Following the fifth practical recommendation, research should come up with a process design in which the strategic behaviour of stakeholders is leading.

The recommendations for practitioners are not ground breaking from a scientific point of view. However, according to practitioners and experts, this research has shown a refreshing light on the practice of the MIRT exploratory phase, by considering practice and theory altogether.

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List of Abbreviations

APD	Adaptive Plan Development
BO MIRT	Bestuurlijk Overleg MIRT (Governmental debate MIRT).
BWM	Best-Worst Method
CBA	Cost Benefit Analysis
DSS	Decision Support System
DSM	Decision Support Method
MCDA	Multi Criteria Decision Analysis
Mer	Milieueffectenrapportage (environmental impact report)
Ministry of I&E	Ministerie van Infrastructuur en Milieu (Ministry of Infrastructure & Environment)
MIRT	Meerjarenprogramma Infrastructuur, Ruimte en Transport
PHS	Programma Hoogfrequent Spoorvervoer (Program High Frequency Rail)
PSS	Planning Support System
RWS	Rijkswaterstaat
VE	Value Engineering

1 Introduction

The government plan projects and programs together with regions to improve the built environment in the Netherlands. The decisions for project investments are ascertained in a consultation that takes place twice a year together with region and government. After a positive decision, the project investments are bundled within the *Meerjarenprogramma Infrastructuur, Ruimte en Transport*, the so-called MIRT. The MIRT covers the whole process, from drafting challenges and plans, until the realization (or management and maintenance) of the project. This program invests in infrastructural, spatial and transport projects with the goal to realise efficient, effective and coherent investments together with the government, decentralised governments and other parties (RoyalHaskoningDHV, 2014). Not all projects fit within this program. Projects assigned as MIRT projects are extensive in time and costs and have a duration of several years. In order to retrieve financial support from the national government, a project has to follow certain guidelines. These guidelines help guarantee a successful outcome.

It is expected that there is a mismatch between the uniformity of the guidelines and the complexity of a MIRT project. It is unlikely that all projects fit within these guidelines, as each project is different. The first chapter will provide more information about the context of the MIRT, in order to further analyse this expected mismatch. It examines the steps of the MIRT process and the steps that take place in a MIRT exploratory phase. Next to that, the previous and current trends of the MIRT are analysed from evaluations and documents. This leads to several observations and problems, which result in a knowledge gap. This knowledge gap is further defined in the research objective and in research questions.

1.1 Shaping the context of the MIRT

The MIRT program is derived from the *Meerjarenprogramma Infrastructuur en Transport* (MIT), which was initiated in 1997. In 2007 it was decided to add spatial projects to the program, which resulted in the MIRT. This led to a more formalized process, to decrease time and enhance certainty of execution (Commissie Elverding, 2008). These projects that are planned and executed have to follow certain guidelines in order to become a MIRT project and receive the financial investment from the government (Ministerie van Verkeer en Waterstaat, 2009). These guidelines identify three phases: the exploratory phase, the plan elaboration phase and realisation phase (Ministerie van Infrastructuur en Milieu, 2011b). As figure 1 shows, these three phases have four decision moments where an explicit decision is made on whether or not to continue with the project as a MIRT project. Before the start decision takes place, a MIRT initiative (also known as pre-MIRT) can be initiated. This initiative phase is not obligatory and is not part of the guidelines, but this initiative helps to identify the problems, challenges and involve stakeholders to provide a well-funded base for the next phases. This initiative can start from regional ambitions (*Gebiedsagenda*) or an initiative can start as bottlenecks on roads, rails and waterways are derived from the National Market and Capacity Analysis (NMCA).

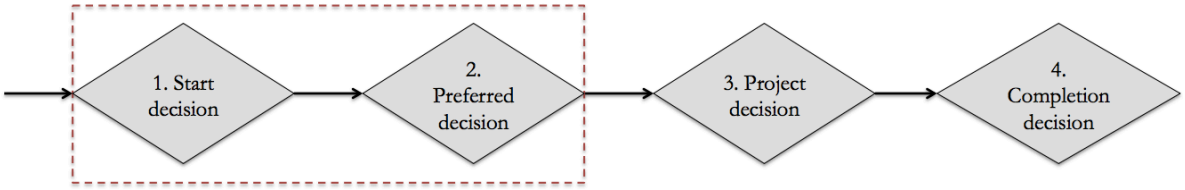


Figure 1: MIRT decision moments

The initiative phase and the exploratory phase have different goals. The initiative phase aims to provide a problem analysis, whereas the exploratory phase aims to identify and compare project alternatives. The exploratory phase can be considered to be one of the most important phases in the MIRT process, since irreversible decisions are made about the project alternatives that are executed in later phases. The exploratory phase is the first official phase of the MIRT, this is a development and decision making process where alternatives are explored and elaborated together with stakeholders. These aspects require a project and a process approach, as project deliverables and stakeholder support are desirable outcomes (AnteaGroup, 2015a).

The exploratory phase, derived from Stoop et al. (2010) and shown in figure 2, distinguishes four steps:

1. Start phase: exploration of the situation that results in an action plan. This contains a problem analysis and definition of the goal and scope of the exploratory phase. This start decision argues whether this project fits within the requirements of the MIRT.
2. Analytical phase: alternatives are generated and the effects are qualitatively scored and estimated (Rijkswaterstaat, 2010). This phase results in a first filter: after developing the solution space, a large set of alternatives is funnelled into a top three or four of the most promising alternatives.
3. Grade phase: the three alternatives are developed in further detail. A Cost Benefit Analysis (CBA) and an environmental impact report (*plan Mer*) are executed. Adjustments from stakeholders are included. These outcomes function as a second filter that influences the decision for the preferred alternative.
4. Decision phase: The preferred alternative is put upfront for discussion. The outcome of the discussion will be either to develop the preferred alternative, to choose for another alternative or to not develop a project at all. The decision is also dependent on the political environment and the support of the project by the residents.

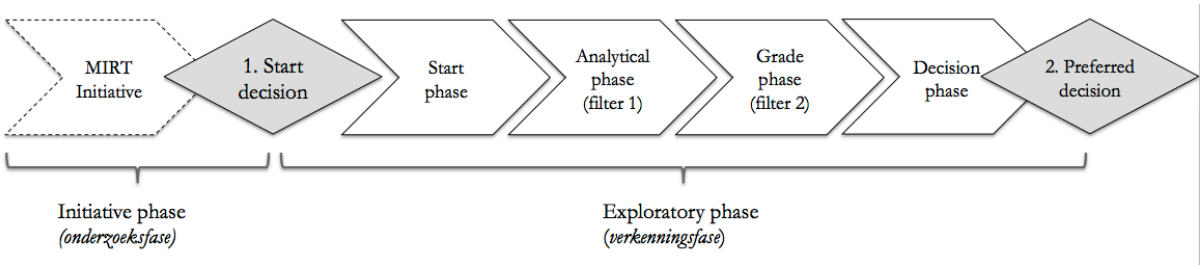


Figure 2: Phases in the initiative and exploratory phase

The grade phase (second filter) has several methods such as a CBA and an environmental impact report to analyse the effects of the preferred alternative and analyse how investments are societally beneficial (Ministerie van Infrastructuur en Milieu, 2012a; Stoop, Arts, van Dongen, van Kruijsbergen, & van de Laak, 2010). The analytical phase (first filter) does not have a uniform and predefined method. There are no methods available to develop alternatives. Expert judgments, quick scan tools and models to calculate expected traffic and allocation of effects are methods for estimating effects to make trade offs that result in a top three of promising alternatives (Rijkswaterstaat, 2010).

1.2 The renewal of the MIRT

Political and societal trends have affected the focus of the MIT and the MIRT over the last twenty years. During the MIT, the exploratory phase could take several years without having a specific outcome. An exploratory phase often started with the request of the region. Budget cuts and politically driven discussions led to endless explorations. The outcome (*Sneller & Beter*) from the committee Elverding (2008) concluded that planning and developing infrastructural projects took too long and this process should be reduced from an average of fifteen years to seven years. In order to fulfil this recommendation, the phases of the MIRT process are clearly defined in the guidelines (Ministerie van Verkeer en

Waterstaat, 2009). These defined steps are shown in figure 2 and are still accurate and obligatory when going through the MIRT process.

Since this MIRT process was defined, several evaluations have taken place. A first evaluation of the guidelines shows that there are some difficulties in using these guidelines. Additionally, it is considered difficult to define the right scope of the exploratory phase. Although it is desirable to take a broad perspective and solve spatial issues, it is easier to focus on infrastructural adjustments and safeguard the investments. This evaluation states the misfit of the guidelines in the political practice and the dynamics within projects (Berenschot, 2009). Another problem that is addressed by Rijkswaterstaat (RWS), concerns the uncertainty of the continuation of projects and the availability of budgets because of changes in the political environment (Heeres, 2010). A third evaluation states that there is no frame to determine the quality of the exploratory phases. Although it is desirable to measure quality, another set of regulations and guidelines are undesirable as this prevents the involvement of the stakeholders and the project organisation (Rijkswaterstaat Verkenningen en planstudies, 2011). A fourth evaluation states that the steps in the exploratory phase lead to misunderstandings, as the outcome of the first filter is often interpreted as a concrete set of alternatives where quantitative information, such as traffic models, is available in full details. It is added that other alternatives, such as non-infrastructural solutions, are not considered because of project complexity and political agendas. It is sometimes considered difficult to apply the defined process steps, as it does not meet the complexity (or simplicity) of the project in practice (RoyalHaskoningDHV, 2011). A last evaluation that is in line with the renewal of the MIRT states that the MIRT inadequately incorporates the change of relations between the central and decentralized governments. Although spatial projects are added within the scope of the MIRT, a broad orientation of (spatial) projects is accounted too little in the MIRT. The aim is a broad goal that leads to an integral project, but practice often shows a project with a narrow goal. The required changes in the long-term focus on redefining the goals, agendas and challenges, which will result in a change of cooperation. Improvements in the short-term should optimise the custom approach of projects and should add a certain flexibility in the MIRT guidelines (RoyalHaskoningDHV, 2014).

These problems has led to a renewal of the MIRT over the last two years (Ministerie van Infrastructuur en Milieu, 2014) with the aim to make infrastructure planning in the Netherlands future resilient (Ministerie van Infrastructuur en Milieu, 2016a). Renewal of the MIRT was necessary as the environment changes faster due to technological changes and it is difficult to forecast these changes. Additionally, the MIRT was not completely functioning as expected and few spatial projects were executed (RoyalHaskoningDHV, 2014). This renewal aims to improve the cooperation between governmental organisations and other parties, as decentralisation and participation became more important. Besides, the renewal aims to prepare the MIRT for changes in the future. This has led to the following aspects that should be applied in the MIRT (Ministerie van Infrastructuur en Milieu, 2014, 2014):

- Broad perspective: involve other parties to tackle challenges. Alternatives are not only scored on their cost effectiveness, but also their impact on other factors such as safety and liveability.
- Custom approach: each project requires another approach. It is desirable to take a more innovative approach, so first consider improving the use of existing infrastructure. Additionally, this also involves incorporation of uncertainties of the project.
- Cooperation: working on challenges together with societal organisations, private parties and central and decentralized governments. This leads to incorporation of all interests.

These actions are positively evaluated in April 2016 (RoyalHaskoningDHV, 2016) and this resulted in the recently published guidelines (Ministerie van Infrastructuur en Milieu, 2016c), where an introduction about the MIRT is given.

Table 1: Goals of the MIRT (derived from Ministerie van Infrastructuur en Milieu (2016c))

The Dutch government works together with decentralized governments (provinces, municipalities, transport regions and water boards), civil societies and companies to improve the competitiveness, accessibility and liveability of the Netherlands in a sustainable way. Parties use each other's ambitions and knowledge to reach better alternatives, this leads to creativity and innovative solutions and cooperation, where each party takes its own role and responsibility. These alternatives consider the uncertainties and future developments, such as climate change and increasing complexity. Additionally, parties seek to tackle challenges where spatial, water and mobility meet different domains and increase the strength to solve problems. This leads to adaptive and integral challenges, drafted from a joint perspective. Cooperation is based on trust, parties adjust investment decisions and work until the end result.

These improvements are retrieved from other trends. For example the spatial plans of an area (*stuctuurvisie* (SVIR)) desires to connect infrastructure with different modalities. This involves a custom fit for each project and it should follow the wishes and developments of citizens and organisations. This requires an innovative approach that is broader than infrastructure investments (Ministerie van Infrastructuur en Milieu, 2012b). Another trend (*Meer Bereiken*) wishes to apply unconventional infrastructure interventions and it aims to tackle accessibility problems integrated with, for example, spatial challenges. It sets conventional infrastructural solutions aside to consider smart solutions, which aim to innovate, inform, maintain, remain, design and invest in infrastructure (five i's) (Ministerie van Infrastructuur en Milieu, 2014).

These evaluations and trends have led to the wish to increase flexibility of financial means. This aims to keep the first part of the exploratory phase open and seek for integral and innovative solutions to tackle challenges. The overarching idea is that this results in more efficient and effective outcomes. It creates space in budgets to anticipate current and unforeseen situations and it leads to a broad perspective as modalities (and their funds) are not yet determined and allocated (Ministerie van Financien, Inspectie der Rijksfinancien/Bureau, & Strategische Analyse, 2016).

The trends addressed above are also observable in the three versions of MIRT guidelines. The first version was published in 2009, with the goal to realise coherent investments in the spatial domain. The second version of guidelines was published in 2011. The newest version was published in the autumn of 2016. An extensive comparison of the guidelines is shown in appendix A. Small differences are observable. The guidelines from 2016 consider the process before the exploratory phase to be important for a problem analysis and to find agreements. Additionally, the objectives of the process and phases are extensively described compared to the decision making moments. The guidelines from 2016 have a process-based perspective and it shows the desire to create a dialogue between regional and national parties and public and private parties to tackle integral challenges. Although a change in objectives and goals is observable, it is less clear how an integral perspective and a dialogue between stakeholders should take place. The guidelines shortly introduce *Omgevingswijzer* and Value Engineering (VE), but next to that the guidelines do not come up with interventions to realise the objectives and desires of the renewal of the MIRT.

1.3 Research objective

The ambitions from the renewed MIRT will be gradually implemented in the upcoming years. Several problems are mentioned above. The (unofficial) initiative phase currently takes an open, integral and cooperative approach by involving other parties. The MIRT initiative is free of prescribed rules and outcomes. However, the exploratory phase contains rules and expectations in uniformity of the

outcomes. Experience is lacking, as few MIRT exploratory phases have been executed under the renewed MIRT, while several MIRT initiatives will continue to the exploratory phase in the upcoming years. Second, the complexity of MIRT projects and the subjectivity of the MIRT process will increase when unconditional modalities are considered. This dilemma is also defined by de Roo (2002). The decisions are becoming communicative driven (instead of technical-rational) when challenges increase in complexity. This leads to subjective interactions between decision makers. Zuidema (2012) adds to this that complex projects can therefore be limited objective which leads to subjectivity in prioritisation of the projects. Also Mouter (2016) and Nyborg (1998) address the dilemma between rational use of methods and the political practice, as the choice for starting a project and the choices made within the project are often politically driven. Third, the exploratory phase is currently inflexible and it shows difficulties to incorporate a broad view and involve different stakeholders. With few concrete actions in the renewed guidelines, it is expected that the MIRT exploratory phase will face a larger dilemma between the open, integral and cooperative approach and the current practice of the exploratory process.

Limited experiences, high complexity and few concrete actions make a successful implementation difficult. An additional change in implementation and planning culture is necessary to make the renewal a success. Currently, no means are known or available in MIRT exploratory phase to realise this desired open, integral and cooperative approach. This research therefore aims to provide Decision Support Methods (DSM) to improve the MIRT exploratory phase and fulfil the desires from the renewal of the MIRT. In order to improve the applicability of DSMs, it is important to consider the context of the MIRT. Experiences from Dutch practice can contribute to scientific insights in the added value of DSMs.

This research will provide recommendations for project organisations to improve the MIRT exploratory phase. The recommendations focus on when and what DSMs could be of added value. It also shows how the exploratory phase currently takes place and which changes are desirable to improve the exploratory phase and make this process resilient in the future.

This research aims to bring research and practice together. Experiences from practice are able to add more knowledge to the added value of DSM. Most of the existing research on the exploratory phase focuses on testing alternatives, while there is little attention on generating alternatives. This research analyses the added value of the DSMs considering both diverging and converging functions in the early exploratory phase. Currently, there are several studies that define the added value of decision support systems, planning support systems and CBA. This research will show in which way a broader set of DSMs can add value, considering their diverging and converging functions and considering the different perspectives on added value.

1.4 Research questions

In order to fulfil the research objective, research questions are defined. These questions will structure this research and they will answer the overarching research question: '*how can Decision Support Methods add value to the first part of the exploratory phase of the MIRT?*' This research question has a normative character, because whether methods are 'of added value' is ambiguous. With the following sub-questions the research aims to give a well founded definition of added value and it aims to fill the knowledge gap between the theoretical ambitions and practical implementation. This provides new insights for the MIRT practice and scientific insight in added value of DSMs. This results in the following sub-questions:

1. How does the exploratory phase take place?
2. What are current and expected problems in the first part of the exploratory phase of the MIRT?
3. How are Decision Support Methods currently applied in the exploratory phase?

4. What is the current added value of Decision Support Methods in the MIRT exploratory phase?
5. Which methods can be of added value in the exploratory phase?
6. In what context can Decision Support Methods be of added value for the exploratory phase?

First, this research analyses the MIRT exploratory phase, where it considers the effectiveness and efficiency of project alternatives in practice. It aims to analyse the decision making process, the scope that an exploratory phase takes and the current cooperation between stakeholders. Second, it considers whether and which DSMs could be useful for the first part of the exploratory phase. Methods are analysed to see how they are able to solve these problems and how to reach the goals of the renewal of the MIRT. It aims to increase the success and make further implementation of the renewal of the MIRT possible.

1.5 Structure

In order to answer the research question, the following structure is followed. First, the research methodology will be explained. Subsequently, the theoretic framework will be examined. This theoretic framework gives a structured approach by defining three perspectives to analyse the elements of the exploratory phase. Using three perspectives will help to identify rational goals but also aims to consider the desires from organisations and individuals within the exploratory practice. More specifically, these three perspectives are used to analyse and explain two case studies in the fourth chapter. The N65 Vught – Haaren and the InnovA58 are two case studies that finished their exploratory phase in 2016. Analysing these cases in chapter four helps to gain more insight in the practical aspects of the exploratory phase. After that, the added value of DSMs in these two cases is considered. Chapter five analyses the decision making process and considers added value of DSMs from literature. Together with the assumptions of the renewal of the MIRT, this leads to criteria for DSMs in chapter six. Hereafter, DSMs are analysed in chapter six. This makes it possible to score the methods, based on defined criteria. These scores will be compared with the experiences of practitioners in chapter seven. This chapter also considers the applicability of DSMs in practice. These chapters bring us to an answer of the research question, where the added value of DSMs is discussed in the conclusion

2 Research methods

Research methods structure information and make the process of acquiring information more transparent. The guidelines, governmental documents and evaluations expose the experiences and problems of the first part of the exploratory phase of the MIRT. These documents state *what* actions to take in the exploratory phase, but much of the experiences and actions stay implicit within the practitioners and experts. This research will therefore answer *how* and *why* the process of the exploratory phase takes place by making the experiences from people explicit. First, the research strategy is defined. Second, the use and setup of interviews and their results are discussed. Last, the Best-Worst Method (BWM) is defined by considering the survey design and analysis of the data.

2.1 Grounded theory approach as a research strategy

Comparing the experiences from practice with theory will lead to scientific insights that are also of added value within practice. A research strategy that is suitable for this problem is the grounded theory approach. Glaser and Strauss (1967) see this approach as "a journey" where insights are retrieved over time. This strategy is well applicable, as it requires the research to constantly compare the results and conclude whether the experiences and findings are in agreement with the previously identified and stated theories (Verschuren & Doorewaard, 2010). These continuous comparisons improve the transparency of the research. The theoretic framework, which is used to compare practice with theory, is further elaborated in chapter three. Compared to other research strategies, the grounded theory approach is dependent on qualitative information, which makes it suitable for this research. Desk research and a literature review are insufficient strategies, as experiences are not considered. Research methods are selected to make implicit experiences explicit. Interviews compare the experiences of two cases. A cross case analysis compares the experiences from practice more extensively (Gerring, 2007). BWM compares the perceptions of practitioners concerning DSMs with the information from literature and case studies. Using two methods (methodical triangulation) and validating these outcomes (data-triangulation) increases the reliability of the analysis and the validity of the outcomes.

2.2 Interviews as a research method

The objective of interviews is to identify characteristics of the exploratory phase of MIRT projects in practice. Although governmental documents show the prescribed steps in the exploratory phase, there are other factors that influence a successful outcome of an exploratory phase. Interviews help to get a more complete image of the exploratory phase in practice, as it makes implicit experiences explicit. Semi-structured interviews are used, as every person experiences other aspects. This creates a dialogue that includes all relevant aspects in the first part of the exploratory phase. A strict protocol might exclude subjects that are important within the exploratory phase.

2.2.1 Goal of the interviews and selection of the interviewees

Two sets of interviews are conducted. First, more general questions were asked to understand the aspects and elements of the MIRT process. These questions identify the characteristics and the issues of the initiative phase and the exploratory phase, to gain a better understanding of the differences between the two phases. Second, a set of interviews focuses on the experiences in the exploratory phase of a specific case and the use of DSMs in this specific case. The interview questions are the same for both cases, so the outcomes can be compared.

These two sets of interviews have different interview questions. The questions for the more general interviews are shown in appendix B. The questions for the case interviews are shown in appendix C. The

type of interviews and interview protocol are the same for both interviews. If differences occur, this is explicitly addressed in the following sections.

The interviewees are selected based on their involvement and experiences in the exploratory phase of the MIRT. Interviewees are selected from different organisations and/or with different roles. A diverse group of interviewees lead to different perspectives and experiences concerning the exploratory phase. Only people that worked within projects from infrastructural and transport projects are considered. This increases the comparativeness of the experiences. Next to that, water, spatial and rail projects represent a minority of the MIRT projects.

For the first set of five interviews, contacts are retrieved from the TU Delft and from Rijkswaterstaat. The interviewees are working for the Ministry of Infrastructure and Environment (I&E), Rijkswaterstaat and consulting or engineering companies that are involved in either exploratory or initiative phases. The second set of interviews of the case studies covers twelve interviews. Based on contacts from Rijkswaterstaat, two case studies are depicted. The interviewees of the case studies are representatives from the organisations that are involved in the MIRT exploratory process. Organisations that are considered for these case studies are the Ministry of I&E, Rijkswaterstaat, the province of Noord-Brabant and municipalities. Also the consulting or engineering company that guided the exploratory phase is involved in the interviews. A complete list of the interviewees is shown in appendix E.

2.2.2 Interview design and interview protocol

Semi-structured interviews with open and neutral questions are used to retrieve the desired information, but leave the interpretation for the interviewee open. The interviewee has the possibility to add their personal experiences and add what is considered important. This follows the entitlements of Charmaz (2006). Besides, it makes it possible to sense whether the interviewee is comfortable to talk about political aspects and influences on the process. Detailed questions about political influence were therefore not defined in the interview questions. The order of the questions and time spent on the subject differs per interviewee, this makes it possible for the researcher and interviewee to steer the interview towards the desired and important information. The interview questions are largely the same for the interview set. This makes it possible to structure and compare the outcomes of the interviews.

It is aimed to have someone first contacting the interviewee, before the person is approached for the research project. The interviewees receive the interview subjects at least one day before the interview, so the interviewee can prepare the subjects and answers. The appointment schedules 60 minutes. However, the duration of the interview differs between 40 and 80 minutes, depending on the input and the schedule of the interviewee. At the beginning of the interview, permission to record the interview is asked.

After the interview, the recording is transcribed as soon as possible, mostly within two days. After transcribing the interview of the case studies, a report is made. This report aims to give a reflection of the interview and it is thus used to check if the conversation was interpreted correctly. These reports were sent to the interviewees with the possibility to make adjustments and with the question to approve the report. Several interviewees responded that the report was of high quality and that it gave a good reflection of the interview. Of twelve interviews, eleven reports are added as within appendix F. These reports make the information source more transparent, which is in line with the grounded theory approach of Glaser and Strauss (1967). The first set of the five interviews is only transcribed. The experiences of the interviewees are used for general understanding of the exploratory phase and they are not used as a source of information.

2.2.3 Analysis of the data and results

Developing a new theory requires accuracy and transparency, as it should be clear how information led to certain conclusions. This involves procedures and techniques that should be carefully and consistently applied during the interviews. In order to do this, Corbin and Strauss (1990) consider three activities. First, open coding explores the field of study. By analysing all relevant information, this leads to formulation of concepts to interpret the experiences of the interviewee. The open coding results in the transcript of interview, where the concepts are marked within the text. Second, axial coding is a more selective phase. Experiences and insights are connected and improved with specific meaning. The information and results retrieved from the interview is summarized and categorised in a report, which is presented to the interviewee. The last step is selective coding, where the information from the two previous steps are reduced to a concise theory. This theory is presented in this report.

With these steps from the grounded theory there is a possibility to take a too broad perspective in understanding the complete complex situation. In order to mitigate this risk, the theory is built around the research questions and the research objectives. Besides, the theoretic framework that is proposed in the next chapter helps to remain focus on the important elements of the exploratory phase.

2.3 Best-Worst Method to validate the outcomes

Added value of DSMs differentiates per person and per perspective. The aspects of added value are captured and bundled as criteria. However, it is assumed that some criteria (thus added value) are appreciated to be more important than other criteria. This means that the importance (or weight) of the criterion is different for each criterion. It is difficult to qualitatively define the weights of criteria and the experts have difficulties in assigning scores to these methods. Furthermore, DSMs can add value in different ways. Each DSM will have their individual score on criteria of added value, as each DSM has other characteristics and qualities.

This leads to the use the Best-Worst Method (BWM). BWM helps to find the weights of the criteria and scores of the methods. BWM is a method to solve multi-criteria decision making problems. Compared to other Multi Criteria Decision Analysis (MCDA) methods, BWM has the advantage that it is understandable and executable for experts. Experts have difficulties in making trade offs when using a traditional MCDA matrix. BWM uses pairwise comparison. Within this pairwise comparison, the expert is asked to express the direction and the strength of the preference of the criterion or the method, over other criteria and methods. This pairwise comparison leads to consistency in the outcomes and reliable results, as less comparisons are required (Rezaei, 2015, 2015; Rezaei, Wang, & Tavasszy, 2015). The reliability of the comparisons is expressed with a consistency indicator. A low consistency ratio (value closer to 1) is the result of the differences in weights of preferences on the most important (best) and least important (worst) scales. Although experts are able to express the direction (one option is more important than the other option), the strength (this option is this much more important than the other option) of the preference is difficult to express (Rezaei, 2015). This almost always leads to inconsistencies, which is expressed with the consistency ratio.

The objective of BWM is to validate the outcomes of the added value of DSM. The scores and outcomes of the experts are compared with the qualitative outcomes of the research, where literature and case studies are used. Using these sources of information together increases the validity of the outcomes and this makes it possible to identify the best method, given a criterion.

2.3.1 Goal of the survey and selection of the experts

The BWM survey is another way to incorporate the knowledge of practitioners. This survey considers the experiences of experts who use DSMs in practice. It aims to evaluate and validate the added value of the DSMs, while considering their applicability. The survey can be found in appendix D.

The experts are selected based on their experience with DSMs and based on their experience with the MIRT process. Two types of experts are selected: first, an expert group who have experience with applying and developing the DSMs. They have knowledge about DSMs and they were asked to rank the criteria and score the methods relative to each other. Second, experts who are working on the renewal of the MIRT are asked to only rank the criteria. Involvement of these two types of experts can show a different prioritisation of the criteria.

The supervisors from Rijkswaterstaat provide names and contact information of the experts. In some situations, the supervisors contacted the experts. The experts are working for the Ministry of I&E, Rijkswaterstaat, ProRail and Witteveen+Bos.

2.3.2 Survey design

Information concerning the criteria and the DSMs is added to the survey. This is excluded in the survey, but can be directly found in chapter six. The survey is sent out over email in a Word format, so the experts can make their adjustments within the document. It is acknowledged that it might be difficult to answer the questions, therefore the survey contains an introduction with the goal of the survey. The first questions provided an example, to help the experts in their scoring. Furthermore, experts are asked to call or email if questions arise.

This survey has two goals, therefore it is split in two parts:

1. Determine the weight factors of the criteria: this part aims to see what criteria are considered more important, over the other criteria. By doing so, it is possible to see if experts consider the rational (efficient outcomes), organisational (shared interests) or political (individual or political influences) function of criteria as more important.
2. Determine the scores of the methods: this part aims to score the methods, comparing a method to the other methods. This makes it possible to see what method is suitable per criterion.

There are two scales to determine the weight factors and to determine the scores of the methods on the criteria. For both parts, two questions are being asked:

1. What do I consider the most important option? And how much more do I consider this option to be more important than the other options?
2. What do I consider the least important option? And how much more do I consider the other options to be more important than the least important option?

These questions are first being answered for the criteria. Afterwards, for each criterion, these questions will be answered by providing a DSM.

Answering these questions follow a nine point scale. For ranking the criteria, this scale answers how much you consider the criterion to be more important than the other criteria. Scoring the methods shows a different scale, shown in table 2. This scale states what method scores best on the given criterion, considering the other methods.

Table 2: Differences in the scales of criteria and methods

Ranking the criteria	Ranking the methods
1. Equal important	1. Equal score
3. Little more important	3. Little better
5. More important	5. More better
7. Much more important	7. Much better
9. Very much more important	9. Very much more better

The values 2, 4, 6 and 8 are lying for both scores in between.

2.3.3 Analysis of the data and results

By answering the survey, it is possible to calculate the weights of the criteria and the scores of the methods. The following five steps lead to values of the criteria weights and method scores (Rezaei, 2015a, 2015b). These values are solved with a linear programming function.

1. Determine a set of decision criteria

Six criteria $(c_1, c_2, \dots\ c_n)$ are identified, which express desirable improvements of the exploratory phase.

2. Determine the best and the worst criteria

Each expert determines the most important (best) and least important (worst) criteria from the following set of criteria $(c_1, c_2, \dots\ c_n)$.

3. Determine the preference of the best criterion over all other criteria

Each expert identifies the preferences of the most important (best) criterion over the other criteria by using a value between 1 and 9 where 1 means equal preference between the best criterion and the other criterion and 9 means very less important than the best criterion. These comparisons lead to a best-to-other (BO) vector:

$A_B = (a_{B1}, a_{B2}, \dots\ a_{Bn})$,

Where a_{Bj} indicates the preference of the best criterion *B* over criterion *j* and $a_{BB} = 1$

4. Determine the preference of all other criteria over the worst criterion

Each expert identifies the preferences of the other criteria over the least important (worst) criterion by using a value between 1 and 9 where 1 means equal preference between the worst criterion and the other criterion and 9 means very more important than the worst criterion. These comparisons lead to a others-to-worst (OW) vector:

$A_W = (a_{W1}, a_{W2}, \dots\ a_{nW})$,

Where a_{jW} indicates the preference of criterion *j* over the worst criterion *W* and $a_{WW} = 1$

5. Find the optimal weights of the criteria

The optimal weights $(w_{c1}^*, w_{c2}^*, \dots\ w_{cn}^*)$ are derived for each criterion. A solution is found where the maximum absolute differences $\left|\frac{w_B}{w_j} - a_{Bj}\right|$ and $\left|\frac{w_j}{w_W} - a_{jW}\right|$ for al *j* is minimized. This is translated to the following minmax model: $minmax_j \left\{\left|\frac{w_B}{w_j} - a_{Bj}\right|, \left|\frac{w_j}{w_W} - a_{jW}\right|\right\}$

Subject to:

$$\sum_j w_j = 1$$

$w_j \geq 0$, for all j

In a linear programming function the problem is defined as:
Min ξ^L
Subject to:
$\left|w_B - a_{Bj} * w_j\right| \leq \xi^L$, for all j
$\left|w_j - a_{jW} * w_W\right| \leq \xi^L$, for all j
$$\sum_j w_j = 1$$
$w_j \geq 0$, for all j
Solving this model leads to the optimal weights (w_{c1}*, w_{c2}*, w_{c3}*, w_{c4}*, w_{c5}*, w_{c6}*) and the lowest possible ξ*. Herein ξ* is the consistency indicator. A value of ξ* closer to zero shows a higher level of consistency.

These steps are repeated to calculate the score of a DSM on a criterion. Thus for each expert this step is repeated for each criterion. Calculating the weights uses the Solver function in Excel. Each expert has their own tab in Excel and their scores are combined into an average, calculated on the first tab. The calculations from the BWM are stated in appendix G. Calculating the averages provide a comprehensive and clear score of the methods on the different criteria. Therefore, this method provides a useful (first) step in comparing the outcomes from literature with practice.

Due to time constraints, it is important to note that the outcomes of this method show limitations. First, as n = 9, individual preferences have a high influence on the outcomes. It is aimed to retrieve the answers from experts of the methods to compare their outcomes with the answers of experts of the MIRT process. However, a limited number of experts of the MIRT process replied, which makes comparison difficult. Second, these outcomes are not tested with a statistical analysis. Although the consistency ratio shows a first step in the consistency of the outcomes, statistical analysis can further analyse the differences between the criteria and methods. It is possible to state that experts (dis)agree about the applicability of the criteria or method. Next to that, there is no concept survey. The designed survey is directly proposed to the experts. This lead to comments and questions about the 'current situation' ("how should I interpret the current situation, if there are already methods applied?"), the diversity of criteria ("you cannot compare apples with pears") and the last criteria, the ability to deal with political influences ("are these influences good or bad?"). The results of this method should therefore rather be seen as an indication of the added value of DSMs. It is not desirable to come up with the 'best' method. It would be recommended for further research to extend the BWM analysis in analysing the applicability of DSMs in the MIRT exploratory phase.

3 Three perspectives to analyse the exploratory phase of the MIRT

The introduction shows a dilemma between the guidelines and the exploratory phase in practice. The guidelines assume uniformity and value maximization of project alternatives. Governmental documents and evaluations show that practice is often more dynamic. Powell & Buede (2009) argue that a decision making perspective helps to decide what critical information should be considered when making a decision. A decision making perspective therefore helps identifying the function that DSMs should fulfil in the exploratory phase. Using one perspective provides a limited and incomplete view of the considered information. Applying several perspectives help to gain a better understanding of the decision making in the exploratory phase, as different elements of the complex situation are revealed (Albaek, 1996; Allison, 1971). This chapter proposes three perspectives as a framework to analyse and explain the decision making process. First, this chapter considers decision making lenses from literature. Second, the rational, organisational and political perspectives are proposed with assumptions for the decision making process.

3.1 Perspectives from literature

In order to justify the decision making process, several rationalities exist which influence the perspective of the decision making process. Goulet (1986) defines a rationality as "any mode of thinking, universe of cognitive assumptions and methodological procedures, or body of criteria for establishing truth or validity". Different rationalities (in this research: perspectives) exist parallel of each other, of which each perspective highlights different premises or criteria that should be completed.

Allison (1971) defines three perspectives or decision making models. The first perspective is the *rational actor* model that assumes actors that address their choices and decisions, based on the goals and the objectives of the actor. The second model is the *organisational process* model, which considers the process and procedure of organisations as the context that lead to choices and decisions. Third is the *governmental politics* model. Events are not considered as decisions or choices, but events are the result of bargaining games between different individuals.

Snellen (2002) identifies four different rationalities or sets of norms, which are present in public decision making. These four rationalities exist next to each other, as there is no overarching consistent set of norms that brings the four rationalities together. The *economic rationality* determines the success of the policy on micro- and macro-economic efficiency. Macro-economic efficiency is often considered as more important, as it calculates and allocates the highest cost-effectiveness. The second rationality is the *legal rationality*, where legal security is determined by jurisprudence. The legal rationality contains actions to ensure the confidence of the law and it constrains governmental actions. Third, *professional rationality* uses scientific knowledge in patterns of behaviour, the sociology of organisations, social psychology and technical sciences. Fourth and last, the *political rationality* is explained as the power of individuals or the power of collectives.

Mu (2013) uses and combines the perspectives from Allison (1971) and Snellen (2002), which results in three perspectives: a *policy analyst perspective*, a *legal perspective* and a *political perspective*. Mu neglects the organisational perspective as data about routines of organisations and actors is often lacking in China. Additionally, Mu assumes that the rational actor model is largely the same as professional rationality and considers the (macro-) economic rationality as the overarching organisational process model. This research considers the economic rationality as the rational actor, where cost effectiveness is maximized. It considers the professional rationality as an organisational lens to understand organisations and society. These models are considered differently from Mu's classification. See * in table 3.

Steunenberg & van Vught (1997) state that there is no generally accepted theory available. They identify three approaches to consider institutions. The first institution is the *political economy-rational choice*, where institutions do not aim to explain politics or public life, but demonstrates how organisations achieve highest quality under the lowest cost. Game theory helps to identify pay offs to avoid sub-optimal outcomes. The second *cultural-organisational* approach identifies patterns of interactions based on norms and rules within organisations and between these organisations. The third institution is the *historical-traditional* approach. It explains political choice and public action by behaviour of individuals, which is designed by individuals themselves.

Table 3: Perspectives derived from literature

Allison (1971)	**Snellen (2002)**	**Mu (2013)**	**Steunenberg and van Vught (1997)**	**Thesis (2017)**
The rational actor	The economic rationality*	The policy analyst perspective	Political economy-rational choice	Rational perspective
The organisational process	The professional rationality*		Cultural-organisational approach	Organisational perspective
	The legal rationality	The legal perspective		
The governmental politics	The political rationality	The political perspective	Historical-traditional approach	Political perspective

This illustrates that research uses other classification of rationalities or perspectives, which lead to small differences in assumptions. Nevertheless, research shows that there is an agreement on the breakdown of hard logic (technical and economic assumptions) and soft logic (individual influence and power) perspectives (Goulet, 1986). Based on these insights it is important to note that the following theoretic framework is not true, but it helps to structurally analyse and explain the practice.

Next to the rational and political perspective, this research adds a bounded rationality with the organisational perspective. In this sense, this research follows the assumptions from Allison (1971). This research takes the rational perspective, the organisational perspective and the political perspective as leading perspectives. Legal aspects will be added within the organisational perspective. Legal components are observable within the three perspectives, which makes it difficult to assign it to one perspective. When legal aspects are considered as rules and regulations in and between organisations, legal aspects are considered as constraints within the organisation.

3.2 Rational perspective

The rational perspective uses scientific knowledge to solve problems. Aids and instruments are used to reach the goal and efficiency assesses the utility of a project (Goulet, 1986; Weber, 1968). The MIRT guidelines can be considered as an instrumental mean, where decisions are based on full information. It uses analytical steps, facts, objectives and expected outcomes, before decisions are made. Information to identify all possible alternatives and choices is available. The consequences or causalities of these alternatives are known in the present and future (Simon, 1978). Or the effects of decisions can be made quantitatively, data can be used to calculate the outcomes, given their situation and specified objectives. The success of the decision can be calculated with economic efficiency, where the decision maker has the aim to make a decision based on the highest cost-efficiency. Kørnøv and Thissen (2000) make a distinction between the rational process and the rational outcome. This research covers both aspects in the rational perspective.

Consequences are derived logically from the objectives and alternatives. This involves the following steps:

1. Problem formulation and analysis

2. Definition of the goals and objectives and choose indicators or criteria
3. Generating potential alternatives
4. Analysing and comparing alternatives based on costs and benefits on the specified indicators
5. Decision on the alternative with the highest score on the earlier defined indicators

The rational perspective has the following assumptions:

- Action as a choice: decisions are chosen actions that will maximize goals and objectives.
- The problem, goals and objectives are clearly defined.
- The government has only one set of objectives.
- Uncertainties are mitigated that leads to precise estimations of the consequences of the alternatives.
- The decision maker has full insights in the potential options that lead to alternatives.
- Alternatives are objectively ranked and evaluated based on full insights in effects and consequences.
- The decision maker chooses the best alternative that maximizes the welfare of society.
- The likelihood that an alternative is chosen is affected by its costs: alternatives with higher costs are less likely to be chosen.
- Decision maker acts within the best interest of society and aims to maximize utility of society as a whole.

The rational perspective is often criticized because it inadequately account for uncertainties and the dynamics in the real world. It focuses too much on the rationality and does not consider other aspects such as stakeholder relations, procedures, routines and strategic behaviour. Although this perspective is little applicable in practice, the underlying goal of full information makes it possible to work towards maximisation of the process and the process outcomes.

3.3 Organisational perspective

The organisational perspective is the second perspective, which builds upon the rational perspective. Simon (1957) shows five problems with the simplified rational perspective: not all aspects of problems can be considered, because problems are often too complex. Second, alternatives are not maximized, but alternatives are selected that are satisfying. This influences the third problem, where decision makers stop searching when an alternative is good enough. Fourth, people try to avoid uncertainty and fifth, people use repertoires in their actions. These aspects lead to bounded rationality and it prevents the decision maker to choose an alternative with the highest value.

This brings us to the organisational perspective. Predictions of the outcomes are dependent on the fixed procedures and programs of established organisations. Roles, routines, rights, obligations and standard operating procedures and practices are influenced by institutional arrangements and individuals, who must interact to achieve goals and purposes (March & Olsen, 1994). Institutions can help understand these interactions between individuals. Ostrom (1999) gives several examples of institutions, such as laws, policies or official procedures. But also more informal norms, standard practices or habits are considered as institutions.

The following premises are defined to explain the organisational perspective:

- The government consists of different sub-organisations.
- Power and potential actions is dependent on their goals and objectives. Goals might be conflicting, which leads to trade-offs between objectives.
- Behaviour and activities are predetermined by the goals and objectives of the sub organisation.

- Laws, policies and official procedures constrain the functions and performance.
- Constraints are based on the expectations and demands of other organisations and citizens
- Activities do not incorporate long-term and flexible adaption to the issue, as organisations have difficulties to deal with uncertainties and deviate from standard procedures.
- Avoiding uncertainty leads to arrangements and contracts and activities stick to standard procedures.
- Alternatives are not necessarily the best alternatives but are rather dependent on the interest in controlling alternatives.
- Alternatives that require coordination from several organisations or that are developed in areas between organisations are likely to be poor.
- Organisations are limited flexible and actions are marginally different from previous behaviour. This leads to incremental changes.
- Long-term planning is often disregarded.

3.4 Political perspective

The political perspective is the third and last perspective. It considers the organisational model as insufficient, as actions are driven by non-homogeneous interests of individuals. Goals and objectives do not agree with the resulting actions, as actions are often influenced by the persuasion power, voting procedures or regulating power of the state (Cyert & March, 1963). This perspective states that outcomes depend on the individuals, the game in which the problem arises and the power and skill of the individuals to turn this problem into actions. It is acknowledged that some problems are solved, but that others are set aside or solved symbolically. This is dependent on the perceptions, motivations, positions and powers of the individuals. Next to that, outcomes of decisions are often influenced by conflicts and consensus between organisations (Moscovici & Doise, 1994). Individuals seek for compromises in order to preserve their interest and power (Goulet, 1986).

There are multiple underlying premises that explains the political perspective:

- Each individual has different perceptions, goals, interests, stakes and stands.
- The chosen alternative is the result of deadlines, compromises, conflicts and confusions between people, where individuals have different interests and power.
- Skill of using bargaining advantages and other individual's perceptions determines the power of the individual.
- Decisions and actions are the result of stands, influences and moves of individuals.
- The environment, the pace, the structure, the law and the reward influence the process.
- Actions rarely agree with an agreed intentions or alternative. It is more likely that individuals with different interests contribute to a resultant outcome.
- Individuals do not focus on a strategic problem, but rather focus on the solution or alternative that must be realized. Decisions are often a coincidence where the alternative meets the problem.
- Individuals build coalitions with others, to build the confidence that the action is needed.
- Building coalitions requires fuzziness, as people must agree with slightly different things.
- The position of the individual influences the issue. This leads to different players, all having different issues and interests.
- Each player has a different style that leads to different behaviour

The political perspective is criticized because of its lack of explanatory power and is difficult to validate the underlying premises. Information is rarely available in documents, which makes it difficult to define the process from a political perspective.

3.5 Conclusion

There is no right perspective in practice and none of the perspectives will be able to explain everything (Albaek, 1996). By using the three perspectives instead of one, a more complete view of the situation can be constructed. The rational perspective is helpful for the decision maker to determine the most effective and efficient project alternative. The organisational perspective helps to identify the differences in interests and preferences, that influence the decision making process. The political perspective considers the political and individual influences on decisions.

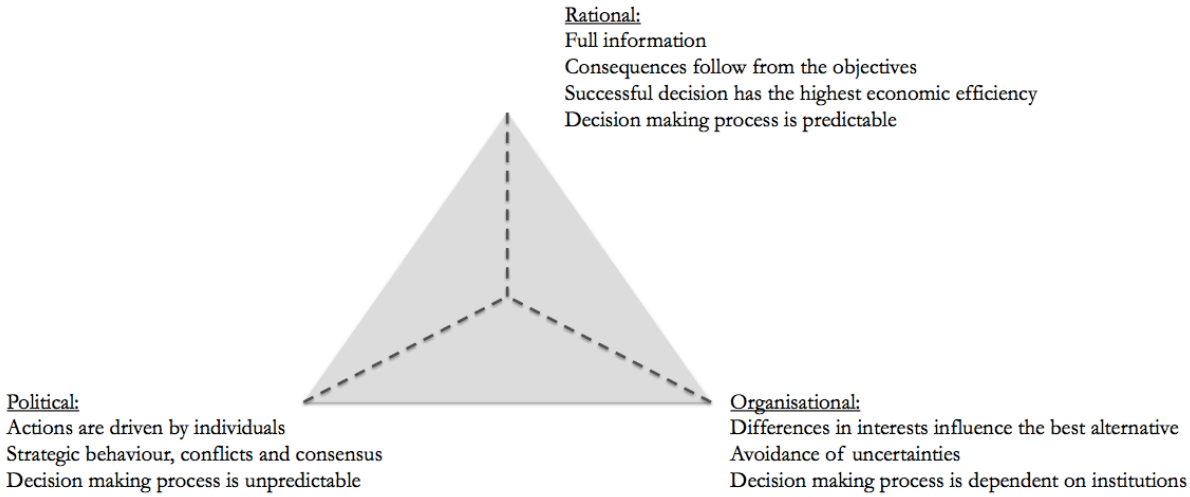


Figure 3: Overview of the three perspectives

However, it is important to consider the complementarities between these perspectives. Goulet (1986) shows that the three perspectives often automatically conflict with each other. Rational alternatives are often political infeasible and vice versa. This shows a problem of how to retain one perspective, while respecting the other two perspectives. Flyvberg (2003) acknowledges the asymmetrical relation between rationality and (political) power. Rationality does not incorporate the influence of power, while power influences the process. When bringing "what should be done" closer "what is actually done", it is possible to understand practice better.

These arguments lead to the decision to use the three perspectives throughout this research. Using three perspectives as a framework increases the completeness of this research. Each of these three perspectives highlight elements of decision making practice and this brings what "should be done" closer to "what is actually done". First, these three perspectives provide a structured approach to analyse and explain the MIRT exploratory phase of two case studies. Information according to the rational perspective can be derived from governmental documents. Input for the organisational and political perspective is dependent on the information from interviews. It is difficult to provide insights from the political perspective. It takes time and trust to get insights in the personal interests and individual actions. The perspectives are also used later on, as added value of DSM, the criteria and the context can be defined and described using these three perspectives.

4 Executing the MIRT exploratory phase

This section analyses and explains the process of the MIRT exploratory phase of two MIRT projects. It aims to see how the MIRT exploratory phase functions in practice. It is first necessary to see how the exploratory phase functions, before determining the added value of DSMs in this phase. This section increases the understanding of the context in which DSMs are currently applied. Currently, a lot is unknown about the exploratory phase and the success of DSMs is expected to be higher when applying them in a well understood context. This chapter aims to provide insights in the characteristics of the exploratory phase. The cases N65 Vught - Haaren and the program InnovA58 are selected. These projects are selected because they recently continued to the plan elaboration phase and both take place in the road infrastructure domain. This leads to recent information and comparable experiences. This chapter has two sections. First, the N65 Vught – Haaren and second, the InnovA58 are analysed and explained. Each section starts with an introduction and overview. After that, the experiences are analysed using the rational, the organisational and the political perspectives. The chapter ends with conclusions, where experiences from both cases are compared.

4.1 N65 Vught - Haaren

The liveability and safety of the areas around the highway N65 are under pressure. This highway crosses residential areas and therefore causes a barrier and noise nuisance. These nuisances accumulated with a railway in the centre of Vught. Additionally, dangerous situations occur because of cut-off traffic that is both experienced in Vught and Haaren. The goal of this MIRT project is to improve the liveability of this area. This contains reduction of noise and air pollution, reduce the barrier function of the N65 between the residential areas and improve the traffic safety. Decisions are made in alignment with the program high frequency rail (Programma Hoogfrequent Spoor, PHS) that increases the capacity of the railway between 's Hertogenbosch and Boxtel (Ministerie van Infrastructuur en Milieu, 2013b).

The Ministry of I&E executed the exploration phase together with the province of Noord-Brabant (as co-client), Rijkswaterstaat Noord-Brabant and the municipalities Vught, Haaren and 's Hertogenbosch. This led to interventions in Vught and Helvoirt, where Helvoirt is part of the municipality of Haaren. In Vught, three deepened intersections will be realised. Two intersections will remain on the same level, but these intersections will be optimised. Three measures are realised in Helvoirt, an intersection will be improved and optimised with a new bicycle tunnel. An eco-bridge will be constructed and parallel roads next to the N65 will be realised.

The start decision was made on the 16th of May 2013. There is a long history of planning for the N65. The first objectives to realise a tunnel were defined in 2007. The preferred alternative changed over the years and a preferred decision was made by the Ministry of I&E on the 27th of June, 2016. Hereafter, the project continued to the plan elaboration phase. Realisation is planned to start in 2021, where the structures will open at the end of 2023. The initial budget of the project was determined to be €100 million, but resulted in a total budget of €107 million, of which €56 million is financed by the Ministry of I&E and €51 million will be contributed by the region (Ministerie van Infrastructuur en Milieu, 2017). The following sections give an overview of the exploratory phase, from the start decision until the decision for the preferred alternative, reasoned from the three perspectives.

Figure 4: Project N65 Vught – Haaren (Ministerie van Infrastructuur en Milieu, 2017)

4.1.1 Rational perspective

Problem analysis

As the start document from May 2013 shows, there are problems with liveability and safety in the area of the N65 (Ministerie van Infrastructuur en Milieu, 2013b). The N65 functions as a barrier in the city and leads to noise nuisance. The noise nuisance is accumulated, as the railways 's Hertogenbosch – Eindhoven and 's Hertogenbosch – Tilburg lead through the centre of Vught. It is likely that this will increase, as the high frequency rail program leads to more trains per hour. The main goal is to improve the liveability, which contains noise levels, air quality, traffic safety and reduce the barrier function between the residence areas around the N65. Improvement in the accessibility is only a secondary goal, as there are no expected bottlenecks in infrastructure, accessibility and traffic. Nevertheless, a better traffic flow leads to an improvement in the liveability, as there is less traffic waiting in the centre. Traffic jams lead to an increased use of secondary, municipal roads, which are unsuitable for the amount of traffic. Effects on the secondary road network, the main road network and indirect measures are also part of the scope. This led to an integral spatial pilot initiated by the province of Noord-Brabant. The scope of the project is 7,7 kilometres. This is a trajectory of the N65 from Vught until Helvoirt.

Identify indicators

The framework to assess the alternatives contains liveability (noise nuisance, air quality, traffic safety, barrier function and possibilities to cross the road), traffic flow and accessibility (in travel times, in local accessibility, effects on the road networks), nature, spatial quality (integration in the environment, contribution to spatial economic ambitions, culture and landscape and recreation), other environmental aspects (soil, water, vibrations, external security risks), technique (realisation risks and time), financial limits (costs of realisation, control and maintenance and costs of spatial implementation) and other societal costs and benefits. These indicators are split in constraints (alternatives should not lead to less traffic safety or lower accessibility) and criteria. The indicators can be both expressed qualitatively and quantitatively (Ministerie van Infrastructuur en Milieu, 2013b).

Generate alternatives

The region proposed a deepened road as the preferred alternative. Therefore the following constraints in the number of lanes (two times two) and the maximum speed (80 km/hours and 70 km/hours in Vught) were already ascertained before the start decision. This alternative was expected to be too expensive and the start decision considers several promising alternatives. Next to that, the start decision stated that the total budget was €100 million, of which €90 million was assigned to Vught and €10 million to Haaren.

This start document led to four alternatives for the N65 in Vught: the current situation with adjustments, divide regional and local traffic by adjusting the local road network, deepened crossings and a deepened road. Appraisal of the alternatives was based on expert judgment, rules of thumb and available research and the available budget of €90 million (Ministerie van Infrastructuur en Milieu, 2014). This led to the conclusion that none of these alternatives was promising in their current state, as none of them had a positive effect on the problems and fit within the budget at the same time. However, the alternative of deepened intersections (in Vught) scored well on improvement of the barrier function, safety, travel times and accessibility. Variants of this alternative considering the width of the lanes and the depth of road at the intersections were analysed (Ministerie van Infrastructuur en Milieu, 2014). This alternative was selected as a basis for promising alternatives for Vught. Parallel roads, a cycling tunnel and an eco passage were considered for Helvoirt. A budget of €10 million was available for interventions in Haaren.

Evaluate and test alternatives

A CBA was conducted for several project alternatives, based on the deepened intersections (RIGO Research en Advies in: Ministerie van Infrastructuur en Milieu, 2016b). However, their cost benefit balance was strongly negative. Most benefits were achieved on improved accessibility. The desired improvements in liveability, spatial quality and reduced barrier were only a small aspect of the benefits. The value for money was too low and these outcomes were unsatisfying. This led to an additional quick scan. Promising elements from the first filter were maintained and new building blocks with higher impact and lower costs were analysed with a VE study. These building blocks were partly obtained with residents. With additional input from the council of Vught, some aspects were set aside and two measures were added as building blocks. This led to the following alternative: a same level intersection (Boslaan/Vijverbosweg), a deepened intersection (Martinilaan/Bréautélaan), half a connection to the N65 and a deepened intersection (Helvoirtseweg/Kennedylaan) and a same level intersection (Torenstraat/Molenstraat) (AnteaGroup, 2016).

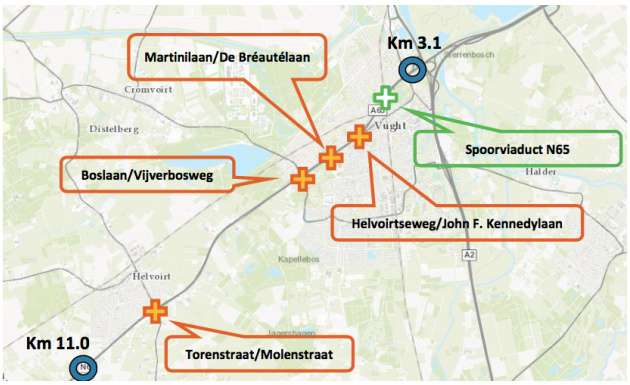


Figure 5: Components of the preferred alternative (AnteaGroup, 2016)

A second CBA was conducted for this alternative. The preferred alternative was compared with the outcomes of the initial promising variants. The initial alternative C6/H2 was comparable with the new preferred alternative. This leads to a comparison of the balance of costs and benefits.

Table 4: Cost Benefit Analysis N65 (adjusted from Ministerie van Infrastructuur en Milieu, 2016b)

Aspect	C6/H2 (CBA 1)	Preferred alternative (CBA 2)
	NCW in mln. €	
Spatial effects residents	-1	-1 (+)
Spatial effects traffic	+	+
Travel time	60	60
Travel costs	12	12

Reliability	15	15
Ease of crossing	3	3 (-)
Traffic safety driving around	-6	-6
Traffic safety when crossing	+	+
Noise	0	0 (+)
Pollution	1	1 (+)
Total benefits	**85**	**85 (+)**
Total costs	**130**	**105,8**
Sum of costs and benefits	**-45**	**-20,8**
Spatial effects and traffic safety	+	+
Benefit/cost ratio	**0,65**	**Indication: 0,8 (+)**

The initial C6/H2 alternative had a balance of - €45 million and the cost benefit ratio is 0,65. The preferred alternative from the quick scan had a balance of - €20,8 million and has a cost benefit ratio of 0,8. Although the effects cannot be accurately determined as some aspects are not considered, the preferred alternative had a higher cost benefit ratio than the initial C6/H2 alternative. Advantages are achieved as costs are lower (AnteaGroup in: Ministerie van Infrastructuur en Milieu, 2016b).

Reflection on the process from a rational perspective

In this section, the process to work from a start decision towards a preferred alternative is related to the project management steps. This section reflects the exploratory phase using the hypotheses of the rational approach.

The exploratory phase mainly followed the steps from the guidelines. The quick scan, executed after the CBA, was not defined in the guidelines. This quick scan was necessary as the available project alternatives were too costly considering their benefits. The outcome of the CBA was negative on all project alternatives. This resulted in a reorientation of alternatives and a second CBA. This CBA was not a prescribed CBA but it was a comparable study, where the initial alternative was compared with the preferred alternative (interview 16). The preferred alternative from the second CBA continued to the plan elaboration phase. This alternative had a less negative outcome than the previous alternatives. This confirms the hypothesis that the likelihood of the chosen alternative is directly affected by its costs.

The goals of the N65 project were clearly defined, as liveability should be improved for the residents living close to the N65. Accessibility was only a secondary goal. However, the most benefits of the preferred alternative were derived from a decrease in travel times, instead of an improvement in the liveability. This shows two potential problems: first, there was a misconnection between the experienced problem and the alternatives that were identified to solve this problem. Project alternatives focus specifically on the N65 road, instead of project alternatives from the spatial domain to improve liveability. Second, CBA is limited when considering spatial quality, as this is only qualitatively expressed (table 4).

The preferred alternative is expected to be beneficial for the people living in Vught and Helvoirt, close to the N65. However, the negative cost benefit balance shows that this project is not in the interest of society as a whole. The money that is spent on this project could have been invested more efficiently in projects with more benefits and with a higher positive impact than the N65 projects.
However, there might have been other factors that were considered more important than the maximization of utility. Although the rational perspective gives a good start to describe the situation,

several aspects stated above cannot be explained. There seems to be a mismatch between the goal to increase liveability and the alternatives that focus on improvement of accessibility. The costs are higher than the experienced benefits, which means that the project is inefficient from a rational perspective.

4.1.2 Organisational perspective

Legal aspects
The N65 project had to meet the guidelines of the exploratory phase of the MIRT. This includes aspects that should be considered in the deliverables, but also means or steps that should be part of the exploratory process. These rules and guidelines are generally applied on all MIRT projects. The *tracéwet* is an act that must be followed when one is planning on expanding or realising a road network that meets a certain magnitude. The foreseeable adjustments were not *tracéwet* required in the N65 project, as there were no planned interventions that adjusted the road network with more than two lanes. Next to that, there was no structure vision and there was no *plan mer* required. After deciding on the preferred alternative, the procedure fell under the responsibility of the council of the municipality (Ministerie van Infrastructuur en Milieu, 2013b).

There were several norms and goals which expressed the observed bottleneck (Ministerie van Infrastructuur en Milieu, 2014). This contained norms and goals concerning accessibility, liveability and safety (e.g. noise, air quality, nature, soil and landscape). Although the norms and directives showed few bottlenecks, interviews with the stakeholders, such as interest groups and the municipalities of Haaren and Vught, showed that accessibility, traffic safety and barrier function were problematic (Ministerie van Infrastructuur en Milieu, 2014).

The guidelines
The guidelines describe how to execute the exploratory phase of a MIRT project. This document was also applicable for the N65 project. It described the use of a traffic model, so the expected traffic intensity could be calculated for the road. This model was insufficient to calculate the traffic flows, because traffic lights were not well considered. This led to the additional use of a regional model. Although the guidelines were well functioning in general, it was experienced that the guidelines were better applicable for the highways or 'A roads' (interview 13; interview 14) than for non-highways, the so-called 'N roads'. Additionally, the guidelines describe the use of means, instead of the goals that should be met at the end of the process (interview 6). The guidelines assume a certain abstraction level, but this exploratory phase was elaborated in much detail (interview 6). This safeguarded the interests of the residents, as the N65 project was a very local problem. The residents who were living close to the project wanted to know what the impact of the project would be on their personal situation. Additionally, as the region financially contributed to the project, this led to close involvement of municipalities in the process (interview 6; interview 13). The guidelines were an aid to see how to deal with situations when the process did not follow aspects of a general MIRT project (interview 6; interview 16). However, the guidelines did not comment on the fact that each MIRT project and each MIRT process has unique aspects (interview 6).

Organisation, roles and responsibilities
The project organisation reflected the cooperation between government and region. The province of Noord-Brabant represented the region and included the preferences of the municipalities Vught, Haaren and 's Hertogenbosch in the process. Each party had its own responsibilities and power to pursue its interests in the committees, where cooperation was considered as a condition to work towards the desired results. The Ministry of I&E and region both financially invested in this project. The province of Noord-Brabant and the municipalities of Vught and Haaren invested in the project. This financial cooperation was unique for this project but also led to organisational interests influencing the project (interview 14).

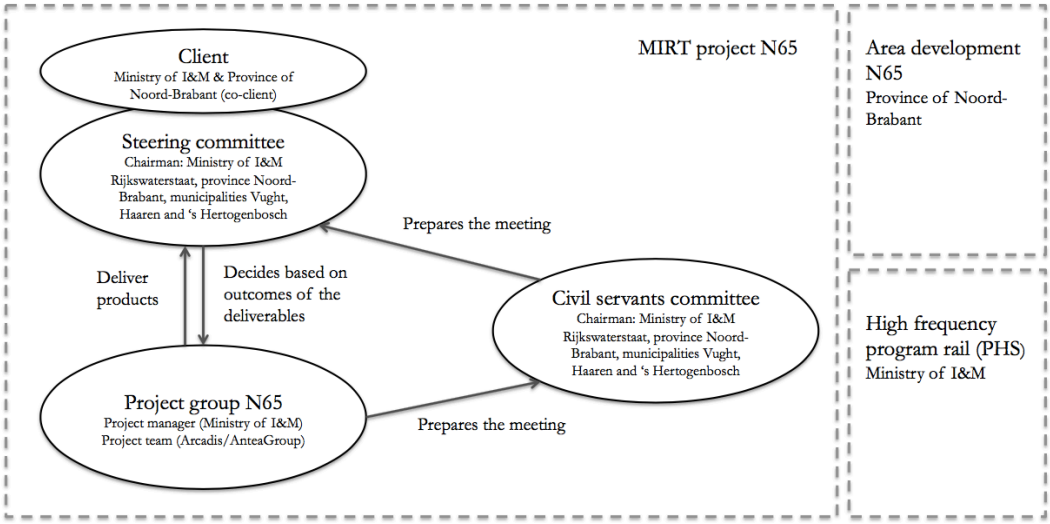


Figure 6: Relation between the stakeholders of the N65 project (based on Ministerie van Infrastructuur en Milieu, 2013)

The role of project manager was covered by the DG accessibility (*DG Bereikbaarheid*) of the ministry Infrastructure & Environment. They were responsible for the quality and process of the exploratory phase. The project manager was not responsible to fulfil the interests and goals of the ministry, but aimed to bring all organisations together (interview 6). The project manager is the chairman in the project team and this team was responsible for the quality and in time delivery of the products.

Rijkswaterstaat Noord-Brabant and the region (the province of Noord-Brabant, municipalities Vught, Haaren and 's Hertogenbosch) were closely involved by participating in the steering committee (*Stuurgroep*), with the Ministry of I&E as chairman. This committee prepared decisions and made interim choices. The civil servants committee (*ambtelijk overleg*) prepared the meetings and decisions of the steering committee. This committee contained representatives from the same organisations as the steering committee, but they did the preparation work for the decisions that would be made in the steering committee. These committees mainly contained the aldermen and representatives concerning traffic and mobility. Although the representative of the province responsible for the spatial challenges initially attended the committee, the representative of traffic and mobility became more present as the focus shifted towards the N65. Instead of spatial challenges, the focus was rather set on the N65. Spatial challenges often involve more time and complexity, as it covers different domains. Alternatives concerning the road infrastructure can be implemented more easily (interview 7).

Participation of the residents and other organisations was an important aspect within the project. The goal was to create a shared solution for the liveability problems. Residents, companies, Platform Vught Noord Structureel (PVNS), the cyclists and walking association were involved for consultation and information (interview 6).

Attitudes towards project alternatives

The attitudes towards project alternatives differed per organisation. The Ministry of I&E did not want to spend money on the project and was a proponent of the sober alternative, which was considered to be the most efficient alternative (interview 7). The province of Noord-Brabant had the wish to integrate the project with their own spatial challenges, but was not an advocate for a specific alternative (interview 12). The municipality of Vught was from the beginning a proponent of the tunnel or a sunken road (interview 6; interview 14). The municipality of Vught did not agree with the proposed alternative. It was considered that the liveability and ease to cross the N65 would decrease with these interventions, as this alternative

contained fewer connections to the N65 and intersections were closed (interview 6). This resulted in an accepted resolution from the municipality of Vught that asked to reconsider the alternatives. The residents and municipality of Vught considered the preferred alternative as insufficient for solving the liveability problems and are still proponent for a deepened road (interview 6; interview 7; interview 14). The preferred alternative left room for a complete deepened road. However, it is not likely that this deepened road will be constructed in the longer term (interview 7; interview 14). There was a mismatch between the wishes and the available budget and these expectations were not well managed (interview 14). For the cyclist and walking association it was important to pay attention to slow traffic in the project alternatives (interview 6). The municipality of Haaren was from the beginning clear about the wish to improve the liveability and safety around the N65. They advocated for realistic and sober interventions with the highest ability to solve the problems concerning liveability and traffic safety (interview 6; interview 13).

Although the municipalities wanted to find the best alternatives for the N65 as a whole, the goal was also to find a solution that maximizes the welfare of the residents in their municipality (interview 13, interview 14). This brought the municipalities in a split position, where they had to advocate the interests of the residents but at the same time they aimed to work towards an agreement together with other parties (interview 13; interview 14). Therefore, the interests of the organisations influenced the process. Next to that, the desire to work towards and come up with a decision was decisive (interview 6). A decision had to be made as noise nuisance would become bigger and sound walls had to be placed (interview 12).

Meeting moments

The national government and the region agreed that the N65 project should be prioritised. This is ascertained within a debate, or so called BO MIRT, in the autumn of 2011. This agreement stated that the government is willing to invest €55 million if the region contributes at least €45 million to the N65 project. The preferred alternative that was drafted before the start decision would be used as a starting point for the project and would be further analysed on their expected impacts and costs (Ministerie van Infrastructuur en Milieu, 2011a). The decision to determine promising solutions was made by the steering committee in November 2014. Herein it was decided to take the alternative with deepened intersections (alternative C) as basis to further develop variants. By varying aspects of the alternative, it might have been possible to increase the efficiency of the alternative (Ministerie van Infrastructuur en Milieu, 2014). However, the steering committee decided in June 2015 to do a quick scan, as the variants of alternative C had little problem solving ability and the costs were too high to realise an in-budget alternative. This quick scan analysed new promising building blocks that could be combined to alternatives.

In October 2015, the committee ascertained the promising building blocks. The remaining promising building blocks and new promising building blocks were further designed and analysed in the quick scan, this led to new promising solutions. (AnteaGroup, 2015b). A combination of building blocks led to a preferred project alternative, which was proposed in the council meeting of Vught in December 2015. The council rejected this project plan. This led to the resolution with the desire to take the sunken road as a starting point again with the possibility to construct a total sunken road in the longer term (Ministerie van Infrastructuur en Milieu, 2016d). The steering committee came back together in December to discuss these outcomes. This led to adjustments of the initial plan and action for further research. Based on the influence of the municipality of Vught and residents, a provisional preferred decision was made. This resulted in the preferred alternative, which was decided in March 2016 (AnteaGroup, 2016).

Additional on-going initiatives

The initial scope would cover the trajectory 's Hertogenbosch – Tilburg. However, not enough budget was available for the whole route and the most problems were considered in Vught and Helvoirt. Therefore the project concentrated on the N65 in Vught and Helvoirt (interview 13; interview 16).

Next to the MIRT project N65, there were two other on-going initiatives. The program high frequency rail (PHS) increased the capacity of the trains. The rail crossed the N65, this led to the desire to mutually adjust the projects. In order to stay informed, the project manager had regularly contact with the project manager of the high frequency rail program to address adjustments and discuss considerations (interview 6). Second, the province formulated several spatial challenges, which would be integrated in the N65 project. It was considered beneficial to connect liveability and safety of the road with ecological and economical aspects in the area (interview 12). The province would be responsible for the adjustments between the MIRT project N65 and their own formulated spatial challenges (Ministerie van Infrastructuur en Milieu, 2013b). However, it was difficult to connect the spatial challenge with the N65 project (interview 12; interview 13).

Reflection on the process from an organisational perspective

The organisational shows several interesting observations. The Dutch government is not one organisation with one goal, but objectives differ both horizontally and vertically between the organisations. On a vertical level, the Ministry of I&E considered this project as unnecessary. They were a proponent of a sober alternative, as this would be most efficient. At the other hand, the region considered the liveability problems. They wanted to intervene and improve the situation. Especially the municipality of Vught advocated for rigorous interventions. On a horizontal level, the municipality of Vught desired to have the budget allocated to their municipality, to fulfil the high expectations. However, this would lead to less money for the municipality of Haaren. From that perspective, each organisation aims to optimise their own objective, instead of fulfilling an overall, shared goal of optimisation of the project alternative.

Although the liveability problem could have led to integral and spatial solutions, the solution was found within the infrastructural domain. There was a wish from the province to connect the project to their spatial challenges, but already in the start document the scope of the alternatives is set on the infrastructure of the N65. The background of the MIT shows that spatial solutions were not included in the MIT (Heeres, 2010) and this program is used to find solutions in asphalt expansion and adjustments of roads. Next to that, the research before the exploratory phase focuses on adjustments on the road of the N65. It was considered difficult to connect different domains. Spatial quality is often difficult to score with the available indicators, as this is often qualitative and subjective. Last, it is often desirable to focus on infrastructural interventions and become a project in the MIRT project, as this is (partly) financed by the national government. Spatial challenges often fall within the responsibilities of the municipalities, which means that they have to pay for these interventions themselves.

As time passed and the decision for the preferred alternative came closer, uncertainties became bigger. There was no agreement on the preferred alternative and it did not meet the expectations of the municipality of Vught. These expectations could not be realised, due to constraints in the available budget. Alternatives were considered based on the available budget. Exceeding the budget led to adjustments in the alternatives by decreasing the number of intersections and the connections to the N65. Although this alternative fit within the available budget, it deviated from the initial idea and preferred solution of the residents and municipality of Vught. With the available budget, an unsatisfying alternative would be realised for the municipality of Vught.

4.1.3 Political perspective

Cause of the project

Although people in Vught and Helvoirt experienced nuisances from the road, this project did not breach stated norms and priorities concerning liveability problems. A political cause led to the start of project N65 (interview 6, interview 7; interview 12). The municipality and the mayor of Vught played an important role in putting the liveability problems of the N65 on the national agenda (interview 7; interview 12). The mayor had politicians from the Dutch parliament in his network and influenced the national politics to do something about the N65. This was observable in the resolution by Aptroot (VVD) and Koopmans (CDA) that was accepted in June 2011 (interview 6; interview 7). The municipality of Vught "is split in four" by the high- and railway and sustainable solutions should be considered in solving these liveability problems. The resolution stated that the available budget of €10,6 million should be preserved and spent in agreement with the municipalities and province of Noord-Brabant, with additional funding of the region (Tweede Kamer der Staten-Generaal, 2011).

Although the liveability in the N65 area could be considered as a regional problem, the resolution obliged the minister to look for sustainable solutions to improve the liveability and safety around the N65. Bringing this to the national agenda is positive for the region, as the national government will have to (financially) contribute in the project. The start decision was prepared together with the region and the available budget was ascertained on €100 million. As the minister was obliged to reserve a funding for the problem, it was stipulated that the region had to invest in it as well (interview 7). Due to budget cuts, the start decision was delayed and was made in May 2013 (interview 6; interview 7).

The accepted resolution was the cause to put the project on the agenda (interview 12). Also the coherence with the high frequency rail project kept the project on the agenda (interview 7). It can be concluded that the project would not have been executed if there was no resolution or political lobby (interview 6; interview 7).

Influence of stakeholders on developing alternatives

Before the resolution was accepted, the region analysed possible interventions. By doing this, it was possible to keep the project within the attention (interview 14). It also led to a preferred alternative for the exploratory phase. The initial wish of the region was to construct a tunnel, but it was clear that there would not be enough budget available to construct this (interview 7; interview 12). This led to the preferred alternative for the exploratory phase to develop a deepened road (interview 6; interview 14). This deepened road was estimated to cost about €90 million. This resulted in a total budget of €100 million of which €10 million was allocated to Haaren. After the exploratory phase started, it became clear that the budget of the deepened road was only a rough estimation, as taxes were not included and construction costs were estimated too low (interview 6; interview 7).

The start document considered four alternatives for the municipality of Vught and and three sober interventions e.g. a cycle tunnel, parallel roads and an eco passage for Helvoirt. These interventions agreed with the budget allocation from the start decision (€90 million to Vught and €10 million to Helvoirt). The alternatives for Vught left room for further elaboration, but the measures for Helvoirt did not deviate much from the initial measures in the start document. The municipality of Haaren wished to consider realistic project alternatives that would be effective in solving the problems in liveability and traffic safety (interview 12; interview 13). This led to tensions between the aldermen of Vught and Haaren (interview 6; interview 7). As Vught invested a lot of energy and money to prioritise the project in the Dutch Parliament, the problems in Vught predominated the process (interview 7; interview 13). This led to an unfair feeling towards Haaren, as Helvoirt also experienced liveability problems (interview 7;

interview 12). As the budget of €90 million was insufficient for the project alternative in Vught, this put the sober interventions within Helvoirt under pressure. Next to that, two municipalities had conflicting interests when it came to the availability of money. When money was allocated to Vught, less money could be invested for measures in Helvoirt (interview 7; interview 12). The municipality of Haaren did not agree with the reallocation of the budget to Vught, as they considered their ambitions to be realistic (interview 13). Therefore, the budget allocation was released later in the process (interview 6; interview 7; interview 14). Due to changes in the council, the municipality of 's Hertogenbosch stayed on the side-line and did not financially contribute in the project.

Four alternatives continued to the exploratory phase, where the alternative of deepened intersections came out as most promising. However, this promising alternative was over budget and adjustments had to be made to lower the costs. These adjustments led to continuous discussions about which side (Vught or Haaren) had to eliminate project measures (interview 7; interview 12; interview 13). These decisions and trade-offs were put upfront within the municipalities, and the ministry of I&E and Rijkswaterstaat took little initiative to steer this process. The Ministry of I&E and Rijkswaterstaat did not prioritise the most effective measures to solve the liveability problems of the N65 (interview 13). Since there was €100 million available, the sober and small measures fell off quick in the process. When the budget became available, the region desired to spend the budget, as the money is kept in the region and cannot be invested in other projects somewhere else in the Netherlands (interview 7).

The variants of the alternatives were further analysed. As more details became available, the impact on the environment turned out to be higher than expected (interview 6). Trees had to be cut and the character of the road would change more rigorously than estimated. Next to that, dwellings had to be demolished to be able to construct the intersections. This led to resistance from the residents (interview 12) and resulted in a revision of the variants. This led to a quick scan, where new variants or building blocks were analysed. There was little support from the council of Vught for the outcomes of the quick scan. The alternative deviated much from the initial desires of the municipality. The council of Vught did not consider that the preferred alternative would improve the liveability and accessibility. This led to a unanimously accepted resolution by the council, with the desire to take a deepened road as starting point. It also desired to maintain as much accesses to the N65 as possible and consider another deepened intersection within additional research. Last, it desired to pursue a fully deepened road on the longer term (van Woesik, du Maine, Cordes, & Kraamer, 2015).

All project alternatives focussed on infrastructure adjustments and the N65 project was not considered as an integral or spatial challenge (interview 6; interview 12; interview 13). First, because the pilot, executed before the exploratory phase, filtered out spatial options (interview 7; interview 14). Second, the spatial challenges of the province would focus on improvement of spatial quality. This was therefore not included in the N65 project (interview 6; interview 14) and this led to detailed project alternatives in the start decision (interview 6). As liveability problems were experienced in the area of the N65, the project would focus on the road (interview 6). Afterwards, it was experienced that the connection between the ambitions of spatial quality (from the province) were little connected with the N65 project (interview 12; interview 13; interview 14). It was difficult to add elements concerning spatial quality in the assessment framework (interview 13; interview 14). The ministry and Rijkswaterstaat addressed problems based on norms and regulations and therefore did not consider the N65 as an urgent matter. However, accumulation of problems (e.g. noise and air quality) is often difficult to consider. Next to that, ease of crossing can be expressed in time, but it does not include the influence on spatial quality and liveability. This leads to a discussion whether the problem was experienced as a real problem or not (interview 14).

Choosing an alternative

The wishes from the residents and the municipality of Vught changed over time, this gave ambiguous indications to the Ministry of I&E (interview 12). Opposition towards the plans made the process more difficult and this led to irritations and misunderstandings between the involved organisations (interview 12; interview 14). Although participation was an objective within the project, participation played a small role during the exploratory process (interview 14). The residents living around the project were only able to comment on the plans afterwards (interview 14). For example, it was not well communicated to the residents that (their) dwellings had to be demolished for the project. As the process was so capricious, participation received less priority (interview 16). Next to that, individuals in the project team influenced the success of participation. Last, the people in the project team switched over time. This prevented working towards a shared goal (interview 12; interview 14).

The resolution and opposition of the municipality of Vught influenced the preferred alternative. The wishes of the council of Vught did not fit within the budget and the process was likely to end in a deadlock. Therefore, the last part to work towards a final decision took very small and fast decisions between decision makers. These small steps retained the agreements to continue towards a decision. Although the project team spent a lot of time time on developing project alternatives, they had almost no influence on finalising these alternatives. The final decisions were made behind closed doors, to secure the decision and maintain speed in the process (interview 14; interview 16). At the end, extra budget from the province was allocated to the project. This €7 million became available to make sure that all parties agreed on the preferred alternative and to continue the process (interview 7; interview 12).

It was beforehand known that the CBA would have a negative outcome (interview 7). Already in the beginning of the process it was known that the experienced problems did not transcend the accessibility and liveability norms. Improvements on these aspects would probably not outweigh the costs from a cost benefit perspective and money could have been invested in other projects where the utility for society would be higher (interview 7; interview 12). The ministry of I&M and Rijkswaterstaat did not want to invest money and energy in the project, as problems were considered to be larger and urgent in other areas in the Netherlands (interview 12; interview 13; interview 14).

The outcome of the CBA was not decisive in the decision making process (interview 7). This is also highlighted in the letter from the minister, where it was stated that the benefit/cost ratio was not the only criterion for investment decisions. This project was the result of the resolution and was a wish from the parliament (Tweede Kamer der Staten-Generaal, 2016). Additionally, interviewee 7 stated, "it was beforehand clear that the proposal would have a negative outcome based on rational and cost effective assumptions" and "it is possible that projects are prioritized that are not the best projects based on efficiency and effectiveness". If the outcome of the CBA had been decisive, this project would not continue to the plan elaboration phase (interview 6; interview 7).

There was a difference of opinion whether the preferred alternative was the best available alternative. Some stakeholders argued that further inclusion of the spatial quality and participation might have led to other and maybe better project alternatives, as there was little connection to the other projects in the N65 area (interview 13; interview 14). However, at the other hand, further consideration of spatial challenges would not have led to other alternatives, as the current preferred alternative met the objectives (interview 6).

Reflection on the process from a political perspective

The process of the MIRT exploratory phase of the project N65 Vught – Haaren is reflected using the political perspective. This perspective highlights other aspects compared to the rational and organisational perspectives.

The accepted resolution from the parliament can be allocated to successful lobbying of the mayor of Vught. The project is largely dependent on the success of the lobby, as there was initially no urgency to consider or prioritise this project based on the norms on travel times, safety or liveability. This resolution gave the region, and especially the municipality of Vught, a good starting position. While the minister was aware that money could be spent more efficiently on other projects, the parliament obliged the minister to make money available to come up with sustainable solutions for the problems around the N65. This influenced the attitude of the Ministry of I&E. They were a proponent for a sober alternative and preferred to keep the money in their pockets. The municipality of Vught spent much energy in the project, as they had the desire to significantly improve the liveability with a sunken road.

The region continuously tried to make more money available for a robust project alternative. Next to that, the available budget is considered an opportunity. When choosing for a expensive project alternative, money is invested within the region. Vught and Haaren desired to aim to improve the liveability within their own municipality. This led to tensions and negotiations between aldermen the municipalities as they both wanted the money allocated to their own municipality and continue the process. When more money is invested in Helvoirt, less money will be available for Vught and vice versa. Next to that, they approached the project differently. Haaren wanted to improve the situation and solve the problem, while Vught had an expensive solution in mind. Consensus was found as the province of Noord-Brabant was willing to invest an extra €7 million. This extra budget made it possible to adjust the preferred alternative to meet the desires of the municipalities.

4.2 InnovA58

The A58 is a160 kilometre road that connects cities in Brabant. This route is part of the connection Rotterdam – Antwerp. It also connects Rotterdam to south-eastern parts of the Netherlands and to the western part of Germany. Capacity analysis shows that several trajectories are expected to exceed the desired travel time. High economic growth will lead to further capacity problems. Additionally, as freight often uses this highway, traffic jams are expected which decrease the traffic flow and security.

These problems and bottlenecks were analysed and solved in the project InnovA58. This project had an additional goal, to analyse if and which innovations could contribute to the solution. Innovations aimed to pre-finance the project investments to move the project forward in time. At the end of 2015, two preferred alternatives were positively evaluated in the decision phase. For the trajectory Sint Annabosch – Galder, the road will be expanded to two times three lanes, with adjustments to the intersections Sint Annabosch and Galder. For the Eindhoven – Tilburg trajectory, the road will be expanded to two times three lanes with adjustments to the intersections De Baars and Batadorp and with adjustments to the connections Moergestel and Best.

The *ontwerp tracebesluit* (OTB) or so called record of decision started mid 2016. Realisation of the expansion starts in 2020 and the road will be opened in 2022-2024. The project InnovA58 will stimulate exploring and using innovations within the project by starting a living lab. These innovations focus on e.g. optimal life cycle costs, smart mobility, decreasing environmental nuisance and new services next to the road. The budget is set for €401 million, including €10 million for the living lab. The start document considered a total budget of €425 million, of which €114 million was reserved to Sint Annabosch –

Galder, €311 million was reserved to Eindhoven – Tilburg. The resulting budget is lower than the initial estimations.

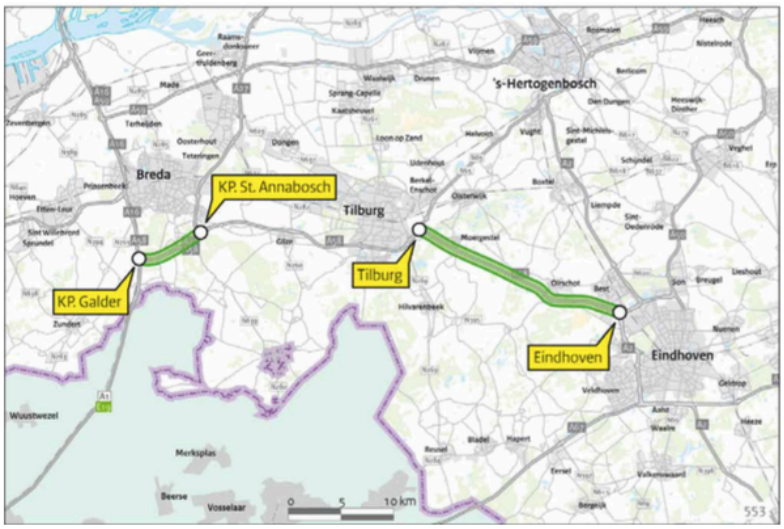


Figure 7: Project InnovA58 (Ministerie van Infrastructuur en Milieu, 2017)

4.2.1 Rational perspective

Problem analysis

The estimated traffic flows were expected to exceed the norms concerning speed and travel time on several parts of the A58. The largest bottlenecks were estimated on the trajectories Tilburg – Eindhoven, Breda – Tilburg and Sint Annabosch – Galder. Especially concerning Sint Annabosch – Galder, speed and travel time targets were not achieved due to capacity shortage. Freight was expected to lead to further shortage of capacity. Therefore, this trajectory was first prioritised. However, based on the National Market and Capacity Analysis (NMCA) in 2011, the trajectory Eindhoven – Tilburg was expected to become an even larger bottleneck in accessibility than expected before. Therefore the trajectories Sint Annabosch – Galder and Eindhoven – Tilburg were prioritised as MIRT projects.

Identify indicators

Alternatives and variants for both trajectories were scored using an assessment framework. This framework contained criteria based on the challenges and goals of the project, but also on the rules and guidelines. Four aspects were identified, which were expressed in criteria. The first one was traffic (measured in travel time and functioning of secondary roads). Second, other effects such as traffic safety, air quality, noise and nature were considered. Financial aspects such as costs for construction, operations and maintenance and costs for spatial implementation were also incorporated. Last, the social benefits should be higher than the costs (Ministerie van Infrastructuur en Milieu, 2013a; Ministerie van Verkeer en Waterstaat, 2010).

Generate alternatives

Several solution spaces were identified, such as solutions based on capacity expansion, solutions based on separating regional and continuing traffic flows and solutions based on a better use of the existing infrastructure (Albers & Mangelsdorf, 2015a). A first estimation of promising solutions showed that alternatives would be based on capacity expansion and separation of traffic flows. This led to several variants. The variants for capacity expansion were a full lane, a peak hour lane, a plus lane or a separate lane for freight. Separation of traffic flows was considered through four variants of parallel structures and hybrid solutions. Additionally, a capacity expansion of two times four lanes was considered. These

alternatives were specifically analysed for Eindhoven – Tilburg, as the exploratory phase of Sint Annabosch – Galder was already executed.

Evaluate and test alternatives

Based on the impact on accessibility, the alternatives two times three lanes and the hybrid variant gave a robust solution for the capacity problem. The peak hour lane was considered as promising, as it was significantly cheaper than the two times three lane alternative. However, as the hybrid solution had the same impact on accessibility but was more expensive, this alternative was considered as not promising. All other alternatives were filtered out based on their cost effectiveness, calculated as their impact on accessibility and their costs. The region desired to analyse another alternative, based on the hybrid solution. As the impact of this regional alternative was not significant, this alternative was filtered out. The two times three lane and the peak hour lane continued to the second filter and were subject of a CBA. As these two alternatives were promising, they were reanalysed for the trajectory Sint Annabosch – Galder (Albers & Mangelsdorf, 2015b).

Table 5: Cost Benefit Analysis of Sint Annabosch - Galder and Eindhoven – Tilburg (adjusted from Albers & Mangelsdorf, 2015a; 2015b)

Effects (in mln €, price level sept 2014)	Sub effects	**Sint Annabosch - Galder**		**Eindhoven - Tilburg**	
		2 x 3	2 x 2 + peak hour lane	2 x 3	2 x 2 + peak hour lane
Financial effects	Investments	-124	-90	-244	-186
	LCC costs	-34	-41	-79	-94
	Operational costs peak hour lanes	0	-15	0	-15
	Avoided investments	2	2	6	6
	Avoided operational and maintenance costs	30	30	71	71
	Total financial effects	**-125**	**-114**	**-246**	**-219**
Direct effects	Travel time benefits car	479	417	581	431
	Travel time benefits freight	212	192	29	32
	Reliability	172	133	152	84
	Change travel costs car	7	11	-11	-9
	Change travel costs freight	5	8	-3	-3
	Total direct effects	**876**	**761**	**748**	**535**
External effects	Climate CO2	-26	-25	-40	-34
	Air quality	-6	-5	-10	-9
	Noise	0	-6	0	0
	Traffic safety	-31	-88	-28	-61
	Total external effects	**-61**	**-125**	**-79**	**-105**
Indirect effects	Taxes and duties	115	104	173	146
	Work opportunities and agglomeration effects	131	114	112	80
	Total indirect effects	**246**	**218**	**285**	**226**
Total sum		**936**	**740**	**708**	**437**
B/C ratio		**8,5**	**7,5**	**3,9**	**3,0**
IRR		**22,0%**	**23,0%**	**13,2%**	**12,1%**

The promising alternatives for Eindhoven – Tilburg were compared with the current situation. Two times three lanes had higher investment costs, as more space and asphalt would be used. Nevertheless, the peak hour lane had higher costs of maintenance, as systems for monitoring and operations require more maintenance. The maintenance costs were partly compensated by the investment costs of the two times

three lanes. The two times three lanes scored higher on accessibility benefits. Negative external effects, such as safety, noise and air quality were expected to be higher for the peak hour lane. Indirect effects were expected to improve the regional labour market and would lead to agglomeration effects. The cost benefit outcome was positive for both alternatives, the balance for two times three lanes was €708 million and the balance for the peak hour lane was €437 million. This gave a cost benefit ratio of 3,9 and 3,0. Both alternatives showed to be a societal profitable investment. In all scenarios, the two times three alternative had a positive balance and was therefore recommended (Albers & Mangelsdorf, 2015a).

The two times three lanes and the peak hour lane alternatives were reanalysed for Sint Annabosch – Galder. The cost benefit outcome was positive for both alternatives, the balance for two times three lanes was €936 million and the balance for the peak hour lane was €740 million. This gave a benefit cost ratio of 8,5 and 7,5. Both alternatives are societally profitable investments. The two times three lane alternative shows a positive balance in all scenarios (Albers & Mangelsdorf, 2015b).

The preferred alternative for Sint Annabosch – Galder and Eindhoven – Tilburg was the two times three lanes alternative. This alternative was ascertained for both trajectories.

Reflection on the process from a rational perspective
From a rational perspective, the InnovA58 project follows the MIRT guidelines. The problem was clear, as the accessibility and traffic flows were considered as problems. Alternatives to expand the road capacity were tested by using the assessment framework. This framework contained criteria to analyse the problem solving ability of the alternative. Alternatives that were too expensive or did not improve accessibility were filtered out. Alternatives with lower costs were more likely to be considered and chosen. The CBA showed this, as the alternative with the highest outcome (highest utility for society) was chosen as preferred alternative. However, Visser & de Lange (2015) state that as only two alternatives were considered, analysing a sober alternative might have led to a higher utility.

The rational perspective provides an explanation of the process to work towards a preferred alternative. However, the innovative tracks to pre-finance the project played an important role in the InnovA58 project, but were not considered in these documents of the exploratory phase. The following perspectives will explain why these innovations were not considered when analysing project alternatives.

4.2.2 Organisational perspective

Legal aspects
The start document stated that the project chooses to follow a fast *trace procedure*. This means that no structure vision is obligatory. However, this resulted in a focus on road infrastructure, where spatial development or larger infrastructure extension cannot be considered (interview 9). The potential alternatives will not exceed more than two lanes (Ministerie van Infrastructuur en Milieu, 2013a). In the subsequent phase, the fast *trace procedure* is added in the assessment framework as a criterion. This filters out extensive solutions that might have been promising, but which were constrained by the fast *trace procedure*. Norms considering air quality, noise and external safety should not be exceeded by alternatives.

The guidelines
The InnovA58 contained three workflows, of which the first one is the regular exploratory phase. This phase will be executed in alignment with the guidelines. This process would be executed efficiently, concerning the *Sneller & Beter* procedure. It was desirable to start the construction as soon as possible. The second and third workflows were technical innovations and innovative financing arrangements. These innovatory tracks were not prescribed by the guidelines, but innovations would be used to pre-

finance the project and this would lead to efficiencies in exploitation, initiated by the Foundation A58. These innovative tracks were not part of the guidelines and these innovations were little connected with the exploratory phase (interview 15).

Organisation, roles and responsibilities

The Ministry of I&E initiated a start decision for Sint Annabosch – Galder in 2010. Several years later, the Foundation A58 presented a bid book to attract attention to the trajectory Eindhoven – Tilburg. This bid book showed how innovations could finance the construction and maintenance of the N65 (interview 15). The Foundation A58 presented this bid book in the interest of businesses, as they wished to increase the capacity of the A58. The government became aware of the necessity of expansion but they did not want to transfer the ownership of the road from Rijkswaterstaat to a third party. Next to that, the MIRT funding would come available in 2023. The region wanted to consider the project earlier than the initial planning of 2023, so the province Noord-Brabant was willing to pre-finance the expansion project (interview 12). The pre-financing would lead to missed interests for the province, so the Foundation A58 would come up with cost effective innovations. This led to a project organisation of four parties: the Ministry of I&E, Rijkswaterstaat, the province of Noord-Brabant and the Foundation A58.

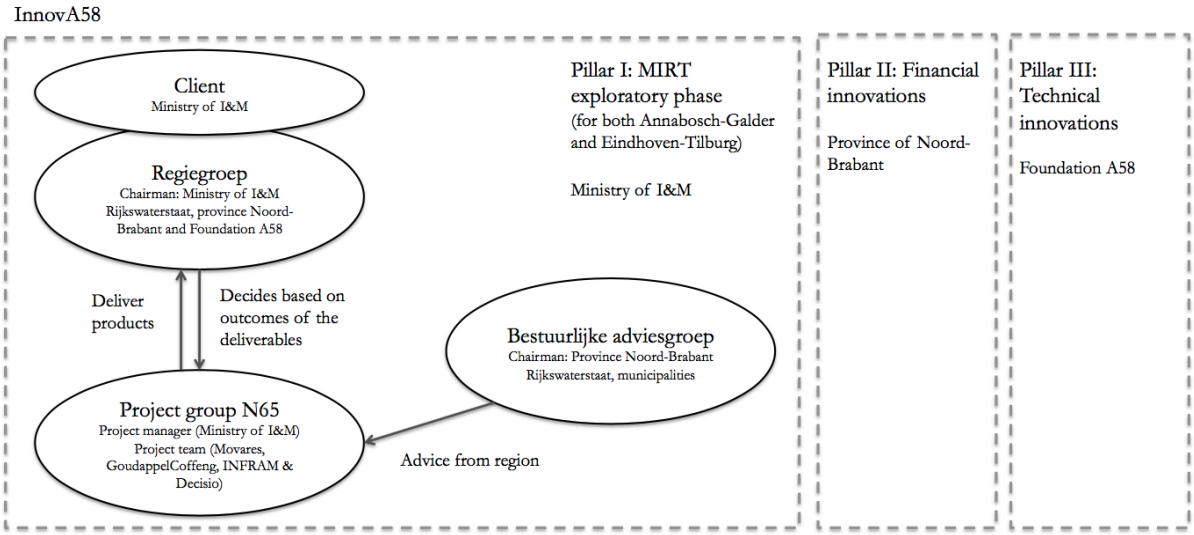


Figure 8: Relation between the stakeholders of the InnovA58 project (based on Ministerie van Infrastructuur en Milieu (2010; 2013))

The Ministry of I&E was the client and initiated the project by providing a project manager. They were also chairman of the management group. This group contained the directors of the initiators, the Ministry of I&E, Rijkswaterstaat, the province of Noord-Brabant and the Foundation A58. The advisory group contained the regional directors of the A58 and was led by the province of Noord-Brabant. The province of Noord-Brabant represented the region within the management group (Ministerie van Infrastructuur en Milieu, 2013a; Ministerie van Verkeer en Waterstaat, 2010) (interview 9).

Attitudes towards project alternatives

The road expansion of the two times three lane alternative was already ascertained in the start decision (Ministerie van Infrastructuur en Milieu, 2013a; Ministerie van Verkeer en Waterstaat, 2010) (interview 9; interview 10; interview 11; interview 12). Although the start decision narrowed the solution space, the exploratory phase took a broader perspective by incorporating other variants of capacity expansion (interview 9; interview 11). All of the parties, in particular the province of Noord-Brabant and the foundation A58, were proponents to enlarge the capacity of the road by asphalt (interview 11).

Municipalities desired to incorporate other alternatives, such as a parallel structure. This alternative would have a positive impact on the accessibility of the residents (interview 11). The Ministry of I&E considered the peak hour lane as an interesting alternative, as this would be less costly and solve the capacity problem. However, Rijkswaterstaat considered the disadvantages of the peak hour lane, this involved operational and reconstruction costs (interview 9; interview 10). The cooperation with the Foundation A58 was positive, as they brought in new insights (interview 11). However, the Foundation A58 were economically focused and the interests of the residents were not always well considered (interview 11). Next to that, the businesses hindered the process as few innovations came up (interview 12).

It was noted that the exploratory phase (workflow I), went well. The process of the two innovative workflows were difficult, as this deviated from the guidelines of a standard exploratory phase (interview 15). It was difficult to involve the technical innovations and innovative financing structures. Opinions about the effectiveness of innovations differed (interview 9; interview 11). Little research was available to decide whether the technical innovations could be financially feasible (interview 9; interview 12). It was initially expected that the Foundation A58 would bring in more knowledge by influencing companies to come up with innovations (interview 10; interview 11; interview 15). Next to that, innovations that would be profitable were often not considered as innovative, because they were successful over the previous years (interview 9; interview 12). Concerning financial arrangements, involving parties early in the process would lead to more innovations, as businesses open up their knowledge once they have the certainty that they will get money for their experience and knowledge (interview 9; interview 10). However, involving organisations earlier in the process includes risks (interview 9) and requires adjustments in rules and arrangements. This requires changes in the conservative MIRT project organisation (interview 12) and this requires a certain degree of freedom in the existing rules and guidelines (interview 15). Adjusting these rules and arrangements would likely cause delays in the project, which was undesirable (interview 10). This resulted in frustrations and little progress within these two workflows (interview 12). This also brought the discussion on the table whether innovations should be applied as a goal, as an ambition or as a mean to earn money in this project (interview 9; interview 12).

Meeting moments

As the national government and the region agreed that the A58 project should be prioritised, the decision to start an exploratory phase was stated in the debate, or so called BO MIRT in the autumn of 2011. It determined an available budget of €425 million for the two projects. However, this budget was only available after 2023. The province of Noord-Brabant showed their willingness to pre-finance the project. An action plan was constructed, that contained the underlying agreements about the pre-financing structure (Ministerie van Infrastructuur en Milieu, 2011a).

The advisory group advised in January 2014 to consider the two times three lanes and a hybrid solution with a parallel structure. There was no clear preference for including a traffic hour lane. Based on this advice, the promising solutions were determined by the management group in March 2014. The alternative of the parallel structure did not make it to the selection of promising alternatives, as it had the same impact on improvements in traffic flows but it was more expensive. The two times three lanes and the peak hour lane would be further considered in the second filter. As these solutions were promising for Eindhoven – Tilburg, these two alternatives were also recalculated for Sint Annabosch – Galder. Additionally, interventions in Oirschot were no longer considered, as the additional costs for an aqueduct did not weight out the benefits to mitigate air and noise nuisance. In December 2014, an alternative was added that was supported by the region. This alternative was based on the parallel structure that did not make it to the selection in March. This adjusted alternative selection was not considered as a promising alternative, as it did not solve the problems on the A58 (Albers & Mangelsdorf, 2015a).

Reflection on the process from an organisational perspective
The exploratory phase of the InnovA58 followed the guidelines. The InnovA58 project is unique in the sense that businesses were on board and that innovations were analysed within the two additional workflows. The innovations were analysed parallel, next to the standard exploratory phase. Therefore, innovations were not incorporated in the process of generating alternatives. This led to little added value of innovations to the exploratory phase of the project (interview 10; interview 11). Besides, the start decision chooses for a short *trace procedure*. This decision excluded extensive alternatives (interview 9).

The organisations had different perspectives on the goals of the project. The Foundation A58 was willing to take risks to exploit a profitable road. They took a shorter time perspective and they paid less attention to the residents (interview 11). It was difficult to deviate from this behaviour, as they focus on making profit (interview 11; interview 15). At the other side, the national and regional governments are more risk averse. They were unable to consider the uncertainties within innovations, as they did not want to cover the negative balance when innovations turned out to be unsuccessful. This is also observable in the guidelines where the decision maker expects a detailed cost estimation for the preferred alternative. The decision maker wants to mitigate risks by incorporating (full) insights into the costs and effects of the alternatives. However, in this situation there was little information available about the expected costs and returns of innovations.

Last, the innovations generated between organisations were poor. The success of innovations was dependent on the companies with knowledge about these innovations. The Foundation A58 was unable to connect the businesses to the project. There was no incentive for companies to open up their knowledge, as they would not get (financially) compensated. This made it difficult to generate more innovative alternatives (interview 10; interview 11; interview 12).

4.2.3 Political perspective

Cause of the project
The project was initiated from accessibility problems on the A58, based on the National Market and Capacity Analysis (NMCA) (interview 11). Before the exploratory phase started, several initiatives were executed over the whole trajectory of the A58, from Zeeland until Eindhoven. Due to re-prioritization, these initiatives were put on hold. Pressure from the region led to adjustments on the trajectory Sint Annabosch – Galder, as this trajectory showed the largest problems (interview 9; interview 10).

This trajectory alone was insufficient to solve the problems on the A58. Therefore the Foundation A58 published a bid book with ideas to invest in the trajectory Eindhoven – Tilburg. This considered ideas to construct and exploit the road cost effectively. This was well received by the national government, as it was the current trend to involve the private organisations in infrastructure development and exploitation (interview 10). However, it led to discussions about the role of Rijkswaterstaat and it was expected that this would lead to inefficiencies. This led to an adjusted initiative of the Ministry of I&E, Rijkswaterstaat and the province of Noord-Brabant (interview 10). As the province of Noord-Brabant was willing to pre-finance the project, the Ministry of I&E declared its willingness to start the exploratory phase. The objective of these projects was to expand capacity within a short time period (interview 9; interview 10; interview 11). There were doubts about the profitability of innovations (interview 11; interview 12) However, the Ministry of I&E made clear that the responsibilities concerning uncertainties of the pre-financing could not be allocated to the government (interview 11). This led to the start of the exploratory phase for Eindhoven – Tilburg (interview 15).

Influence of stakeholders on developing alternatives

It was unusual that a lobby organisation took place in the project organisation, especially as they did not financially contribute in the project. As the bid book of the Foundation A58 contained innovations, it was expected that they would contribute with knowledge (interview 10; interview 11; interview 12). This input turned out to be disappointing and innovations were considered to be less promising then expected before (interview 11). Next to that, the innovative companies dropped out from the foundation to be able to participate in the tender. Constructional companies remained seated and represented the companies. This led to a conservative focus on road expansion. The Foundation A58 did not aim to apply innovations, the ambition was rather to bring the project on the agenda to increase the road capacity of the A58 (interview 10; interview 15).

The municipalities combined their powers to analyse other measures that might have been promising. Municipalities considered the opportunity to connect their desires with the national MIRT project, as it could improve congestion within the centre of the municipalities and it could handle traffic flows of e.g. the Brainport and Eindhoven airport (interview 9; interview 10; interview 11; interview 12). This led to incorporation of project alternatives in the first filter. However, it turned out that the parallel structures and hybrid alternatives would exceed the costs, it did not have as much problem solving capacity and this would not fit within the fast *trace procedure* (interview 9). This alternative was adjusted into a regional alternative, with lower costs and higher traffic capacity. Even after adjustments, this did not lead to adoption of the regional alternative in the exploratory phase (Albers & Mangelsdorf, 2015a).

The region also asked for several variants, such as a detour around Oirschot and an aqueduct. As the region could and would not financially contribute, these aspects were left out of the preferred decision. Next to that, the benefits of these variants did not outweigh the costs. It is noted that it is possible for the region to influence adjustments of the preferred alternative in the plan elaboration phase (interview 11).

Choosing an alternative

As the two times three lanes had a positive cost benefit outcome and it fit within the available budget, all parties agreed on the preferred alternative (interview 9). It is noted that this might have been different if the preferred alternative would not fit in the budget (interview 11).

The innovations from the bid book of the Foundation A58 were not well applicable in the InnovA58 project. It was difficult to come up with innovations as they were not cost effective, they involved high uncertainties or they were already applied (interview 12). This shows a mismatch between the Foundation A58, as they wanted to stimulate creative thinking within the project organisation (interview 15) and the other parties to actually find innovations to pay for the pre-financing of the project (interview 11; interview 12). The innovations that came up were not promising. Therefore, the pre-financing of the InnovA58 became uncertain. At the other hand, the pressure to continue the InnovA58 increased because of involvement of market parties was considered as innovative. This led to a pressure from the national politics to make the project a success (interview 10).

Continuation of the project

During the process it became clear that pre-financing could not be achieved through innovations. As a project around Eindhoven was cancelled, a budget became available (interview 9). The representative of the province advocated keeping the money in the region, by presenting a bid book. This led to the program SmartwayZ, in which the InnovA58 was included. A budget was allocated to the "program SmartwayZ.nl" and this led to money that became available for the road expansion of the InnovA58. The pre-financing of the province became irrelevant and innovations became a side aspect which could cost

money, instead of generate money (interview 10). This released the pressure to find innovations to pay for the pre-financing (interview 10).

Some people consider this program as successful as organisations can make trade offs within and between the projects. This is expected to lead to more successful and integral outcomes (Timmermans, 2004; van Eekelen et al., 2013). At the same time, this SmartwayZ.nl is rather considered as a bundle of projects to keep the money within the region (interview 17).

Reflection on the process from a political perspective

The preferred alternative was already decided in the start document. The CBA was used to confirm the thoughts and justify the preferred alternative (interview 9). This did not cause any problems or discussions as the preferred alternative fit within the estimated budget. Interviewee 11 states "it would likely cause more problems and discussions if there was a mismatch between the preferred solution and the available budget".

The continuation of the project and the innovative workflows can be described and explained by the political perspective. The bid book that was proposed by the Foundation A58 resulted in an initiative. This initiative gave companies a place at the table. Although they did not contribute financially or with knowledge, their ideas and opinions were considered at formal decision moments. Some people considered their input beneficial, the companies had a different view on the project. They rather think in opportunities, than boundaries. However, others noted that the input of the businesses was disappointing and that they rather hindered the process. This is observable in the continuation of the project. The Foundation A58 proposed innovative solutions with the aim to start an exploratory phase. As soon as this phase continued and these examples were further elaborated, it turned out that these solutions were not cost effective. Next to that, it was difficult to consider technological and financial innovations within the restrictions of the guidelines. The guidelines are unable to consider different contracting strategies and deal with uncertainties in scope and estimated effects.

4.3 The added value of Decision Support Methods in the N65 and InnovA58 cases

The use of CBA and *plan mer* is prescribed by the MIRT guidelines and is therefore executed at the end of the exploratory phase in both cases. These two projects also applied a VE study and a multi criteria analysis in the analytical phase of the exploratory phase.

These two projects applied a VE study to identify the problem and generate alternatives. The N65 Vught – Haaren project contained two VE sessions (Ebbink, 2013). The first session did not lead to promising outcomes, as alternatives that were too costly or had too little problem solving capacity came up (interview 16). This led to a second session, which helped to define building blocks with higher benefits and lower costs, compared to the initial alternatives. However, it is stated that the organisation that provides the session and the contributing individuals are of high importance of the process and outcome of the session (interview 16). Next to that, the outcomes of the process are beforehand unsatisfying, as the stakeholders did not agree on the perceived problems and solution space. This method was of added value in optimising the desired outcomes in their costs and benefits.

A VE study was executed for the InnovA58 (Ramadhin & Keizer, 2014), as the municipalities wanted to incorporate other alternatives, than the alternative which was already ascertained in the start decision. Stakeholders experienced this session differently. One states that another instrument would have led to the same outcomes (interview 9) while others state that it was valuable to be able to discuss the different perspectives and interests concerning the preferred alternative (interview 11). Next to that, the selected

people did not lead to a broad exploration of alternatives, as only representatives of the mobility domain were part of this session (interview 10). Additionally, the success of the method is dependent on the people and individuals that participate in the session (interview 17). This method was of added value, as it helped the participants to look for other alternatives and optimise the available alternatives. Next to that, it improved collaboration and it led to information and knowledge sharing between stakeholders. However, it is noticeable that the outcomes are dependent on the individuals and the information that is used as input.

The outcome of the CBA of the N65 was negative. The outcome of the initial CBA was unsatisfying and this led to adjustments in the project alternatives. This second CBA was still negative, but costs were lower while benefits remained the same. It was from the beginning evident that the CBA would have a negative outcome, as only small improvements were expected (interview 7). Additionally, benefits were achieved on the accessibility instead of liveability (interview 16). As the N65 project continued, it can be concluded that the CBA outcomes had little influence on the decision for the project alternative. However, the CBA helped to improve the project alternatives.

The outcome of the CBA of the InnovA58 was positive. The CBA compared two project alternatives, a two times three variant (the preferred alternative from the start decision) and a peak hour lane. The two times three lane alternative came out as cost effective and robust alternative. Although the peak hour lane was cheaper, the permanent extra lane was more robust, as operational costs were lower. The CBA ensured the effectiveness of the project alternative and it justified the added value of the project, as the CBA had a positive outcome. It is noted that promising alternatives dropped out early in the process, as they did not fit in the shorten *trace procedure* (determined in the start decision) (interview 9). Next to that, sober alternatives were not considered and innovative variants were analysed parallel to the exploratory phase. Innovative solutions were therefore not considered in the process of generating promising alternatives.

4.4 Conclusion

The three perspectives highlight different elements of the exploratory phase. These three perspectives provide a comprehensive overview of the exploratory phase of the MIRT. This section will shortly address the usefulness of each perspective, which resulted in new insights for each case.

Considering the N65 Vught – Haaren case, the rational perspective cannot explain the decisions. The CBA outcome was negative. Next to that, improvements were observable in accessibility instead of liveability. This shows two problems, either the preferred alternative has little positive impact on improving the liveability or the CBA has difficulties to consider spatial quality and liveability aspects. The organisational and political perspectives help to explain the high influence of stakeholders on the process and show the political cause of the exploratory phase. As the project was initiated from a resolution instead of exceeding norms concerning liveability, it is difficult to show the rational desirability of the project.

The InnovA58 project can be well considered using the rational perspective. The project is initiated from an accessibility bottleneck, it follows the guidelines well and it shows a positive CBA. However, the two workflows of technical and financial innovations do not fit in these rational guidelines. The organisational and political perspectives show the different attitudes of stakeholders towards uncertainties and the ability to deal with these uncertainties. These two workflows deviated from the guidelines and it was uncertain how this would fit in the exploratory phase. Innovative alternatives were therefore excluded from the exploratory phase. Exclusion led to limited innovative project alternatives, but it helped in speeding up

the process and it led to an exploratory process with few problems. There were no problems as the wishes and expectations fitted within the available budget.

These two cases show differences in the rationality of the decision making process, in behaviour of stakeholders and the dilemma between (preferred) alternatives and available budget. These differences are also observable in the use of DSMs. In the N65 Vught – Haaren case, DSMs are used to increase the rationality of the process. The methods have the aim to increase the cost effectiveness of the project alternatives, by increasing the problem solving capacity and decreasing costs. For the InnovA58 case, DSMs do not have to fulfil this function, as the preferred alternatives are already promising. In this situation DSMs are rather used to give space to the desires of municipalities (organisational driven) and confirm the predefined ideas (political driven).

These differences and the influence of uncertainties and external factors are important for the success of the decision making process. This should therefore be considered in the renewal of the MIRT. Especially as the renewal of the MIRT desires to incorporate stakeholders and modalities, it is likely that this will lead to a higher complexity of the process. The following chapters will consider these observations from the two case studies. Next to that, it will analyse how DSMs could be of added value in solving these problems.

5 Decision Support Methods in the MIRT

The MIRT exploratory phase is a spatial-infrastructural planning process that works towards a decision moment that leads to an alternative as an outcome. After a positive decision, this preferred alternative continues to the plan elaboration phase. This planning process is a decision making process, as the phase works towards a choice between available options or alternatives. This section takes a look at decision making theory and the exploratory phase in practice. DSMs are often applied to improve the decision making process. This section analyses the added value of DSMs. The previous chapter showed that DSM can add value in a rational way (optimising outcomes) and in a organisational or political way (getting people on board or justify the decision afterwards). Therefore, added value will be considered using these three perspectives.

5.1 Decision making theory and identifying and generating alternatives

Harris (2008) defines decision making as "… the study of identifying and choosing alternatives based on the values and preferences of the decision maker" and as "… the process of sufficiently reducing uncertainty and doubt about alternatives to allow a reasonable choice to be made from among them". There are several decision making models available, that define the process of problem solving in several stages. The first authors such as Dewey (1910), Simon (1960) and Brim et al (1962) assume a sequential process of problem solving. Brim et al (1962) identifies the following steps (1) identification of the problem, (2) obtaining necessary information, (3) production of possible solution, (4) evaluation of such solutions and (5) selecting a strategy for performance. These steps led to criticism as they always follow the same order. In practice, these phases are rather executed in parallel or iterative, influenced by the behaviour of the organisation (Witte, 1972). There is no right decision making model, as this is often dependent on the characteristics of the process. Models to generate and test alternatives can contain the following steps and might include feedback loops to apply adjustments when new insights and information is available (Parnell, Driscoll, & Henderson, 2011).

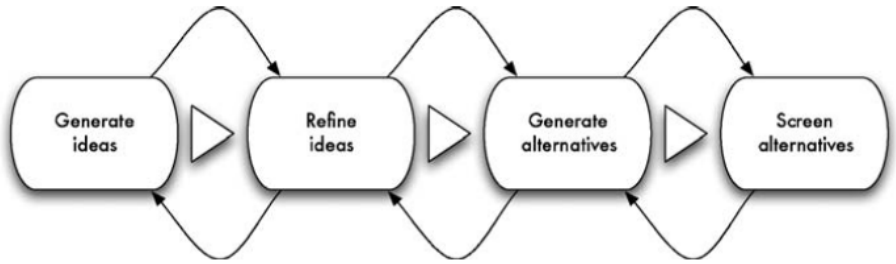


Figure 9: Basic model to generate alternatives (Parnell et al., 2011)

Harris (2008) also incorporates 'identifying alternatives' within his definition. However, research shows that little information is available in identifying and generating alternatives (Beach, 1993; Siebert & Keeney, 2015). Bayne (1995) examines the importance between a good decision and the quality of the alternatives, as good decisions cannot come from poor alternatives. Identifying alternatives based on stakeholder values is often not happening, as trade-offs between the objectives are not made explicit. However, the demand to propose transparent and well-argued project alternatives becomes higher as the complexity of infrastructural investments increases (Gregory & Keeney, 1994). Good decisions cannot be made when few decision alternatives are compared, as important alternatives might be overlooked (Powell & Buede, 2009). The problem definition determines the success of a project. A wrongly defined problem leads to a wrong objective. This results in wrong alternatives and wrong outcomes. The project manager needs to incorporate stakeholders' needs, wants and desires within the problem definition and when generating alternatives.

Parnell et al. (2011) add that the decision making contains two phases, of which the first one is to diverge (identify many alternatives to come up with creative and innovative alternatives) and the second is to converge (work towards decisions). However, this does not always work in practice. As Kaner et al (2007) show, a convergent phase does not logically follow from a divergent thinking process. This is often caused by misunderstandings and miscommunication, as it is difficult to understand and integrate new and different ways of thinking. Next to that, the goals of the decision are often dependent on what stakeholders know, what stakeholders can do and what stakeholders want to do (Edvardsson & Hansson, 2005) and the process of designing and generating alternatives is dependent on the people that represent the organisations (de Leeuw, 2002; Witte, 1972). Although Powell & Buede (2009) note that generating and optimizing alternatives requires full information, full information is often not available. This leads to decisions based on incomplete or second-best available data (Marcelo, Mandri-Perrott, House, & Schwartz, 2016).

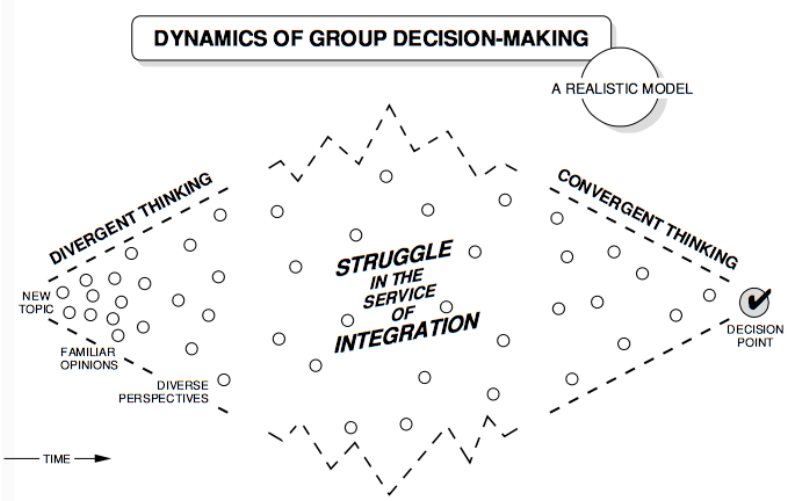


Figure 10: Dynamics of group decision making (Kaner et al, 2007)

5.2 The exploratory phase of the MIRT in practice

The previous section shows possible problems with the decision making process. Incomplete information and stakeholder involvement can influence the project alternatives. As experiences from theory and practice might be different, this section will consider the experiences from the decision making in the exploratory phase with the use of interviews. Five people from different organisations and with different roles were interviewed. The interviewees are stated in appendix E and the interview questions can be found in appendix B. Based on these general experiences retrieved from interviews, several observations about the MIRT initiative and exploratory phase are made.

The scope of the problem analysis is often difficult to determine. It is desirable to have a clearly defined scope, as the modality and financing source is often determined in the start decision. The scope of the projects differs per project and depends on the initial objective of the project. Bedsides, the recommendations from Elverding to execute the exploratory phase in two years forces the project to stay within a small scope. Next to that, the projects still have a strong focus on transport problems. The guidelines pay little attention to characteristics and rules of spatial and water projects and prescribed methods are often unable to deal with these differences. A scope is often set too narrow, which leads to limited creative and innovative alternatives. This leads to missed chances and solutions, which are available in other domains. Even if a broad scope is taken, it is difficult to determine what should be done with the retrieved information and one switch back to the initial, smaller scope. Stakeholders have

different interests that should be part of the chosen solution and the project is dependent on the available money from stakeholders. This leads to negotiations and often results in a focus on the desired outcomes, instead of the experienced problems. Some organisations stay involved in the process to influence the considered alternatives. It is acknowledged that a broad scope should not be a goal in itself, as some bottlenecks are clear and require intervention in that specific aspect.

Additionally, a broader scope increases discussions about money. When a broad scope is set, it often involves different modalities and different financing sources. Regions feel that problems are transferred to them and there is less certainty about the available money. It was noted that the financing structure is recently adjusted, as money is not yet distributed to modalities. Only 75% of the budget should be certain before the exploratory phase starts. This will lead to higher uncertainties, as projects are expected to drop out. It also leads to the difficulty to determine what the initial budget is, if the alternatives are derived from other modalities with less expensive alternatives. It is uncertain how this will work out in practice.

All stakeholders agree to the added value of a broader perspective. However, it is difficult to get the region on board. Organisations are still holding on to their own interests and they are exploring their new role and responsibilities. Conflicting interests between national government and regions can occur, as an integral approach requires organisations to be involved. Modalities concerning economy and liveability cover responsibilities thus financial involvement of the region, which they do not agree with. Next to that, the official decision moments often involve decision makers from the mobility domain, instead of decision makers from the economy or spatial development domain. These organisational aspects make it difficult to look for non-infrastructural solutions. Last, taking a broader perspective will probably lead to political discussions. As economy, society and liveability should be considered next to mobility, politicians have to add weight factors to what they consider more important. Weight values are normative and are often dependent on political preferences.

Changing the perceptions of stakeholders and politicians can lead to a broad approach. A broad approach is new and requires time to change. Exploring alternatives is considered as normative that is often influenced by budget and shared preferences of the organisations. Politicians still feel that they have to bring in new projects. If there is no direct yield or perspective on financial investments, they will not invest the time and energy. It is often difficult for parties to look further than the money and consider the problem from a societal perspective. The region tries to make their regional problem a problem in public interest, to make national budget available. At the other hand, the government tries to keep the money in the pocket. The government has to go with the interest of the municipality or province, as they can drop out when the outcome is not in their interest. Differences are observable as the national government takes a long-term perspective, while other organisations often take short-term perspective when considering investments. Last, it is sometimes difficult to involve residents when the problem is too abstract. They would rather see how project alternatives impact their environment.

Decision making methods were once introduced to objectify the prioritisation of projects, which are often politically driven. Although it is helpful to identify the effects with a CBA and it is desirable that this instrument has a strong role to support decisions, the outcomes are sometimes neglected by politics. They have other considerations to continue the project. This shows a certain tension between the guidelines and practice.

These experiences from practice show that working towards a decision is not always straightforward. The attitudes of stakeholders, availability of money, habits and uncertainties are of influence on the success of the decision making process and the outcome.

5.3 Added value of Decision Support Methods

Decision support helps and guides decision makers to work towards a decision. When high (initial) costs over a long time are considered, methods can be helpful to decide the efficiency and effectiveness of the investments (Soltani, Hewage, Reza, & Sadiq, 2015; Karmperis, Sotirchos, Aravossis, & Tatsiopoulos, 2012). The process to come up with a project alternative at the decision moment contains two prior aspects: identifying alternatives and choosing alternatives. Much is written about the use and usefulness of methods to help decision makers choosing the preferred alternative in infrastructural planning. Cost Benefit Analysis (CBA), Cost Effective Analysis (CEA) and Multi Criteria Decision Analysis (MCDA) are DSMs that are used within infrastructure planning and investments to prioritize alternatives (Annema, Mouter, & Razaei, 2015; Marcelo et al., 2016). There is little information available about the added value of methods to identify and generate alternatives during the decision making process. Therefore, the added value of systems that support the planning process, such as Planning Support Systems (PSS) and the added value of methods to work towards preferred alternative in project appraisal, such as CBA and Decision Support Systems (DSS) are included in the analysis. Although this is not always directly applicable to the MIRT exploratory phase, these insights and attitudes are considered to be valuable.

This section will analyse the added value of DSMs based on available literature. The objectives of DSMs can differ, as already in the case studies. Added value is considered as "an improvement of the exploratory phase, in comparison to a process where DSMs are not applied". DSMs often improve the efficiency and effectiveness of the project alternative. However, there are also other dimensions in which these methods can add value to the decision making process e.g. it can stimulate the organisation to work towards a decision, or it can help the politician to justify the decision. Therefore, the added value will be analysed using the three perspectives identified in chapter three.

5.3.1 Added value from a rational perspective

The rational perspective aims to solve the problem by generating and choosing an alternative with the highest efficiency and effectiveness. This involves an alternative with the highest impact with the lowest possible costs. Pearson & Shim (1995) conclude that DSS could improve the efficiency and effectiveness of the decision, made by the decision maker. Marcelo et al (2016) considers a decision making framework as useful, as it improves the prioritisation of infrastructure investments by systemising prioritisation of projects based on objective goals, optimal use of available information, influence decision makers to (ex ante) state criteria, to prevent wasteful white elephant projects and identify missing information that is necessary to improve project appraisal. Hopkins (2001) gives the following four criteria to analyse whether plans work: effects (did it affect on the decision making?), net benefits (are the benefits of the plan higher than the costs?), internal validity (did it follow how it was intended to work?) and external validity (did the outcomes meet the external criteria?). Pelzer (2014) considers the added value of PSS in spatial planning as an improvement of the outcome of the planning process, thus an improvement of internal validity as PSS leads to more and better available information. Figueira et al. (2006) state that decision aiding helps to elaborate recommendations derived from models and computational procedures.

Mouter (2017) analyses the attitude of Dutch politicians towards CBA. It shows that Dutch politicians consider the use of cost benefit as positive, as it improves the planning process. It makes politicians better informed about the effects, which leads to better debates between the politicians. This also improves the arguments and political decisions. It makes it possible to compare project alternatives. Negative outcomes of the analysis leads to optimisation of project alternatives. It also helps to prevent projects that are a disadvantage for society. Mouter (2013) also analyses the role of CBA in MIRT projects, experienced by practitioners. Important advantages are: identifying usefulness, necessity and design of a project, provide independent and objective information and enhance the discussion about the usefulness, necessity and design of a project.

However, practitioners also experience disadvantages. Mouter (2013) notes that estimates are always uncertain, as calculations are based on current information. Next to that, it is not possible to consider all effects as not all effects can be quantitatively estimated. Last, the method is considered to be difficult and executing a CBA costs time and money.

5.3.2 Added value from an organisational perspective

From an organisational perspective, the organisation and cooperation between parties is considered to be fundamental in a successful outcome. DSMs can improve the cooperation between stakeholders, as the different interests and preferences are considered together. Pelzer (2014) identifies two types of added value of PSSs concerning cooperation. First, on the individual level, such as learning about the object and learning about other stakeholders, is considered to be of added value. Second, the added value on a group level shows improvements in the collaboration, sharing information and knowledge (communication), consensus on problems and solutions and efficiency. Te Brömmelstroet (2013) states that PSSs could improve both the planning process and the planning outcomes. It can be used to inform people so information becomes accessible. It also improves communication between organisations and it improves and facilitates the data to gain information for modelling and designing. The organisation of the process leads to consensus in the processes. Also Figueira (2006) sees the added value of decision aid, as it organizes and structures the decision making process, considering the underlying objectives and goals. Next to that, bringing stakeholders together to cooperate leads to mutual understandings and a better debate. Shim et al. (2002) state that DSSs should be capable to deal with softer information, in order to be of added value in the future. They acknowledge the importance of group sessions. Mouter (2013) acknowledges that CBA makes the decision transparent and it encourages stakeholders to cooperate. The interviewed politicians in Mouter (2017) see the advantage of CBA as it considers the residents' concerns and interests.

However, there are several observable process-related problems within CBA (Beukers, Bertolini, & Te Brömmelstroet, 2012). There is a miscommunication between planners and calculators and there is a possibility of strategic behaviour when it comes to the input and output. Next to that, CBA is often executed too late in the planning process and there is a certain time pressure, as the length of discussions on assumptions and starting points is often underestimated. Last, there is little room for uncertainties and nuance in the decision making process. It is noted that it is necessary to bring the different people, such as planners and economists, and their thoughts and assessment closer together, to improve the outcomes of the process. This involves an increase in trust, to improve the communication and cooperation between the organisations in the decision making process. It is noted by Sager (2005) that there are certain complications when it comes to the added value of participation and consensus building with organisations. The individual rationality is probably not in alignment with the collective rationality. This often leads to uncertain outcomes, where decisions are unpredictable even if the individual preferences are known. Dialogue might reduce conflicts and provide more insight into mutual preferences, but it is difficult to compare the individual preferences and make a democratic trade-off.

5.3.3 Added value from a political perspective

The political perspective considers political components and individual preferences as leading in the decision making process. DSMs are not specifically of added value to improve the outcome or cooperation, but could rather support the personal preferences or political debate. Mouter (2017) identifies political advantages from CBA, as it is helpful in forming an opinion about a project and it helps to verificate or check the political interest. Nyborg (1998) states that although cost benefit outcomes are useful to prioritise projects, it is rather used in the debate to attain further attention for projects.

However, disadvantages of the use of CBA are also acknowledged by Mouter (2017). It is sometimes used to terminate the political discussion. It can legitimise the decision of not prioritising a project, when the outcome is negative and it can be used to delay the process. When the outcome is not supporting the opposed decision, it can lead to frustrations among stakeholders. Last, by a selectively use of information, CBA can be used in such a way that it supports the decision of the minister. Sager (2005) identifies an other disadvantage. As individual preferences may differ, it is possible to manipulate the preferences for strategic decisions. It is possible to advantage the organisations that are making noise in the process, while disadvantaging (the majority of) the organisations that keep quiet.

Sager and Ravlum (2005) use a political rationality to consider how they make decisions, based on the results and outcomes of planning models. They make several assumptions why politicians do not automatically accept the outcomes of the CBA. Politicians can use the CBA outcome to justify adjustments of the budget. Although it is used to avoid unnecessary projects, there are other factors that determine the project prioritisation. Next to that, CBA can help to justify spending money in the public interest. It is also possible to end the pressure from interest groups lobbying for a certain project. Decision makers need to be efficient with their time and do not have the understanding to fully discuss the different variants. Therefore, they are likely to only discuss one option. The outcomes of the models are therefore considered to be irrelevant. However, it is a mean to balance the relationship with the legislative and political bodies. It is noted that politicians first decide and then look for information afterwards, to claim what they already know. Decision aid can legitimize the final decision (Figueira et al., 2006). Next to that, they use the information strategically to only use the information that supports the project and rationalise the decision. It is noted that further elaboration of evaluation techniques will work contra productive, as this makes the input of analytics more unattractive in the political rationality. In this political practice, trade-offs should be made that cannot be (fully) supported by planning models.

5.4 Conclusion

This chapter shows that the success of the decision making process and the decision itself is dependent on several aspects. Project alternatives can be dependent on stakeholder knowledge and stakeholder communication of interests. This leads to decisions made with incomplete information. The experiences from practice show that it is difficult to take a broad scope in exploring project alternatives. Even if one takes a broad perspective when identifying project alternatives, one has to deal with uncertainties, with a certain abstraction level and with political discussions. Also other influences such as a focus on the MIT, the recommendations from Elverding, budget availability and the interests of stakeholders bring the exploratory phase back to a small scope. It requires efforts to change this.

The three perspectives show that DSMs can be of added value in decision making practice. The added values from the three perspectives are summarised in table 6.

Table 6: Overview of the added values

Perspective	Added value
Rational	- Improve efficiency and effectiveness of the alternative - Improve the prioritisation of project appraisal - Improve the planning process - Increase and improve the available information concerning the effects - Improve the use of information - Improve comparing the projects - Improve the decision when considering usefulness and necessity of the project
Organisational	- Improve insights in underlying objectives and mutual interests - Improve cooperation and communication - Increase consensus between organisations - Improve accessibility of information which leads to higher transparency
Political	- Increase the support of personal preferences - Increase the political interests - Increase attention for projects

This chapter provides a first step when considering the added value of DSMs. Using these three perspectives made it possible to provide insights in the opportunistic use of DSMs, next to the rational motivations to use DSMs. These insights will be used in the next chapter when formulating the criteria to express desirable improvements of the MIRT exploratory phase. The next chapters will elaborate on this chapter and will work towards an answer on the main question.

6 Five Decision Support Methods

The previous chapters show that the MIRT exploratory phase and the use of DSMs within these exploratory phases are different for each project. DSMs can improve the exploratory phase by structuring the process and work towards effective and efficient project outcomes. Additionally, DSM can fulfil the function of bringing stakeholders together, which is desirable within the exploratory phase. Besides, it might improve the project organisation and meet the desires from the renewal of the MIRT. This chapter will examine six criteria of desirable improvements, based on the added values identified before. Second, five DSMs are analysed that can fulfil these criteria by applying the methods in the first filter of the exploratory phase. Last, the DSMs are scored based on these criteria, by using literature.

6.1 Criteria that methods should meet

By considering the added value of DSM, theory and added value from practice are brought together. This section will formulate criteria, using different sources of information. First, it uses the information derived from the added values discussed in the previous chapter. Second, these criteria also incorporate the requirements and desires from the current MIRT exploratory phase and the renewal of the MIRT. Incorporating these aspects from practice will improve the usefulness and applicability of the DSMs. Third, problems and experiences from the problem analysis and from the two case studies are included in the following criteria. Although methods often assume a more rational approach, consideration of the organisational and political context can be desirable for practitioners and it can increase the applicability of methods in practice. These three perspectives are therefore leading when formulating criteria. Table 7 provides an overview of the information that is used for formulating these criteria. It is derived from literature (L), the case studies which show desires from practice (P) and the ambitions (A) from the renewal of the MIRT.

Table 7: Backgrounds and sources of the criteria

Criterion	L	P	A	Sources and assumptions
C1: Improve the analysis of generating project alternatives		X		Projects start with predefined ideas
			X	Incorporate alternatives from goals instead of norms
		X	X	Apply a custom approach
		X	X	Consider non infrastructural alternatives
			X	Anticipate on uncertainties and opportunities
C2: Improve insights into the effects	X			Not all interests and effects are considered
		X	X	Effects of spatial alternatives are difficult to measure
		X		Difficulties to analyse alternatives with uncertain effects
C3: Improve incorporation of broad scope and interests	X		X	Stakeholder involvement leads to a better process
		X		Mismatch between possibilities and expectations
	X			Analysing all possible alternatives leads to agreements
			X	Apply a broad view
C4: Improve communication and cooperation	X			Shared insights and mutual understanding are desirable
			X	Actions are based on shared goals and ambitions
	X	X		Acknowledge that conflicts exist within cooperation
C5: Improve transparency of the decision	X			Transparency is important for decision making
		X		Uniformity (with guidelines) can conflict with creativity
C6: Improve ability to deal with political influences	X	X		Political preferences influence the decision
	X	X		Prevent political influences is impossible and undesirable

Information is derived from literature (L), the case studies in practice (P) and the ambitions from the renewal of the MIRT (A)

6.1.1 Improve the analysis of generating project alternatives

Problems and challenges are often formulated from predetermined judgments and preferred alternatives. The N65 Vught – Haaren and InnovA58 cases started with predefined ideas about the preferred alternatives (interview 6; interview 7; interview 9; interview 11) and decisions in the start decision limits the solution space (interview 9). Project organisations often follow the interests and desires of the Ministry of I&E (interview 15). It is therefore essential to postpone decisions until all stakeholders gained and shared insight about the situation or problem (interview 14). Considering all interests provides a clear picture of the problems and chances. It is noted that it is also important to pay attention to the alternatives that are not promising. By doing so, it prevents parties to get back to these alternatives later in the process (interview 17). Also the Ministry of I&E (2014) acknowledges the importance to incorporate alternatives from goals, rather than from norms. This leads to a focus on outcome, instead of output. The first filter should then make a trade-off based on information and elaboration on a less detailed level (interview 9; interview 16). Alternatives are compared and optimised to improve the promising alternatives. This makes it possible to look for win-win situations where knowledge of stakeholders is connected (van Eekelen et al., 2013) (interview 10).

DSMs are a mean to help the project team to explore the problem and to gain insight about the situation. It should provide a momentum to discuss and share the experienced problems and values. Next to that, it should provide room to creatively think about project alternatives. DSMs can be useful instruments to improve alternatives by continuously comparing and optimising these alternatives.

Improve the analysis of generating project alternatives also includes the desire to apply a custom approach and improve flexibility of the alternatives (Ministerie van Infrastructuur en Milieu, 2014). There are differences in the scope of projects and each scope requires another approach. This diversity is difficult to catch in guidelines (interview 6; interview 17). There is also a desire to improve the use of the existing infrastructure, incorporate uncertainties and work towards the desired result in small steps. This last aspect shows a wish for adaptive planning, to respond to challenges and chances and take uncertainties into account (Ministerie van Infrastructuur en Milieu, 2014). Currently, traditional alternatives involve little risks and they are robust in effectiveness. Next to that, the allocation of the budgets also prevents to think beyond the traditional alternatives. Interviewees from both case studies state that it would be desirable to have more flexibility in budget allocation to include non-infrastructural aspects, such as spatial integration (interview 10; interview 17). Next to that, budget allocation in the start decision leads to early focus on the end result, instead of a focus on an integral trade-off (interview 6; interview 7; interview 12; interview 13).

DSMs should improve the process of working towards a promising alternatives. DSMs should facilitate a process where the available funding is of little influence on this process. This includes an open view, where it is incentivised to come up with the best alternative concerning problem solving capacity, instead of focusing on individual preferences and predefined solutions.

6.1.2 Improve insights into the effects

The current methods, such as CBA and a *plan Mer* do not cover all the relevant aspects in the decision making process (Reinhard, Vreke, Wijnen, Gaaff, & Hoogstra, 2003). There are (non-financial) effects that are difficult to measure in objectivity and monetary values, but they are important to consider when alternatives are scored (Ministerie van Infrastructuur en Milieu, 2014). Estimation of the effects of spatial alternatives is often dependent on the location, as spatial quality is more important in the city centre than next to a highway (interview 13; interview 16). Current DSMs are often unable to incorporate exceptions and soft effects, as it uses uniform key figures. Therefore an additional, nuanced approach makes it possible to consider effects qualitatively (van Eekelen et al., 2013). Incorporating the effects of

alternatives on spatial quality and liveability was considered as a problem in the N65 case (interview 12; interview 16). It is difficult to apply the traffic models (interview 7) and it was noted beforehand that the project would not lead to a positive cost benefit outcome because profits are not achieved on accessibility (interview 7; interview 16). Next to that, both municipalities acknowledge that too little attention was paid to spatial quality and spatial integration (interview 12; interview 14). For example, as noise was exceeding the norms, sound walls were needed to mitigate the noise. However, the provincial character of the road and the ambitions of the region did not allow sound walls around the N65. This led to misunderstandings, as it was difficult to discuss these subjective aspects (interview 14). The InnovA58 case shows difficulties in estimating the effects of innovative alternatives. The perception of the impact of innovations differed per person, as little information was available and uncertainties were high. This made it difficult to incorporate the effectiveness of both technical and financial innovations (interview 9; interview 10; interview 11; interview 14). In both cases, this narrowed the solution scope.

DSMs should provide an opportunity to think about these effects together, as each stakeholder considers different effects to be important. This leads to an allocation of effects. It would also be desirable to incorporate positive from opportunities in a project.

6.1.3 Improve incorporation of broad scope and interests

It is important to involve stakeholders to create a shared interest for alternatives. This broad approach concerning the scope and the interests of stakeholders seems to take a lot of time. However, this is expected to lead to trust and a positive energy between the stakeholders, which improves the following phases (Ministerie van Infrastructuur en Milieu, 2016c). Both N65 and InnovA58 cases show that the stakeholders have a preferred project alternative in mind, before the exploratory phase starts. For the N65 case, the desire of the municipality of Vught to construct a tunnel remained leading in the process and this prevented the search for other alternatives (interview 6; interview 7; interview 16). Expectations were not well managed (interview 14). This disturbs the follow-up planning process. Analysing and considering alternatives together leads to agreement about undesirable or unreachable alternatives (van Eekelen et al., 2013). This follows the renewal of the MIRT, where a broad view is one of the three goals. By involving a broad diversity of parties, challenges from a shared perspective can be defined earlier in the process. Integrated project alternatives can lead to new opportunities and higher added value of the project (Ministerie van Infrastructuur en Milieu, 2014, 2016c) (interview 10). Although the preferred alternative for the InnovA58 was already considered in the start decision, the following phases also considered other promising alternatives that were analysed and graded on their problem solving capacity. This was a desire from the municipalities and their interests were considered during the process (interview 9; interview 11).

DSMs should help to identify the preferences and interests of the stakeholders. It should provide an opportunity for all stakeholders to express their wishes and interests. Next to that, it should bring all these interests together to agree on realistic expectations. By doing so, it is possible to acknowledge and understand the mutual positions and interests, where some interests might be conflicting. There is an important role for the Ministry of I&E to facilitate this process, as it is undesirable to give stakeholders false hope. It is important to manage the expectations of all parties.

6.1.4 Improve communication and cooperation

Differences in interests are often understandable, misunderstandings and mistrust can lead to a tiresome process where stakeholders hold on to their arguments. In order to work together towards a shared solution and increase the success of a project, shared insights and mutual understanding is necessary (van Eekelen et al., 2013). This follows the goal of cooperation of the renewal of the MIRT, where actions are based on shared challenges and ambitions (Ministerie van Infrastructuur en Milieu, 2014). Cooperation

should be able to deal with the different problems and interests that stakeholders have. It is incorrect to assume that there are common interests, as each party has to act in the interest of their organisation. It is therefore important to acknowledge that there are some conflicts and competition within the cooperation (van Eekelen et al., 2013). This was also observable in the N65 case, as the interests of the organisations differed from each other. The wishes and the impact of the preferable project alternative and the available money led to misunderstandings and resistance towards the plans (interview 12). Next to that, where the Ministry of I&E and Rijkswaterstaat aimed to come up with cheaper alternatives with high problem solving capacity, the municipality of Vught had to obey the wishes of the council of Vught. It is desirable to start the process problem oriented by developing shared goals. The solution that was leading in the process led to disagreements (interview 14).

DSMs should improve the cooperation and communication between the stakeholders in the project organisation. In order to improve the process to work towards a shared solution, a moment to share insights and find mutual understandings helps to do so. When doing this early in the process, it is likely to lead to better communication later on in the process.

6.1.5 Improve transparency of the decision

Transparency of information, next to participation and quality of information, is considered to be important for the decision making process (Priemus, 2004). This is important, as it is desirable to involve the residents and have a system of checks and balances to estimate the feasibility and the effects of the solution spaces early in the process. Currently, the first part of the exploratory phase is not transparent. Although it prescribes how to work towards a preferred alternative with a CBA and *plan mer*, there is little written about a uniform process of identifying and generating project alternatives. Practice shows that identifying project alternatives and coming up with promising alternatives differs per MIRT project. For the N65 case, it was not clear how the exploratory process led to a justifiable decision (interview 6). Although transparency is important, it is also noted that further elaboration of the exploratory phase in the guidelines is undesirable as it hinders a creative process (interview 14; interview 15; interview 16; interview 17).

DSMs can improve the transparency of the decision, as alternatives are derived following the same procedures or methods. Next to that, a method often includes systematic steps that work from a problem to a preferred alternative. This requires the project organisation to make their decisions within the process transparent.

6.1.6 Improve ability to deal with political influences

The current DSMs in the exploratory phase can be used in the decision maker's personal advantage. For example, it is possible to use the outcomes to justify the decisions that were predetermined early in the process. These political influences are also observable in both cases. The N65 project started when a political resolution was accepted by the national parliament (interview 6; interview 7). The municipality of Vught's desires and interests have to be incorporated in the outcome. This led to a quick process, where other promising elements were left out in order to work towards an agreement (interview 14; interview 16). For the InnovA58 case, it is noted that the lobby from the region was of high importance in prioritising the trajectory Eindhoven – Tilburg (interview 10; interview 11; interview 17). Their innovative approach led to early available funding from the Ministry of I&E, but had little impact to actually consider innovative solutions in the exploratory phase (interview 10; interview 11; interview 12). Opinions differ whether political influences are considered as a negative component within decisions of infrastructural projects. As we live in a democratic country where politicians represent the citizens, the parliament is decisive in the decisions and prioritisation of projects.

DSMs should therefore not reduce the political influence or political trade-offs, but it should provide a moment of attention for the political debate. It should structure the process and make the political influence on the decision making process more explicit. It is desirable to provide a moment for politicians to form their point of view and to reconsider their position.

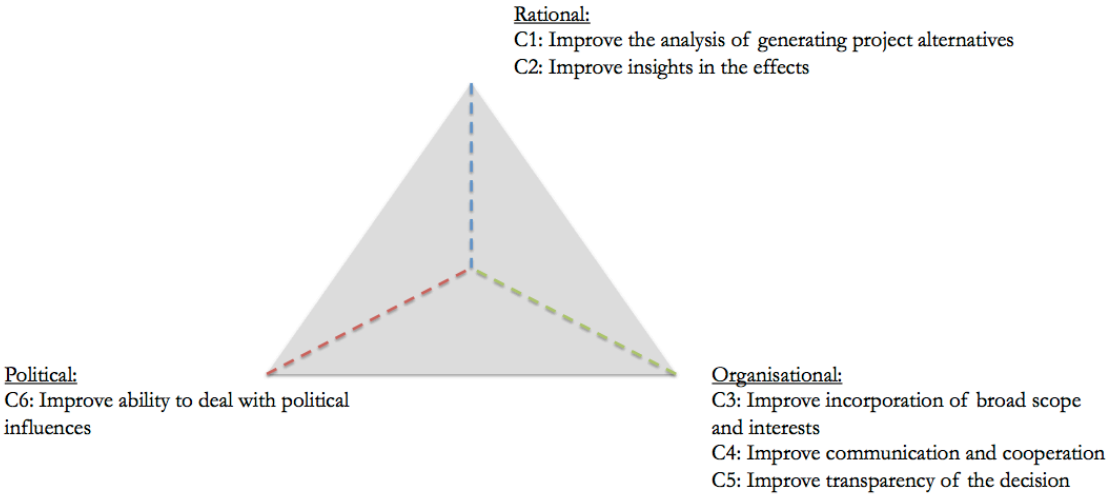


Figure 11: Criteria derived from three perspectives

6.2 Identifying five Decision Support Methods

The following five DSMs are considered as they take trends and desires into account. These DSMs were chosen together with supervisors, who considered these methods to be desirable to analyse. Next to that, the methods came up in governmental documents, research and meetings or they are already considered in practice. Based on these aspects, the following DSMs are defined: Value Engineering, EffectenArena, Adaptive Plan Development, Multi Criteria Decision Analysis and a quick and global Cost Benefit Analysis. Pure technical methods such as DSS and PSS are not part of the scope, as they are not considered in governmental documents. The depicted methods have different functions, as identified in the previous chapter. Some aim to diverge with identifying and generating alternatives, while others facilitate the decision to work towards the first filter. It was desired by the supervisors to consider these methods altogether. This section provides insight in the added value of the method and potential drawbacks. Based on available literature, a first indication states how the method should be executed and how it functions in practice. It was not always possible to find journal articles about the methods. Therefore, also practical information is used.

6.2.1 The existing situation

A reference situation makes a comparison with other DSMs possible. According to the available literature, there is no predefined DSM that provides a uniform way to generate and filter alternatives before the first filter. However, in both case studies VE was used together with a multi criteria analysis to provide the first qualitative filter. A CBA provides information for a second filter, based on a quantitative analysis. Although the CBA is prescribed in the guidelines, the use of other methods is rather dependent on the questions and the preferences of the project organisation (interview 17).

This degree of freedom is experienced both positive and negative. Positive as it gives the project organisation room for interpretation. It is possible to adjust the process (and the instruments that support the process) to the desires of the stakeholders. However, it is also noted that the current process of generating alternatives and working towards a first filter does not always lead to a smooth follow up

phase, especially since the second filter is established in details in the guidelines. Next to that, the guidelines rather focuses on the use of means, such as traffic models and CBA, than the goal of the exploratory phase (interview 6; interview 16) to work towards a shared problem (interview 14).

6.2.2 Value Engineering

Since the 1950s, Value Engineering has been a method to assess cost effectiveness of construction projects. It aims to increase the project value, by reducing the costs. It addresses the aspects of costs, quality and satisfaction of the needs, together with stakeholders (Connaughton & Green, 1996). These authors differentiate value management as a structured approach to develop a strategic plan and consider VE as a systematic approach that contains techniques to obtain the highest value for money. However, others state that value management, value analysis, value control and VE are definitions that refer to the same methodology (Mandelbaum & Reed, 2006; SAVE, 2015). This thesis will adopt the definition of VE to reduce misunderstandings. Miles (1972) describes value analysis, or VE as "… a problem-solving system implemented by the use of a specific set of techniques, a body of knowledge and a group of learned skills. It is an organized creative approach that has for its purpose the efficient identification of unnecessary cost" this definition is still of value today. The Society of American Value Engineers (SAVE), defines VE as "…the systematic application of recognized techniques which identify the function of a product or service, establish a value for that function, and provide the necessary function reliability at the least overall cost" (American Association of State Highway and Transportation Officials, 1987).

VE is a helpful method to expose value for money. When maximizing value, the function or performance of the project is maximized and the overall costs are minimized. Calculation of Value = Function / Cost. Although this problem solving approach is often intrinsic within the project teams, VE makes it possible to formalize the process (Green, 1994). This can only be assured when the need for additional projects is proven and when objectives are identified. Identifying objectives, analysing project alternatives and evaluating the expected outcomes is done together with the project team and experts. This creates an overall understanding of the project and leads to a common understanding and improved communication. Additionally, a diverse group leads to a shared problem analysis and innovative ideas and project alternatives (Connaughton & Green, 1996).

SAVE International is the society that promotes, advocates, certifies and educates the use of VE. The application of techniques to improve quality and performance and decrease costs follows a certain job plan, which contains three phases: pre-workshop preparation, value workshop and the post-workshop documentation and implementation (SAVE, 2015). This is further defined in the following phases:

1. Information phase: define the goals and the current situation.
2. Function analysis phases: determine the functions to meet the project's goal. Functions are a two-word measurable noun or an active verb.
3. Creative phase: identify ideas to perform or improve the project's desired functions.
4. Evaluation phase: select ideas that meet the functions. Potential ideas are filtered based on needs and constraints.
5. Development phase: development of the ideas into alternatives.
6. Presentation phase: report or present the developed ideas and alternatives.

The following conditions must be satisfied in order to qualify the study as a value study (SAVE, 2015). First, the team follows the six phases defined in the job plan. Second, the value study is executed with a multi disciplinary team of experts and project stakeholders, with experience and expertise in the project field. Additionally, it is possible to add individuals who are indirectly concerned with the project, such as residents and other stakeholders. Third, the value team leader who is executing the value study must be a

certified value specialist. This person must be qualified to elaborate the job plan and the techniques, such as function analysis.

The added value of Value Engineering

The theory of VE is closely related to the use of VE in practice. Male et al. (1998) examines ten critical success factors concerning the use of VE. All factors should be met otherwise VE workshops could not be successful. Palmer et al. (1996) show that the set up of the workshop is uniform, but that the outcomes of the session vary. The success of the workshop is dependent on several factors; the personality of the team leader, the interaction and input of the design team, the role of the client and the timing of the study. Because the team is focused on the cost savings as an outcome, methodology implementation (and for example inclusion of function analysis) and interactions between the team and participants are often neglected (Chen, Chang, & Huang, 2010). They state that constructability and completeness of recommendations, team leader's abilities in coordination, in controlling the job plan, conformance to the job plan and satisfaction with the workshop goal are important aspects when evaluating the VE workshop performance. Additionally, communication and consensus and the professional level of the team members are important for the quality of the performance.

Value Engineering in practice

VE uses function analysis to identify the problem and objectives, which the project alternative should solve. Multidisciplinary teams are formed to increase creativity, experience and knowledge. This leads to creative and more innovative ideas. Additionally, involvement of many stakeholders might increase the acceptability and willingness. It is expected that this leads to better implementation of project alternatives, as there is more insight in mutual interests. However, it must be noted that the method is dependent on the information and participants that take place in the study. The use of this method is addressed in the guidelines (Ministerie van Infrastructuur en Milieu, 2012a).

6.2.3 EffectenArena

EffectenArena is developed in the Dutch practice in 2008 to discuss the intervention and the effects in an area. It is a method to identify the investments and the measures and it stimulates to think about the effects. It clarifies who benefits and who pays for the interventions. Making this explicit with the method, this increases transparency as interventions and their effects are identified. Besides, it helps to create a dialogue between stakeholders. The stakeholders are involved in the process and stakeholders' expectations are tested. Their involvement leads to conversations and increases mutual understanding.

A session takes about three to four hours. The method involves different steps such as:

1. What is the intervention? This first step analyses the expected results and outcomes.
2. Who invests? This step considers who pays or who (financially) invests in the intervention
3. What are the effects? Effects are identified for the area and for individual residents
4. Who benefits? The last step analyses who experiences an increase of value in dwellings or costs reduces?

The added value of EffectenArena

EffectenArena analyses if the intervention fits the goals. It evaluates the effects of the intervention, based on estimations. Not only the outcomes of EffectenArena are valuable, also the process of identifying expectations and thoughts of stakeholders is beneficial. It is an easy instrument to start the conversation about societal effects and consider whether there is an agreement on the impact of the effects (Deuten, 2013). Besides, the tool improves the communication of the information with the residents and it helps to make a trade-off between the people who pay and the people who benefit. Although direct effects on a local level are well identified, it is difficult to identify indirect effects on a national level (SEV, 2009).

EffectenArena in practice

The EffectenArena is often used on a local level, to consider the social impact of investments on the area. Participants experience the broad perspective and transparency as positive elements. It provides insights into content of the intervention and it stimulates to express mutual expectations. The simplicity of the tool makes it easier to understand the complexity of the project. The EffectenArena can be a first step in the evaluation of an intervention. It can be a first step towards a CBA, where the identified effects are further elaborated (SEV & Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2011). The EffectenArena is a visual tool that can be used in workshops. The published example should be used for inspiration, as each situation should incorporate other aspects and effect. Each EffectenArena requires a custom approach and the results might differ per session.

6.2.4 Adaptive Plan Development

Adaptive Plan Development is a method that develops investment strategies, to prevent over- or under investments and ineffective alternatives. Decisions are based on improved and increased information. It incorporates uncertainties and it adds the flexibility to adjust and develop plans over time. It creates chances to reduce costs or optimise functionality. It can lead to a more effective cooperation with stakeholders as an ambition is shared and stakeholders work together to find a strategy. APD differs from a regular approach, as it aims to transparently incorporate uncertainty and chances of future developments within decisions. Alternatives are specified and divided based on short-term interventions and long-term challenges. It defines development paths, instead of a final project. Next to that, it looks for opportunities to connect this project with other challenges of other modalities (Ministerie van Infrastructuur en Milieu, 2014; Stratelligence, 2015).

Real option analysis is a (quantitative) subpart of this method. It analyses how to maximize the strategy by splitting up the investments over years. It defines strategies to develop development paths. The long-term investment is developed when the situation is positive. This increases flexibility of the project.

Adaptive Plan Development is an iterative and cooperative process and considers the following elements:

1. Problem analysis and collection of information: gain insight about the challenges and identify chances and developments. This includes defining the ambitions, consider the interventions and options and identify the key uncertainties that might influence the project.
2. Define solution spaces and elaborate development plans: order and prioritise challenges. Moments are identified to see when to adjust and implement the interventions. In order to do so, a strategy to monitor if and when an intervention should be executed is defined. This is based on limitations and norms. This strategy defines the steps to work towards the goal, it connects short-term measures with long-term challenges, it considers flexibility and robustness and it identifies options, with the aim to keep them open.
3. Decision making: Compare the outcomes of the regular approach with the adaptive approach and defines differences. Based on the recommendations, decision makers and other relevant stakeholders make agreements concerning follow up interventions.

The added value of Adaptive Plan Development

APD makes it possible to take uncertainties into account. This is useful, as projects increase in complexity and dynamics. With the limited available financial funds, it is important to make decisions at the right moment and prevent over- or under investments. As society changes, there is a desire to look for integral initiatives. It is therefore desirable to keep options open for stakeholders and other solutions. At the other hand, APD is not of added value when there are few uncertainties within the project.

Adaptive Plan Development in practice

The method of APD is already implemented in water projects. It is expected to be applicable in infrastructural projects as well. However, it is important to consider several aspects that are different, such as the stakeholders and the policy culture. Next to that, the recommendations from Elverding state that decisions should be made fast and irreversible in other phases. This goes against the characteristics of APD. Last, an integral approach where different modalities come together make it difficult to define development paths (Stratelligence, 2015).

6.2.5 Multi Criteria Decision Analysis

Multi Criteria Decision Analysis is a method to compare alternatives and make a rational decision based on more than one criterion. It ranks the information, makes the decision process transparent and supports decision makers.

The Department for Communities and Local Government London (2009) has a manual to execute a MCDA. They identify the following steps.

1. Establish the decision context: this identifies aims of the MCA and the objectives of the decision makers and other key players. Next to that, it is important to consider the overall ambition.
2. Identify the options: most project organisations already have an idea about potential alternatives. However, creativity leads to improved alternatives that will continue to the next phase.
3. Identify the criteria and sub-criteria: clearly define the criteria and make them operational, so it reflects the value associated with the consequences of each option. It should be checked if all criteria are included, if some criteria are redundant, if criteria are operational and if the criteria are independent from each other.
4. Describe the expected performance of each option against the criteria
5. Weighting: assign weights to the criteria to reflect their relative importance to the decision
6. Combine the weights and scores for each of the options to derive an overall value
7. Examine the results
8. Conduct a sensitivity analysis of the results to changes in scores or weights

The last four steps can be left out in order to execute a more objective MCDA.

The added value of Multi Criteria Decision Analysis

Beinat and Nijkamp (1998) give several advantages of the use of multi criteria analysis in land-use management. First, it supports to analyse several alternatives and it identifies the most suitable option for the identified purpose. Second, the effects can be shown in different units. Third, it provides a framework to identify and discuss objectives and it makes it possible to make transparent trade-offs between the objectives. It helps to consider the different interests of the stakeholders, which helps to identify potential conflicts for later phases. MCDA helps to make a trade-off between alternatives when objectives are conflicting (Keeney & Raiffa, 1993). It is the most popular framework to take the different perspectives and wishes from stakeholders into account (Karjalainen et al., 2013; Soltani et al., 2015). San Cristóbal Mateo (2012) also adds that the output of the analysis is often easy to communicate to other stakeholders, as the suggested criteria are comparable and the output has a simple format that makes it easily applicable.

Multi Criteria Decision Analysis in practice

MCDA is a tool that is commonly used by Dutch policy makers when multiple (conflicting) objectives are considered (Rijksoverheid, 2012). However, there are also disadvantages acknowledged. Decision makers often use aggregate measures to compare alternatives. This leads to less useful information. Second, as weights are given to the impacts, the underlying assumptions are often implicit or speculative. Third, although a decision maker can make a decision for a preferred alternative, it does not include the different

values of multiple decision makers (Walker, 2000). Monnikhof & Bots (2000) state that "the use of MCDA was unstructured, strategic, amateuristic and with little influence on the outcomes".

6.2.6 Quick and basic Cost Benefit Analysis

Cost Benefit Analysis is already used in the second filter. It is useful to analyse the effects of the alternatives earlier in the phase on a global scale by using standard numbers. Using standard numbers leads to a quick and basic CBA. This can help gain early insight into the effects on e.g. travel times, safety or cost-effectiveness of the alternatives. This method can function in addition to the CBA executed later in the exploratory phase.

The following steps are part of the quick and basic CBA:

1. Calculate all costs: this contains capital costs, revenue costs and in-kind costs
2. Calculate the benefits: fiscal benefits and public value benefits
3. Incorporate time and calculate the net present value (NPV)

The added value of a quick and basic Cost Benefit Analysis

A quick and basic CBA early in the process is valuable for identifying effects early in the process. Next to that, it helps to score the alternatives in the first filter based on their societal advantages. Alternatives that are not promising or are negative can be optimized and adjusted to decrease the costs or increase the benefits (Ministerie van Infrastructuur en Milieu, 2012a). A CBA earlier in the process prepares people for the use and outcomes of the CBA later on in the preferred alternative. Next to that, it gives stakeholders an impression about the alternatives and whether this fits within the budget (Reinhard & Gaaff, 2006). However, as the model is based on assumptions and standard data, it is not recommended to base decisions fully on the outcomes of the CBA (Public Service Transformation Network, Whitehall Partners, & New Economy, 2014).

Quick and basic Cost Benefit Analysis in practice

Such a quick and basic CBA is used to transform public services in United Kingdom. It is simple and it involves lower costs. It is also applicable when there is little information for the analysis and research is available (Public Service Transformation Network et al., 2014).

6.3 Scores of the methods on the criteria

After generating the criteria and methods in the previous section, these DSMs are put together in a 'toolbox'. This toolbox shows what method is applicable when an improvement is desired. The score from the table must be read as 'how does this method score on the desire to improve this criterion?'. The first two criteria (blue) are in line with the rational perspective. Criteria three, four and five (green) are in line with the organisational perspective. The last (red) incorporates the political aspects. The scores rather give an indication about the usefulness of the methods, than a specific score or an answer when to use what method. The methods are scored based on the existing situation. Therefore, the existing situation is considered as neutral. The indicative score is derived from literature and practical experiences. These scores are further explained in the text below.

Table 8: Matrix to trade off the Decision Support Methods

	Existing situation	Value Engineering	Effecten Arena	Adaptive Plan Development	Multi Criteria Decision Analysis	Quick and Basic Cost Benefit Analysis
Improve the analysis of generating alternatives	0	++	+	+	0	0
Improve insights into the effects	0	+	++	+	+	++
Improve incorporation of broad interests	0	++	++	0	+	+
Improve communication and cooperation	0	++	+	0	0	0
Improve transparency of the decision	0	+	+	+	+	+
Improve ability to deal with political influences	0	0	0	0	0	0

6.3.1 Value Engineering

VE improves the analysis when generating alternatives. It aims to make the problem or the function of the project explicit. Besides, it maximizes the performance while minimising the costs. This method helps to take a problem-oriented approach and prevents the project organisation to start with a narrow problem perspective. Project objectives and alternatives are analysed and the expected outcomes are evaluated together with stakeholders. This process is structured with a FAST diagram, which contains the functions of the project (interview 17). Connaughton & Green (1996) conclude that VE leads to a more and creative project alternatives. Next to that, these alternatives have a higher problem solving capacity, as they are based on the problem and functions of the project (Elias, 1998). The functional analysis and creative thinking techniques are useful in VE sessions (Cheah & Ting, 2005). VE gives a clear perspective about the function and potential alternatives of the project. However, VE does not explicitly consider the effects of project alternatives. VE is a mean to analyse and incorporate the stakeholders' requirements. It incorporates a broad set of interests, as project alternatives are considered together with the stakeholders, with the aim to find consensus or agreement (Green, 1994; Kelly, Graham, & Male, 2004; Luo, Shen, Fan, & Xue, 2011). Next to that, as stakeholders take actively part in these sessions, other organisations have a better understanding of their interests and standpoints, which leads to mutual understanding between stakeholders (interview 11). A VE workshop is able to support communication and coordination that leads to consensus, instead of conflicts (Chen et al., 2010). The VE study leads to a list of promising project alternatives, including a good argumentation why other alternatives did not make it to the selection (interview 17). This trade off between project alternatives improves the transparency of the process to work towards a decision. The last criterion is the ability to deal with political influences. This includes whether the outcome of the method can be influenced by the input. It is noted that the outcomes of the VE study are dependent on the people who participate in and facilitate the study (Kelly et al., 2004). Participants with a spatial or sustainable expertise are expected to have inputs that lead to other outcomes than when people from the mobility domain participate in the study. It is noted that generating innovative alternatives with free-thinking techniques is limited by the participants' experience, knowledge and creativity (Zhang, Mao, & AbouRizk, 2009) (interview 9; interview 17). The VE process requires a structured approach, where the workshop is facilitated following the rules. However, strictly following the rules conflicts as participants desire to reduce the time of the workshop (Kelly et al., 2004).

6.3.2 EffectenArena

EffectenArena does not directly improve the analysis of generating alternatives, as this is not a component of the method. It is possible to improve projects and project outcomes, as the effects of project alternatives are identified early in the process (Larsen & de Boer, 2011). It qualitatively identifies effects, preferably together with stakeholders. When discussing this together with stakeholders, it becomes evident who experiences and who benefits from the project alternatives. This also helps to discuss whether these negative effects are acceptable for the stakeholders. This leads to possible adjustments of project alternatives (SEV, 2009). The EffectenArena uses a pre-identified set of effects. It requires some preparation from the organisers to identify other effects, which are suitable for the project. Next to that, the pre-considered effects are relevant on a local level, it is therefore uncertain if this method could be applied on a more abstract level, within a region. As it considers indirect effects in the area, it is difficult to incorporate effects that are observed outside this area. The EffectenArena involves stakeholders and it provides new insights. By considering the effects of a project alternative on the stakeholders, this leads to the consideration of a broad set of interests. Identifying the effects of an alternative together improves the cooperation and communication between stakeholders. Stakeholders are encouraged to express their wishes and problems. This leads to constructive conversations between the stakeholders. Larsen & de Boer (2011) state that identifying investments, measurements and effects with the EffectenArena will gain more support for the project. Only qualitative effects are considered within the process, this gives a first idea about the societal benefits of the project (SEV & Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2011). The method can be applied prior to a CBA in the later phase. The mutual expectations and involvement improves transparency of the process to work towards a decision (Deuten, 2013). The decision can be based on a more abstract idea of the effects, instead of effects that can only be monetized and which are considered in a CBA. The EffectenArena does not include political weights to consider some effects as more important than other effects.

6.3.3 Adaptive Plan Development

APD improves identifying and generating alternatives. It helps the project organisation to think in building blocks and alternatives that can be adjusted and changed over time. This leads to flexibility in the preferred alternative, as it contains elements for the long-term and for the short-term. It provides the opportunity to adjust or change the alternatives when the situation changes and this leads to efficient and effective alternatives (Ministerie van Infrastructuur en Milieu, 2014). Last, it leads to better support for the decision, as more information is available (Stratelligence, 2015). It does not explicitly incorporate a moment to consider alternatives from other domains or modalities. The allocation of effects is not considered, but uncertainties are taken into account. Based on these uncertainties, scenarios are constructed to test the robustness of the alternatives. As this method focuses on the project performance, there is less room for stakeholder involvement. Incorporating broad interests and improvement of communication and cooperation by the involvement of stakeholders is little considered within APD. Next to that, the involvement of different stakeholders makes it difficult to define clear development paths (Stratelligence, 2015). By adding flexibility in long-term developments, this increases the uncertainty for residents. It is not considered how uncertainties will have an impact on the residents (interview 9). More insights into the development paths and into the uncertainties that influence decisions concerning the project alternatives are helpful to support the transparency of the decision (Ministerie van Infrastructuur en Milieu, 2014). However, APD considers uncertainties as predictable. This can lead to a false sense of security. Analysing the development paths lead to the idea that the future is known. Although it considers e.g. climate change and economic developments, it does not incorporate uncertainties such as changes in the political environment.

6.3.4 Multi Criteria Decision Analysis

MCDA is a promising method to test alternatives. It does not help generating a broad set of project alternatives, but it tests alternatives by scoring them based on the criteria that are considered to be important. The scores of the alternatives on these criteria can be expressed quantitatively, but the goal is rather to have a global idea about the effects that the project alternatives have on the criteria. Criteria can be generated and developed together with stakeholders. This expresses what criteria are considered to be important by these organisations. It could therefore incorporate broad interests and this can improve communication between the organisations. The MCDA could start a discussion about the impact on the criteria that are either beneficial or unfavourable, considering the different interests. These steps also improve the transparency of the process to work towards a decision. However, it is not a component within the steps to define a multi criteria analysis together with other organisations. When this analysis is executed from behind the desk, it is unlikely that a broad set of interests is incorporated and that this will improve the communication and cooperation between stakeholders. It could rather lead to misunderstandings and opposition, as other organisations might not agree with the criteria that are considered or the outcomes of the alternatives scored on the criteria. It is possible to add weight factors to the criteria, which makes one criterion more important than another. This makes the MCDA sensitive for political influences and strategic use (Monnikhof & Bots, 2000). These weight factors can lead to further discussions between the stakeholders, as these weight factors contain certain subjectivity.

6.3.5 Quick and global Cost Benefit Analysis

CBA is often used to analyse the costs and the benefits of projects, to come up with the project that has the highest societal benefits. This helps to make a well-informed decision about the preferred alternative. However, it is also possible to apply this method earlier in the process. Not with the goal to come up with the project alternative that has the highest societal benefits, but rather to identify the effects of the different project alternatives. This does not include generating project alternatives. It aims to quickly and globally identify the effects by using standard numbers. Although this gives a first insight in the effects and the allocation of the effects, it is difficult to include effects that cannot be monetized. This also means that spatial quality will be difficult to incorporate. Next to that, as standard numbers and assumptions are used, this might lead to unsuitable and therefore unreliable outcomes. A CBA is highly methodological and is therefore unable to incorporate a broad set of interests and is unable to improve cooperation and communication. The quantitative study might be difficult to understand for stakeholders. However, a first estimation facilitates the discussion organisations. CBA improves the transparency of the decision, as the scores on the effects show why some project alternatives continue to the following phase. Project alternatives that have high costs and low benefits are optimised or are not further considered. The CBA can help to work towards project alternatives with the highest efficiency and effectiveness, however it is questionable how the decision maker will accept or neglect the outcomes of the analysis, if the outcomes do not agree with the wishes and desires of the stakeholders.

6.4 Conclusion

This chapter shows that DSMs can be of added value in improving the MIRT exploratory phase. All methods have advantages and disadvantages and none of the methods are promising to fulfil all criteria. It is therefore important to consider the characteristics of the phase, before applying one of these methods. VE and EffectenArena are methods to improve cooperation and communication and improve the incorporation of broad interests. A quick and global CBA, MCDA and EffectenArena are well applicable when it is desirable to improve the insight into effects or when one wants to improve the transparency to work towards a decision.

There are some notes that have to be made. Concerning the criteria, the speed of the decision making is not considered as a criteria within this analysis, as this did not come up with literature, ambitions or practice. Considering the methods, not all promising methods were included in this analysis. Concerning the methods, it would have been valuable to also add *Omgevingswijzer* or Impact Assessment methods, as this is used in practice. However, these methods did not come up within the meeting of the supervisors and time limited the methods that could be considered. Reflecting the scores shows that none of the methods are 'able' to deal with political influences. This criterion was defined vague, to keep open whether political influences are desirable or not. Whether a method should facilitate political influences depends on the perspective. From a rational perspective, it is undesirable to have individual preferences influence the outcomes. While from a political perspective, it is desirable to add individual preferences because decision makers consider additional aspects that are not part of the method. Besides, rational methods are unable to incorporate political influences as they often neglect power (Albaek, 1996).

The analysis of determining the added value of DSMs was done using literature. Practical aspects are not always well considered within the theory and experiences are sometimes derived from documents that promote the method. Therefore, it will be interesting to see how practitioners experience these methods and whether these outcomes agree with the analysis from literature. The following chapter will analyse the usefulness of DSMs considering the experiences from practice.

7 Usefulness of Decision Support Methods in practice

As shown in the previous chapter, DSMs can be of added value in the MIRT exploratory phase. However, the context is expected to be of influence on the success of DSMs in practice. This chapter pays attention to successful use of DSMs in practice. First, this chapter will consider the experiences of practitioners concerning the added value of the DSMs. Second, the outcomes from the validation session are compared with the outcomes of the previous chapter. Third, a hybrid method is proposed while considering the different methods and their characteristics. This section ends with contextual conditions of the process for successful application of DSMs. These conditions are derived from theory and interviews. This will improve successful implementation of DSMs in practice.

7.1 Validation of the added value of Decision Support Methods

In order to improve the usefulness of DSM in practice, this section validates the added value of methods with experts. This validation follows the Best-Worst Method (BWM), constructed by Rezeai (2015). BWM uses relative preferences that require less comparison data. Relative preferences improve the consistency and these structured trade-offs make it easier for the experts to rank and score the criteria and methods. Elaboration of the outcomes can be derived in appendix G. This section will first identify the weights of the criteria. Second, the scores of DSMs are discussed considering the usefulness of DSMs. Table 9 shows the criteria and the DSMs with their abbreviations, which are used within the analyses.

Table 9: Abbreviations of criteria and DSMs

	Criteria			Decision Support Methods (DSMs)
C1.	Improve the analysis of generating alternatives		**M0.**	Existing situation
C2.	Improve insights into the effects		**M1.**	Value Engineering
C3.	Improve incorporation of broad interests		**M2.**	EffectenArena
C4.	Improve communication and cooperation		**M3.**	Adaptive Plan Development
C5.	Improve transparency of the decision		**M4.**	Multi Criteria Decision Analysis
C6.	Improve ability to deal with political influences		**M5.**	Quick and global Cost Benefit Analysis

7.1.1 Identify the weight factors of criteria

The first step is considering the weight factors of the criteria, as some criteria can be considered to be more important than others. Six criteria were proposed and experts were asked to rank the most and least important criterion, considering other criteria. The distribution of the importance of the criteria is shown in figure 12.

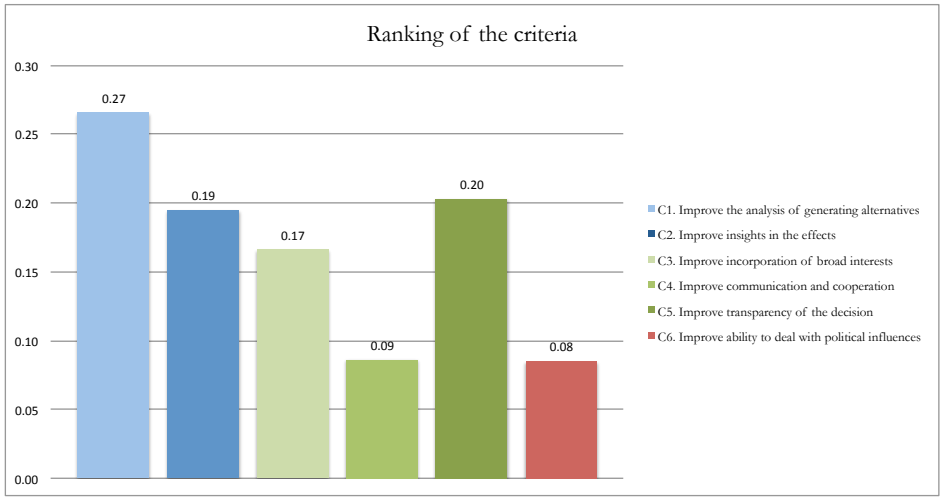


Figure 12: Distribution of the weights of the criteria

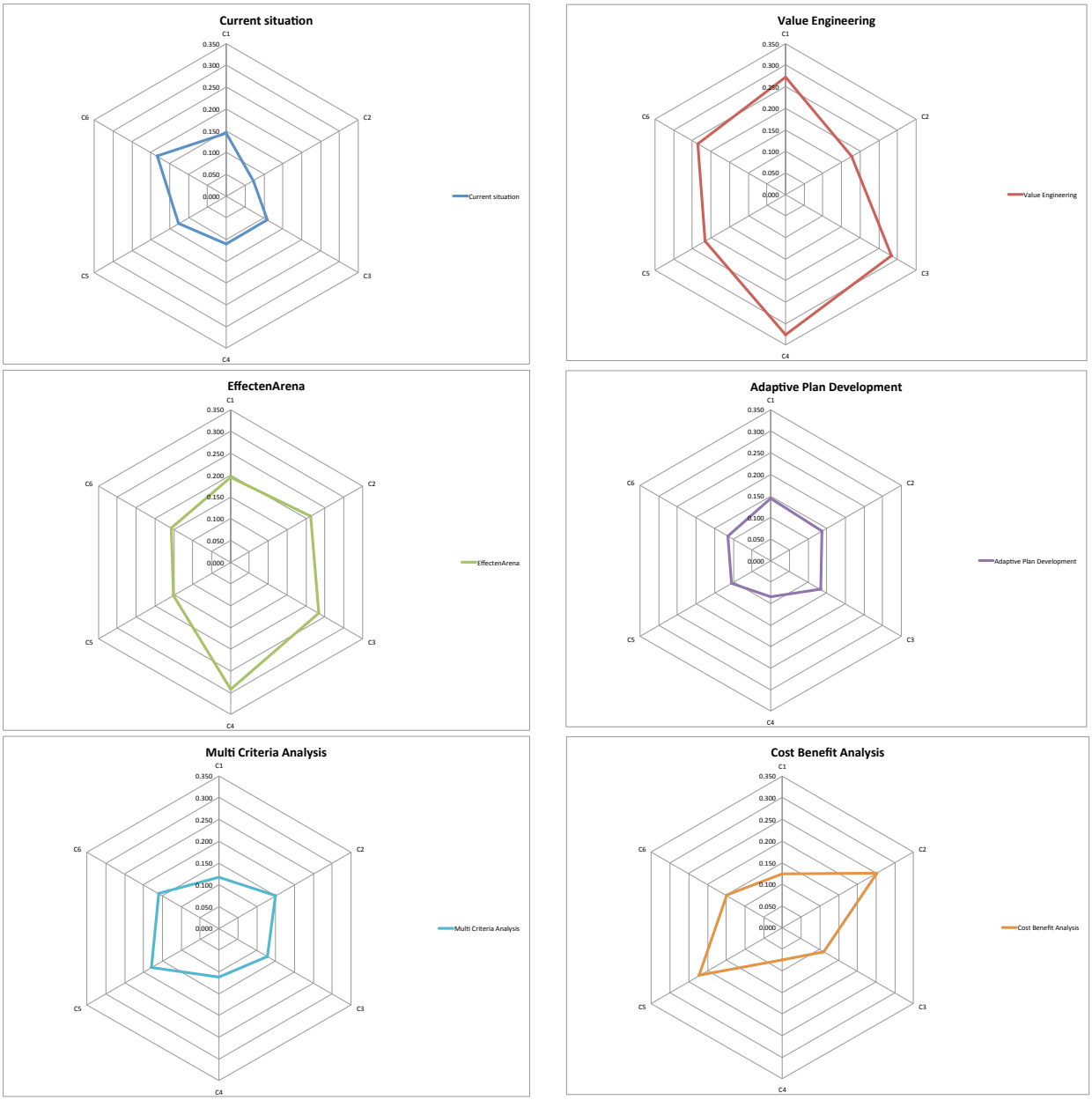
Analysis of generating alternatives is considered to be the most important improvement, followed by an improvement in the transparency of the decision, an improved insight into the effects and incorporation of a broad set of interests. Improvement of communication and coordination and the ability to deal with political influences are considered to be least important. The distribution of the weights shows that the more rational criteria (improve generating project alternatives and improve the insights in the effects) are considered to be more important than the criteria that consider organisational and political elements. There are several aspects that can explain this. First, it can be assigned to the background of the experts, as they use DSMs in a rational way to improve the effectiveness and efficiency of the project outcomes. Second, the criteria with organisational and political elements might be considered as a secondary goal of DSMs. For example, experts note that improvement of communication and cooperation is important, but that this is difficult to achieve with the use of DSMs. The ability to deal with political influences is an ambiguous criterion, where political influences can be considered as both desirable and undesirable. Experts noted that they rather leave this criterion in the middle.

7.1.2 Identify the scores of the methods

The main goal of this validation is to see how experts score the DSMs. It is difficult to state which method is the best method, as this depends on the objective of the use. It is therefore desirable to present the strengths and weaknesses of the DSMs, considering different elements in the decision making process. Figure 13 shows the individual scores of the methods, considering one of the six criteria.

The current situation is often undesirable. Improvements are possible when structurally applying a method. Value Engineering (M1) is considered as a useful method, as it scores well when improving generating alternatives (C1), improving a broad set of interests (C3) and improving cooperation and communication (C4). EffectenArena (M2) is able to consider effects early in the process (C2) and it considers a broad set of interests (C3) by considering the allocation of effects. When doing this together with stakeholders, it is possible to improve cooperation and communication (C4). Adaptive Plan Development (M3) shows low scores on the criteria. Experts noted that they had less knowledge and experience with Adaptive Plan Development, which likely led to a lower score. Multi criteria analysis (M4) is useful when estimating effects early in the process (C2). It also helps to improve the transparency to work towards a decision (C5). However, applying a global Cost Benefit Analysis (M5) early in the process has a positive effect. By adding monetary values, it is possible to gain information concerning the effects (C2) and this improves the transparency of the decision making process (C5).

These outcomes show two trends: a quick and global Cost Benefit Analysis, a Multi Criteria Analysis and the EffectenArena are well applicable when it is desirable to improve the insight into effects or when one wants to improve the transparency to work towards a decision. Value Engineering and EffectenArena are methods when it is desirable to consider and generate a broad set of alternatives. Next to that, these two methods are well applicable for improving cooperation and communication and for improving the incorporation of broad interests.



Legenda

C1.	Improve the analysis of generating alternatives	**M0.**	Existing situation
C2.	Improve insights in the effects	**M1.**	Value Engineering
C3.	Improve incorporation of broad interests	**M2.**	EffectenArena
C4.	Improve communication and cooperation	**M3.**	Adaptive Plan Development
C5.	Improve transparency of the decision	**M4.**	Multi Criteria Decision Analysis
C6.	Improve ability to deal with political influences	**M5.**	Quick and global Cost Benefit Analysis

Figure 13: Overview of the scores of the DSMs

7.1.3 Reliability and conclusion of the outcomes

The reliability of the outcomes are expressed by the consistency of the outcomes. The consistency ratio ξ^* is a value between 0 (fully consistent) and 1 (fully inconsistent). When the value is closer to zero, the more reliable the outcomes are. It is worth noting that the average consistency of the criteria is 0,097, with a maximum of 0,139 and a minimum of 0,054. This shows that the outcomes concerning the criteria are consistent. When considering the scores of the methods, all scores together gives an average consistency of 0,152. This shows that the outcomes concerning the methods are also consistent.

It is important to note that there were some discussions about the survey. First, three experts experienced that the outcomes of the survey agree with the initial thoughts and ideas. Next to that, the BWM fits well with the set up of the validation. However, the survey was considered to be long which led to a decreased focus. As BWM asks for reciprocity, some experts reflected the answers. Next to that, it was sometimes difficult to place the existing situation (M0) into the right context, as it does not contain a clear methodology. However, this existing situation includes the informal trade-off and practical implementation, as it is desirable to consider if methods are an advantage or disadvantage compared to the existing situation. Last, as only nine respondents were considered, extreme scores are of influence in the weights and scores of the criteria and methods. This is also observable in the consistency. This limited number of respondents leads to high impacts of individual scores. For example, when excluding the scores of one respondent, the average consistency increases from 0,152 to 0,112. When considering more respondents, the individual influence on the outcomes will be lower which will lead to more reliable outcomes.

7.2 Comparing the outcomes

After the literature, a validation took place to consider the experiences and ideas of practitioners. This section compares the outcomes from literature with the experiences derived from the respondents. As already noted in the previous chapter, Multi Criteria Decision Analysis, Cost Benefit Analysis and EffectenArena are methods to early identify the effects of the alternatives. At the other hand, Value Engineering, EffectenArena and Adaptive Plan Development identify more project alternatives. From an organisational perspective, Value Engineering and EffectenArena improve incorporation of broad interests and improve the communication and cooperation.

When considering the outcomes from the validation, Value Engineering and EffectenArena are helpful in identifying and generating alternatives. A quick Cost Benefit Analysis helps to identify the effects early in the process. Value Engineering and EffectenArena are applicable when broad interests are considered. Although improvement of communication and cooperation is defined to be least important, Value Engineering shows highest improvements, compared to the other methods. A Cost Benefit Analysis helps to improve the transparency, next to Value Engineering and a Multi Criteria Analysis. All methods score about the same on the ability to deal with political influences. This agrees with the conclusions from the previous chapter, as this criterion is ambiguous and difficult to interpret.

The aim of this comparison is to check and support the previous outcomes. When comparing both analyses, it can be concluded that applying instruments in the MIRT exploratory phase leads to added value. Both analyses show that the current situation is undesirable and improvements are possible. The added values agree with the validation of practitioners. Also the scores on the ability to deal with political influences are consistent. Nevertheless, there are also differences observable. Adaptive Plan Development scores low with practitioners. This is possible, as the method spends little attention on stakeholder involvement and applying broad interests. Next to that, practitioners noted that they had little information and experience with applying this method.

Based on these observations, it would be recommended for future research to further analyse the applicability of the methods (and especially Adaptive Plan Development) in practice. It is not possible to provide a method that covers all these aspects and which is applicable in all situations. Each MIRT exploratory phase is different and requires another focus, either on content or on stakeholder involvement. However, it would be desirable to come up with a process in which the behaviour of stakeholders and use of the methods is considered.

7.3 Combining the methods into a hybrid method

The previous chapter analysed the different characteristics of DSMs. It might be desirable to combine different methods into a hybrid method, to take advantage of the characteristics of DSMs. As shown in figure 14, the first part should be able to consider a broad set of interests (divergence). It should be able to generate a diversity of alternatives from different modalities. In order to do this successfully, it should improve the involvement of stakeholders and it should improve the communication. VE shows to be able to create choices, as it aims to generate project alternatives together with stakeholders. When it is desirable to make choices and consider the effects early in the process (convergence), a quick and global CBA makes it possible to make early decisions for the preferred project alternatives. A MCDA could also provide this. However, a MCDA always includes subjectivity. Next to that, adding monetary values adds the possibility to calculate the expected effects. Since the exploratory phase asks for a broad consideration of interests and a decision for three preferred alternatives, these two types of methods make it possible to consider both functions of DSMs.

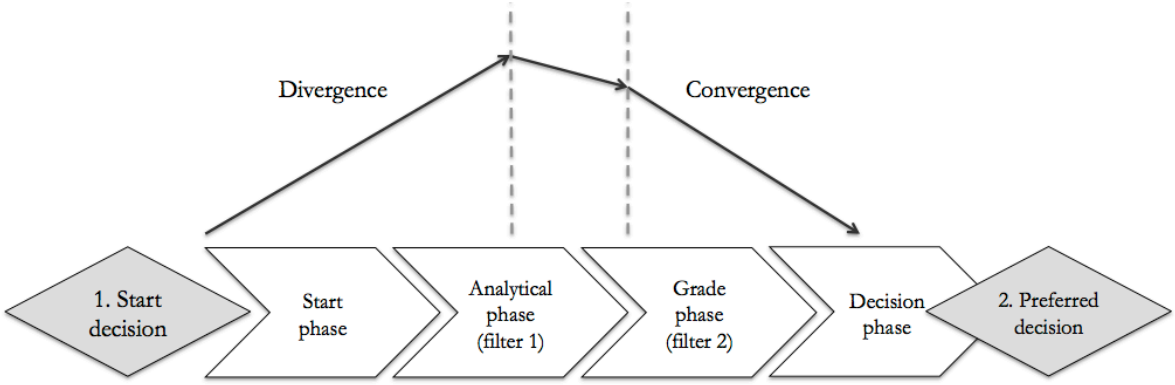


Figure 14: Two functions of the exploratory phase

7.4 Conditions for successful application

It is important to consider the context in which it is desirable to apply the DSMs. Neglecting the context might reduce the added value of DSMs, as they are insufficient to deal with organisational or political influences. Literature shows several recommendations for successful application of DSMs in planning processes. Next to that, the interviewees from the problem analysis and from the case studies gave several comments on the use of DSMs in practice. The perspectives show that the applicability and the success of DSMs are dependent on the perspective. From a rational perspective, Connaughton & Green (1996) state that in order to work towards a successful outcome, decisions have to be made rational. This means that the problem has to be fully understood, decisions are made based on the objectives and options are fully considered. Next to that, decisions have to be made explicit where the effects are known.

From a more organisational perspective, De Bruijn en ten Heuvelhof (2010) identify four critical requirements of a process. First, participants should participate in an open process where different stakeholders can participate in the decision making process. Next to that, they should be able to influence the decision making agenda. Second, it is important to protect the values and interests of the individual parties, as parties commit themselves to the project. Third, it is important to maintain progress in the decision making process, as considering the first two elements might block the decision. Last, as these first three conditions are met, it is necessary to guarantee a certain quality.

These process steps are not observable in the N65 Vught – Haaren case. The interests and values of stakeholders were not well protected. Also the residents were not able to address their preferences and influence the agenda. For the InnovA58 case there were no problems in stakeholder involvement.

Therefore, it was easier to focus on the third and fourth requirements. Following the first requirement of de Bruijn en ten Heuvelhof (2010), DSMs should not be leading in planning process. DSMs often focus on the progress and quality of the process, while neglecting the open process and safeguarding of values and interests.

It is important to consider the experiences of stakeholders concerning DSMs. It is possible that stakeholders will not support DSMs directly or explicitly (they will reject the method) or indirectly and implicitly (they will neglect the outcomes with strategic behaviour). Rather, it is desirable to respect the principles of the method in the decision making process (Monnikhof & Bots, 2000). Also te Brömmelstroet et. al. (2017) addresses stakeholders that are sceptical concerning DSMs. Differences are observable between people that execute these models (high trust and understanding concerning DSMs) and people that work with more strategic tasks (lower trust and understanding concerning DSMs). Thiry (2001) states that the willingness of individuals to work towards a shared solution is important. Also interviewees acknowledge that DSMs can only consider a broad perspective when stakeholders accept the DSMs (interview 16; interview 17). It is therefore important to consider the behaviour and attitudes of individuals when using DSMs.

8 Conclusions and recommendations

This research provided insights into the MIRT exploratory phase and it gave an answer to how DSMs could be of added value in the exploratory process. The N65 Vught – Haaren and the InnovA58 projects were used to analyse the MIRT exploratory phase. These two case studies provided insight into the elements that play an important role within the early planning phase of infrastructural planning. It also showed how different these processes are, despite the fact that they were executed in the same time and were following the same guidelines. This research concluded with assumptions for a successful application of DSMs, as projects never take place in the same context with the same stakeholders. First, this last chapter answers the research questions that were formulated in the first chapter. Second, it will discuss and critically reflect on this research project. Recommendations lead to recommendations for practitioners and recommendations for further scientific research. Last, it will conclude with a personal reflection, where I will reflect on the process of executing this research.

8.1 Answering the main question

The research objective of this research was to improve the practice of spatial planning in the Netherlands. As problems were experienced and as the MIRT is currently still being renewed, this research analyses how DSMs could implement the ambitions of the renewal in the MIRT exploratory phase. This has led to the following research question: '*how can Decision Support Methods add value to the first part of the exploratory phase of the MIRT?*'. Answering this research question contributes to scientific insights into Decision Support Methods and this contributes to an improved definition of added value.

In order to bring theoretical ambitions and practical implementation closer together, several sub-questions were defined.

1. How does the exploratory phase take place?
2. What are current and expected problems in the first part of the exploratory phase of the MIRT?
3. How are Decision Support Methods currently applied in the exploratory phase?
4. What is the current added value of Decision Support Methods in the MIRT exploratory phase?
5. Which methods can be of added value in the exploratory phase?
6. In what context can Decision Support Methods be of added value for the exploratory phase?

Currently, there is no uniform way in which an exploratory phase takes place. The N65 Vught – Haaren and the InnovA58 cases show different experiences with the exploratory phase. The N65 Vught – Haaren case show that stakeholders have a high influence on the process. The political cause and the spatial characteristics of the project lead to a misfit in the rationality of the guidelines. The InnovA58 case follows the guidelines well. The preferred alternative shows a significant improvement in the accessibility problems and organisations had the same interests. The two innovative workflows were difficult incorporate and were therefore not considered in the exploratory phase.

These differences in exploratory phases are also observable in the use of DSMs. Both cases apply Cost Benefit Analysis and Value Engineering. The N65 Vught – Haaren case uses these methods to improve and adjust promising project alternatives. On the other side, the InnovA58 case shows that DSMs are rather used to incorporate stakeholders and to confirm the usefulness of the preferred alternatives. Since the preferred alternative is already promising, it is not necessary to objectify the promising alternative.

Experiences from practice show that stakeholder attitudes, initial wishes and availability of money, political influences, habits and uncertainties are important for the success of the decision making process. Previous trends such as the background of the MIT and the recommendations from Elverding makes it

difficult to apply a broad scope where all interests are considered. These factors should be considered when applying DSMs in the exploratory phase.

DSMs can be of added value in several ways. From a rational perspective, DSMs can provide more insights into the effects of the project alternatives. This makes it possible to improve the process and to improve the process outcomes (an improved project alternative, an improved project prioritisation and an improved comparison of alternatives). Added value from an organisational perspective shows that it can improve cooperation and communication. Organisations have a better understanding in mutual objectives and interests, which might lead to consensus. Next to that, involvement of other organisations increases the accessibility of information, which makes the decision more transparent. Last, DSMs can also add value for political use. DSMs can increase the support of personal preferences or political interests.

Value Engineering, EffectenArena, Adaptive Plan Development, Multi Criteria Decision Analysis and a quick and global Cost Benefit Analysis were considered to be of added value in the MIRT exploratory phase. However, none of these methods is promising in improving all the criteria. Value Engineering and EffectenArena are useful methods to improve cooperation and communication and improve the incorporation of broad interests. A quick and global Cost Benefit Analysis, Multi Criteria Decision Analysis and EffectenArena are applicable when it is desirable to improve the insight into effects or when one wants to improve the transparency to work towards a decision.

Considering the applicability of the DSMs, the experiences of experts who use DSMs in daily practice agree with the insights from literature. Future research is necessary to analyse the applicability of the methods, as the experiences concerning the applicability differed per expert. These outcomes also show that there is not a method that is applicable for all criteria and in all situations. DSMs can only partly realise these improvements, as organisations and individuals should support the method and should participate in an open process where their values and interests are protected. The two case studies show that the exploratory phase and DSMs in particular do not always safeguard these aspects.

Answering the main question, DSMs are of added value within the exploratory phase of the MIRT. Some DSMs can also play a significant role within the renewal of the MIRT, as they are able to consider a broad set of interests. Another desire from the renewal of the MIRT is applying a custom approach. In line with this, a DSM should not be considered as a silver bullet. The DSMs should be adjusted to the process in which they are applied. In this situation it might be more important to consider the main objective of the outcome, the attitudes of the stakeholders who participate and the political environment, instead of perfect elaboration of the method. This shows a dilemma between uniformity (of the guidelines) and a custom approach (incorporate influences from organisations and politics). The experiences from this research show that it is difficult to deal with this dilemma. The exploratory phase should find the right balance between these two extremes.

8.2 Recommendations for practice

This research is based on practical experiences, which lead to several practical recommendations. I formulated five recommendations for improving the MIRT exploratory phase. This paragraph will elaborate on these recommendations. As the renewal of the MIRT is currently on going, I found interesting elements that I could not discuss due to limited available time, but are worth noting for possible further research.

As stated before, DSMs are not a silver bullet in the planning process. This means that it is impossible to come up with a uniform and prescribed process design as each project, and thus process, is different. It is

therefore recommended to match the characteristics of the DSMs with the situation in the DSM is applied. In order to deal with this, awareness should be raised within project organisations. Besides, applying the method should not be a goal in itself. One should be aware of the overarching objective when using the DSMs as a mean. In order to have people on board and bring the project to a success, it might be desirable to satisfy the principles of the methods.

The second recommendation is to step out of the familiar perspective and consider the three lenses together, to get a well founded and complete view of the problems that exist within the exploratory process. Considering the people I have talked to and the documents I have read, I feel that a majority of the people working in the MIRT exploratory phase are captured within their own perspective. Taking these perspectives together, it is possible to prioritise one perspective over the other. This is important, as this research also shows the contradictions between the perspectives: although Value Engineering and Cost Benefit Analysis are currently being applied in practice, there are characteristics and circumstances in the context from a organisational and political perspective that one has to consider in order to apply these methods properly.

Third, the process of identifying and generating project alternatives needs to be improved. The renewal of the MIRT aims to incorporating broad interests and additional modalities, which puts extra attention to this phase. Currently, this phase differs per exploratory phase. It is therefore desirable to structure this process or provide means to do so. Generating and identifying project alternatives is considered to be obvious for the project organisation, while those steps are not always straightforward. Practice shows that there is a gap between what should happen (broad exploration) and what is currently happening (narrow scope). In order to improve this broad exploration of alternatives, it is necessary to share experiences and thoughts on how to steer this process towards a broad perspective. It is recommended to organise events to discuss how to improve stakeholder involvement and expectation management.

A fourth recommendation is to accept the differences between organisations and make sure that expectations are managed. Interviewees acknowledge that organisations should be involved in the process. Their influence should increase in the agenda setting and it is important to share personal interests and values. On the other hand, it is important to manage the expectations of stakeholders properly. As the renewal of the MIRT will contain a broad perspective, the trade off between modalities and interests will become difficult and politically driven. This requires attention from policy makers, to acknowledge that there will always be differences in interests and preferences.

Fifth, it is important to look forward and consider how new elements, such as changes in financing structures and Adaptive Plan Development will be of influence on the process. It is especially important to consider how this will affect the behaviour of stakeholders and how uncertainties will affect the continuation of the projects. It is recommended to consider how participation fits within this method and how this method will affect stakeholders, as it identifies uncertainties and it aims to postpone the long-term decision as much as possible. It is also important to see how the MIRT initiative will continue to the MIRT exploratory phase. There are no rules for the MIRT initiative, which might lead to difficulties in transiting it into the MIRT exploratory phase, where the process is captured within guidelines. It is recommended to analyse cases that currently apply aspects from the renewal of the MIRT. It would be beneficial to consider the changes in the cases, compared to the previous or 'old' MIRT projects. This makes it possible to come up with opportunities or improvements for the renewed MIRT, comparing both situations.

8.3 Recommendations for scientific research

Although this research focuses on practical experiences, there are also scientific insights that lead to recommendations for future research. This paragraph will elaborate on the challenges for future research from a scientific point of view.

Little information was available concerning DSMs. Although much is written about PSS, DSS, MCDA and CBA, little information was available concerning the smaller, but more practical methods. Next to that, there is little information available concerning the international experiences of using such DSMs. Again, much is written about the use and experiences of MCDA and CBA, but little information is available about the experiences of other methods in spatial-infrastructural planning. It would be interesting to see how other countries apply DSMs.

The next recommendation follows this observation. There is little information available about the diverging function of DSMs. Although research acknowledges the importance of a broad set of alternatives, next to Value Engineering, there are few creative methods available to work towards a broad set of alternatives. It is interesting to consider other domains with projects characterised with high costs and long term planning in which creative techniques are applied. This increases the knowledge concerning the added value of DSMs in the spatial-infrastructural planning.

For future research, it would be desirable to see how stakeholders and their expectations can be well managed. This might be useful and beneficial in practice, as the goals from the renewal of the MIRT require another focus within the process. It would be interesting to analyse the incentives behind the budget allocation and see how this affects the behaviour of stakeholders. Preferably, this results in a process design, which is able to deal with the involvement of stakeholders' interests. I tried to give a small start by using de Bruijn en ten Heuvelhof's(2010) four requirements of a successful process design.

8.4 Discussion and reflection on the research

As one of the interviewees noticed in the interview: "I am very curious how you will structure all this information into a thesis". It was difficult to stick to the two case studies, as interviewees added elements that they consider important within the MIRT exploratory phase, but fell outside the scope of this research. The semi-structured approach of the interview questions was beneficial, as it helped the interviewees to state what they considered to be important. At the other hand, the outcomes of the interviews differed from each other as some interviewees focussed on the technical and objective elements, while others were very open about the political practice and the process of working towards a decision. Next to that, some interviewees focused on the case studies, while others took the opportunity to talk about other experiences as well. Last, it was difficult to get information about the InnovA58 case. The interviewees often focussed on the innovative tracks, instead of on the exploratory phase because there were no problems considered in the exploratory phase of the InnovA58.

The characteristics of the cases I analysed influence the conclusions. It is likely that other cases would have led to different outcomes. It is therefore preferable to test the outcomes by analysing other cases. In this thesis, I have only considered cases from the mobility domain. It would be interesting to also consider projects from the water and spatial domain, as these projects have different characteristics. Next to that, the political cause and local impact played an important role within these two projects. Next to that, the two cases that ended in 2016 were a slightly behind on the current developments that are taking place concerning the renewal of the MIRT. Considering on-going MIRT exploratory phases, where aspects of the renewal are implemented, could have prevented this. It would have been possible to consider a question in the interviews to ask the interviewees how this exploratory phase would have been

different if the trends of the renewal of the MIRT were considered in their project. However, it is difficult to analyse on-going cases, as there is no outcome or decision made yet. Adding to that, I have decided to focus on the exploratory phase, while many changes are currently applied within the MIRT initiative. This scope demarcation was necessary for this research to structure it, but might decrease the usefulness of the outcomes, as changes in the MIRT initiative also lead to changes in the exploratory phase. Next to that, I tried to use as much literature during my research as possible. Unfortunately, the newest guidelines will be published in spring and it is not possible to add this within my research. Considering the available information, this research is therefore mainly based on the previous situation. This shows limitations in its added value. Nevertheless, I believe that these insights in the current or previous situation provide a necessary basis, before it is possible to state recommendations for the future.

Pure support systems such as a DSS or the PSS's mapping table to generate alternatives are not considered. The selection of decision methods was based on the desires of the supervisors and these (promising) methods were not considered. It would have been desirable to have a better focus on what the DSM should do: divergence or convergence. This research analyses DSM with both characteristics. It was difficult to change this and consider only one function, as the supervisors already showed their desires to include these methods that fulfil both functions. Next to that, it might have been beneficial to include the *Omgevingswijzer* and other methods.

In order to validate the experiences of experts with DSMs, I validated this research with the BWM. Although this method was useful in doing so, it also caused some discussions. Experts found it difficult to understand the questions, which led to some ambiguity in their answers. Ambiguity was also caused as some experts score extreme than others. Additionally, it was difficult to activate experts to fill in all the pages and fully understand the DSMs and the questions. This validation step came at the very end of this research, which led to limited time to prevent these drawbacks. For future research, I would recommend to take time explaining the questions and also be active in supporting the experts for filling in the survey. Next to that, the number of respondents was low. The outcomes of the survey should rather be considered as an indication, than as a solid conclusion. Validating these outcomes and optimising the BWM and corresponding survey would be another thesis in itself.

Despite these points of improvements, I think this research has given an in depth and refreshing perspective on the current MIRT and the objectives of the renewal of the MIRT. The five recommendations are of use for practitioners within the MIRT exploratory phase, as it contributes to improving the MIRT exploratory phase. I believe that my experiences and outcomes are helpful in providing a mirror for practitioners and that this provides arguments to shift the focus from project to process. Next to that, this research adds knowledge on a scientific level. The theoretic framework connects the three perspectives to a practical implementation, which improves the assumptions and the applicability of the three perspectives. Next to that, only the added value of DSS, PSS and CBA was available within literature. This research provides an additional contribution to added value, as it considers the added value within the decision making process (considering diverging and converging together) rather than the added value of the instruments themselves.

This thesis is a typical SEPAM project. Methods are often applied in a technical manner and rely on a hard systems thinking. This research shows that practice shows that the situation is often more complex. The three perspectives help to define the behaviour of stakeholders. This shows that the decision making process in practice is never straightforward. Next to that, I applied two different methods. First, I used interviews to express the concerns and experiences of the people involved in the two projects. Second, I used BWM to support the outcomes quantitatively to discuss the outcomes from the validation. I believe that using a combination of these research methods give a good example for a SEPAM thesis project.

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Appendix A: Comparison of the guidelines

Table 10: Comparison of the 2011 and 2016 guidelines

	Guidelines 2011	**Guidelines 2016**
MIRT process	Incorporates the exploratory phase, plan elaboration phase and realisation phase	Incorporates the area agenda, program approach, initiative, exploratory phase, plan elaboration phase and realisation phase. This helps to define the strategic agreements and set priorities for programs and projects
Structure of the guidelines	Four decision moments are further defined, with a description of the three phases that contribute to or are the result of the decision moments	The first part defines the process and involved parties in five phases (including area agenda and initiative phase). The second part defines legal requirements based on the decision moments
Goal of the guidelines	Describe the decision making requirements from the government that result in a decision about the financial contribution	Describe the policy making process and the methods, roles and tasks of parties and describe the decision making requirements from the government that result in a decision about the financial contribution
Desired outcome of the guidelines	Aims to realise more coherent investments of connected projects and programs in the spatial domain: mobility, residential areas, businesses, environment, nature and water	Aims to tackle challenges. Arrange agreements based on dialogues between public/private and national/regional parties to create integral and sustainable solutions
Goal of the initiative phase	Analyse and set the scope of challenges that are not yet specific or specify the scope of regional development projects	Identify the challenges, scope and stakeholders of challenges, bottlenecks or national themes
Execution of the initiative phase	Has to meet the principles from Elverding	Use a broad perspective to analyse challenges on a short and long-term. It depends on the initiative whether to execute a first estimation of costs and benefits
Goal of the exploratory phase	Work from many alternatives towards one resilient and preferred alternative, considering the necessity of the potential alternative. Decide on the financial involvement of the government and the execution of (parts of) the alternative	Work towards a smart, sustainable and climate resilient alternative. This is based on a thorough problem analysis and broad analysis of the challenge, where the trade-off between alternatives is made comprehensible
Execution of the exploratory phase	Analyse a broad set of project alternatives and work towards a preferred alternative, using CBA	Analyse a broad set of project alternatives and work towards a preferred alternative, using CBA. One non-infrastructural method is considered
Selection process	Define and set a clear scope the project. Funnel from many alternatives to one robust preferred alternative	Broad orientation of challenges, identify their relevance on the short and long-term, using *omgevingswijzer* or Value Engineering. Funnel towards an alternative that creates room to adapt to new developments and maintain flexibility

Appendix B: Interview preparation problem analysis

Gespreksleidraad

Datum: **[date]**
Aanwezig: **[name]** en Fransje Oudshoorn
Locatie: **[location]**

Beste **[name]**,

Hierbij stuur ik u de gespreksleidraad toe. Graag zou ik deze punten willen bespreken tijdens ons gesprek wat betreft het gebruik van afweegmethoden in de verkenningsfase van het MIRT. Dit gesprek zou ik graag mee nemen in het opstellen van de probleemanalyse van mijn afstudeerproject. Mochten er onderdelen missen of onderwerpen zijn die mogelijk interessant zijn voor mijn onderzoek, dan hoor ik dit graag.

Te bespreken onderwerpen:

Inleiding

- Wat is uw achtergrond?
- Korte toelichting doel onderzoek en doel interview
- Wat is uw ervaring met de verkenningsfase van het MIRT en het gebruik van KBA?

Verkenningsfase

- Hoe sluit het MIRT onderzoek aan op de MIRT verkenning?
- Hoe wordt er op dit moment in de verkenningsfase naar een top drie alternatieven toegewerkt?
    - Hoe worden verschillende alternatieven gegenereerd (divergeren)?
    - Hoe wordt een top drie van alternatieven gevormd (convergeren)?
- Spelen er problemen binnen dit onderdeel van de verkenningsfase?
- Welke kansen en verbetermogelijkheden ziet u?
- Wat zou dit moeten verbeteren, rekening houdend met de vernieuwing van het MIRT?

KBA in de verkenningsfase

- Volgt de KBA logisch op het eerste deel van de verkenningsfase?
- Zou het mogelijk zijn om de 'nadelen' van de KBA mee te nemen en op te lossen in de voorafgaande fase?
- Welke afweegmethoden worden in de verkenningsfase gebruikt, naast KBA?

Vervolg

- Wie zou ik verder kunnen spreken om de verkenningsfase beter in kaart te brengen?
- Wenst u op de hoogte gehouden te worden van de resultaten van mijn onderzoek?

Appendix C: Interview preparation case studies

Gespreksleidraad

Datum: **[date]**
Aanwezig: **[name]** en Fransje Oudshoorn
Locatie: **[location]**

Beste **[name]**,

Hierbij stuur ik u de gespreksleidraad toe. Graag zou ik de volgende punten willen bespreken tijdens ons gesprek wat betreft het afwegen van alternatieven in de verkenningsfase van het MIRT. Dit gesprek zou ik graag mee nemen in het analyseren van de **[case study]** in mijn afstudeerproject. Mochten er onderdelen missen of onderwerpen zijn die mogelijk interessant zijn voor mijn onderzoek, dan hoor ik dit graag.

Te bespreken onderwerpen:

Kennismaking en inleiding (incl. doel onderzoek en doel interview)

Aanleiding

- Wat was de aanleiding voor de MIRT verkenning **[case study]**?
- Hoe is de scope van de MIRT verkenning vastgesteld?
- In welke mate komt de integrale gebiedsaanpak terug in de verkenning?
- Heeft de vernieuwing van het MIRT invloed gehad op de verkenningsfase van de **[case study]**?

Verkenningsfase

- In welke mate is er gebruik gemaakt van de spelregels en handreiking?
- Hoe zijn de oplossingsrichtingen en alternatieven tot stand gekomen?
- Wat was de rol van de gemeente Haaren in het verkenningsproces

Projectorganisatie

- Welke partijen waren betrokken bij de verkenningsfase?
- Welke doelen en belangen hadden deze partijen?
- Welke groepen zijn er gevormd en welke overleggen vonden plaats?
- Hoe hebben de belangen van de verschillende partijen in het proces meegespeeld?

Vervolg

- Gebruik van de informatie
- Wie zou ik verder kunnen spreken om de verkenningsfase van de **[case study]** beter in kaart te brengen?
- Wenst u op de hoogte gehouden te worden van de resultaten van mijn onderzoek?

Appendix D: Survey to validate the methods

	M0. Existing situation	**M1. Value Engineering**	**M2. Effecten Arena**	**M3. Adaptive Plan Development**	**M4. Multi Criteria Decision Analysis**	**M5. Cost Benefit Analysis**
C1. Improve the analysis of generating alternatives						
C2. Improve insights in the effects						
C3. Improve incorporation of broad interests						
C4. Improve communication and cooperation						
C5. Improve transparency of the decision						
C6. Improve ability to deal with political influences						

Om de bovenstaande tabel gestructureerd in te vullen, zou ik graag de 'Best-Worst Method' toe willen passen. Aan de hand van jullie antwoorden kan ik dan de gewichten van de criteria en de scores op de methodes bepalen. De 'Best-Worst Method' het heeft als doel om tot een gebalanceerde afweging te komen. Deze methode heeft als voordeel dat je de opties met elkaar vergelijkt. Hierdoor is er minder discussie over de schalen waarop deze keuze is gebaseerd (bijvoorbeeld: waarom is iets ++ in plaats van +?) en dit leidt tot meer consistentie in de uitkomsten.

De manier van afwegen met de Best-Worst Method passen we twee keer toe:
1. Om de weegfactoren van de criteria te bepalen
2. Om de scores van de methodes op de criteria te bepalen (dit doen we per criterium).

De Best-Worst Method vraagt iedere keer om twee keuzes:
1. Wat vind ik de beste optie? En hoe veel keer vind ik deze optie beter dan de andere opties?
2. Wat vind ik de slechtste optie? En hoe veel keer vind ik deze optie slechter dan de andere opties?

Jullie hoeven de tabel niet in te vullen. Jullie antwoorden op onderstaande vragen geven mij de informatie om de tabel in te vullen. Ik begrijp dat het redelijk wat stappen bevat, maar deze structuur biedt een kwantitatieve onderbouwing wat betreft het scoren van de methodes. Het zal in het begin een beetje lastig zijn, maar het zal later een stuk gemakkelijker gaan, omdat je iedere keer dezelfde afweging maakt. Mocht het onverhoopt toch niet lukken, dan hoor ik graag van jullie. Mochten jullie meer informatie willen krijgen over de methode, dan kan je www.bestworstmethod.com raadplegen.

Bepalen weegfactoren van de criteria
De criteria staan in de meest linker kolom en zijn in paragraaf 1 verder uitgelegd. Desalniettemin zijn sommige criteria belangrijker dan andere, daarom is het waardevol om de weegfactoren van de criteria te bepalen. Het toekennen van de weegfactoren bevat enkele stappen. De vragen zijn onderstreept. Graag zou ik jullie willen vragen om de antwoorden in de tabel in te vullen. Om jullie op weg te helpen staat er een voorbeeld in het grijze vlak.
Voor de stap waarin je aangeeft hoeveel je de beste optie beter vindt of de slechtste optie slechter vindt dan de andere opties gebruiken we een negen punts schaal. Deze schaal voor het afwegen van de criteria verschilt iets van de schaal voor het vergelijken van de methodes. Voor het afwegen van de criteria geldt:

1 even belangrijk
3 iets meer belangrijk
5 substantieel meer belangrijk
7 veel meer belangrijk
9 heel veel meer belangrijk

De waardes 2, 4, 6 en 8 zitten hier tussenin.

Stel je voor dat je het proces van de verkenningsfase van het MIRT wil verbeteren. De volgende criteria zijn geselecteerd omdat ze mogelijk de verkenningsfase kunnen verbeteren: **C1** het verbeteren van genereren van project alternatieven, **C2** het beter meenemen van effecten, **C3** het beter meenemen van brede belangen, **C4** het verbeteren van samenwerking en communicatie, **C5** vergroten van transparantie van het besluit en **C6** het beter omgaan met politieke invloeden.

1. Wat vind je het meest belangrijke criterium?

Meest belangrijk:	C1	C2	C3	C4	C5	C6
<invullen>	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**

2. Hoe veel belangrijker vind je dit criterium ten opzichte van de andere criteria?

Schrijf het meest belangrijke criterium in het grijze hokje. Vergelijk het meest belangrijke criterium met de rest van de criteria. Dit doe je op basis van het toekennen van de cijfers 1 tot 9. Een 1 geeft aan dat je het belangrijkste criterium even belangrijk vindt als bovenstaand criterium. Een 9 geeft aan dat je het belangrijkste criterium heel veel meer belangrijker vindt dan bovenstaand criterium. De punten hier tussenin staan boven in de uitleg. Let op dat je bij het belangrijkste criterium een 1 invult.

3. Toelichting

Voorbeeld:

Meest belangrijk:	C1	C2	C3	C4	C5	C6
C2	4	1	9	3	7	3

Ik vind criterium C2 (het beter meenemen van effecten) het meest belangrijk. En ik vind C2 (het beter meenemen van effecten) iets/substantieel belangrijker dan C1 (het verbeteren van het genereren van projectalternatieven). En ik vind C2 (het beter meenemen van effecten) heel veel belangrijker dan C3 (het beter meenemen van brede belangen). En ik vind C2 (het beter meenemen van effecten) iets belangrijker dan C4 (het verbeteren van de samenwerking en communicatie). Enzovoort. Let op dat je bij het belangrijkste criterium een 1 invult.

1. Wat vind je het minst belangrijke criterium?

Minst belangrijk:	**<invullen>**
C1	**<invullen>**
C2	**<invullen>**
C3	**<invullen>**
C4	**<invullen>**
C5	**<invullen>**
C6	**<invullen>**

2. Hoe veel minder belangrijk vind je dit criterium, ten opzichte van de andere criteria?

Schrijf het minst belangrijke criterium in het grijze hokje. Vergelijk het minst belangrijke criterium met de rest van de criteria. Dit doe je op basis van het toekennen van de cijfers 1 tot 9. Een 1 geeft aan dat je het minst belangrijkste criterium even belangrijk vindt als het linker criterium. Het toekennen van een 9 geeft aan dat je het minst belangrijkste criterium heel veel minder belangrijk vindt dan het linker criterium. De punten hier tussenin staan boven in de uitleg. Let op dat je bij het minst belangrijkste criterium een 1 invult.

3. Toelichting

Voorbeeld:

Minst belangrijk:	C3
C1	2
C2	9
C3	1
C4	4
C5	4
C6	3

Ik vind criterium C3 (het beter meenemen van brede belangen) het minst belangrijk. En ik vind C3 (het beter meenemen van brede belangen) hetzelfde/iets minder belangrijk dan C1 (het verbeteren van het genereren van projectalternatieven). En ik vind C3 (het beter meenemen van brede belangen) heel veel minder belangrijk dan C2 (het beter meenemen van effecten). Enzovoort. Let op dat je bij het minst belangrijke criterium een 1 invult.

Bepalen van scores van methoden op de criteria
De volgende stap is het scoren van de methoden op basis van de criteria. Hierbij stel je per criterium vast welke methode het beste scoort en welke methode het slechtst scoort. Ook hierbij vergelijk je de best scorende methode en de slechtst scorende methode met de andere methodes op dat specifieke criterium. Omdat er zes criteria zijn, zal deze stap zes keer gemaakt moeten worden.

Voor de tweede stap gebruiken we dezelfde negenpuntsschaal als hiervoor. De denk stap is hetzelfde, waarin je aangeeft hoeveel je de beste methode beter vindt of de slechtste methode slechter vindt dan de andere opties, waarbij:

1	even goed
3	iets beter
5	substantieel beter
7	veel beter
9	heel beter

De waardes 2, 4, 6 en 8 zitten hier tussenin.

De volgende methodes nemen we mee om het MIRT verkenningsproces te verbeteren. **M0** de huidige situatie, **M1** Value Engineering, **M2** EffectenArena, **M3** Adaptieve planvorming, **M4** Multi criteria analyse, **M5** Snelle en globale kosten baten analyse.

1.1. Wat is de beste methode om het analyseren en genereren van alternatieven (C1) te verbeteren?

Beste methode:	M0	M1	M2	M3	M4	M5
<invullen>	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**

En hoe veel beter vind je deze methode om het analyseren en genereren van alternatieven te verbeteren, ten opzichte van de andere methodes?

Toelichting

1.2. Wat is de slechtste methode om het analyseren en genereren van alternatieven (C1) te verbeteren?

Slechtste methode:	**<invullen>**
M0	**<invullen>**
M1	**<invullen>**
M2	**<invullen>**
M3	**<invullen>**
M4	**<invullen>**
M5	**<invullen>**

En hoe veel slechter vind je deze methode om het analyseren en genereren van alternatieven te verbeteren, ten opzichte van de andere methodes?

Toelichting

2.1. Wat is de beste methode om het inzichtelijk maken van de effecten (C2) te verbeteren?

Beste methode:	M0	M1	M2	M3	M4	M5
<invullen>	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**

En hoe veel beter vind je deze methode om het inzichtelijk maken van de effecten te verbeteren, ten opzichte van de andere methodes?

Toelichting

2.2. Wat is de slechtste methode om het inzichtelijk maken van de effecten (C2) te verbeteren?

Slechtste methode:	**<invullen>**
M0	**<invullen>**
M1	**<invullen>**
M2	**<invullen>**
M3	**<invullen>**
M4	**<invullen>**
M5	**<invullen>**

En hoe veel slechter vind je deze methode om het inzichtelijk maken van de effecten te verbeteren, ten opzichte van de andere methodes?

Toelichting

3.1. Wat is de beste methode om brede belangen mee te nemen (C3)?

Beste methode:	M0	M1	M2	M3	M4	M5
<invullen>	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**

En hoe veel beter vind je deze methode om brede belangen mee te nemen, ten opzichte van de andere methodes?

Toelichting

3.2. Wat is de slechtste methode om brede belangen mee te nemen (C3)?

Slechtste methode:	**<invullen>**
M0	**<invullen>**
M1	**<invullen>**
M2	**<invullen>**
M3	**<invullen>**
M4	**<invullen>**
M5	**<invullen>**

En hoe veel slechter vind je deze methode om brede belangen mee te nemen, ten opzichte van de andere methodes?

Toelichting

4.1. Wat is de beste methode om samenwerking en communicatie (C4) te verbeteren?

Beste methode:	M0	M1	M2	M3	M4	M5
<invullen>	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**

En hoe veel beter vind je deze methode om samenwerking en communicatie te verbeteren, ten opzichte van de andere methodes?

Toelichting

4.2. Wat is de slechtste methode om samenwerking en communicatie (C4) te verbeteren?

Slechtste methode:	**<invullen>**
M0	**<invullen>**
M1	**<invullen>**
M2	**<invullen>**
M3	**<invullen>**
M4	**<invullen>**
M5	**<invullen>**

En hoe veel slechter vind je deze methode om samenwerking en communicatie te verbeteren, ten opzichte van de andere methodes?

Toelichting

5.1. Wat is de beste methode om de transparantie van de besluitvorming (C5) te verbeteren?

Beste methode:	M0	M1	M2	M3	M4	M5
<invullen>	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**

En hoe veel beter vind je deze methode om transparantie van de besluitvorming te verbeteren, ten opzichte van de andere methodes?

Toelichting

5.2. Wat is de slechtste methode om de transparantie van de besluitvorming (C5) te verbeteren?

Slechtste methode:	**<invullen>**
M0	**<invullen>**
M1	**<invullen>**
M2	**<invullen>**
M3	**<invullen>**
M4	**<invullen>**
M5	**<invullen>**

En hoe veel slechter vind je deze methode om transparantie van de besluitvorming te verbeteren, ten opzichte van de andere methodes?

Toelichting

6.1. Wat is de beste methode om om te gaan met politieke invloeden (C6)?

Beste methode:	M0	M1	M2	M3	M4	M5
<invullen>	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**	**<invullen>**

En hoe veel beter vind je deze methode om om te gaan met politieke invloeden, ten opzichte van de andere methodes?

Toelichting

6.2. Wat is de slechtste methode om om te gaan met politieke invloeden (C6)?

Slechtste methode:	**<invullen>**
M0	**<invullen>**
M1	**<invullen>**
M2	**<invullen>**
M3	**<invullen>**
M4	**<invullen>**
M5	**<invullen>**

En hoe veel slechter vind je deze methode om om te gaan met politieke invloeden, ten opzichte van de andere methodes?

Toelichting

Appendix E: List of the interviewees

Three interview sets take place, respectively for the problem analysis, to identify the MIRT exploratory phase with two case studies and lastly, surveys to validate the added value of the methods.

Table 11: Interviewees problem analysis

Name	Date	Position
Clement Jager	28 September 2016, 10:00 – 11:00	Ministerie van Infrastructuur en Milieu, policy maker
Hans de Vries	28 September 2016, 14:30 – 15:30	Rijkswaterstaat, consultant
Luc de Vries	29 September 2016, 13:00 – 14:00	Ministerie van Infrastructuur en Milieu, project manager
Maarten van Dongen	30 September 2016, 16:00 – 17:00	Witteveen+Bos, ex consultant
Thomas Straatemeier	21 October 2016, 15:00 – 16:00	GoudappelCoffeng, consultant

Table 12: Interviewees case studies

Name	Date	Position	Interview report
Marijke Dirkson	19 December 2016, 9:30 – 10:30	Ministerie van Infrastructuur en Milieu, project manager, N65	Interview 6
Jonneke van Keep	19 December 2016, 10:30 – 11:30	Ministerie van Infrastructuur en Milieu, authorized supervisor, N65	Interview 7
Steven Voest	20 December 2016, 10:00 – 11:00	Ministerie van Infrastructuur en Milieu, project manager, Corridorstudie Hoorn Amsterdam	Interview 8
Tom van Tilborg	21 December 2016, 14:00 – 15:00	Ministerie van Infrastructuur en Milieu, project manager, InnovA58	Interview 9
Marco Bakermans	13 January 2017, 10:00 – 11:00	Rijkswaterstaat, environment manager, InnovA58	Interview 10
Bas Hoogeboom	17 January 2017, 14:00 – 15:00	Ministerie van Infrastructuur en Milieu, authorized supervisor, InnovA58	Interview 11
Janny van der Heijden	19 January 2017, 13:00 – 14:00	Province of Noord-Brabant, representative of the province, N65 and the InnovA58	Interview 12
-	19 January 2017, 16:00 – 17:00	Municipality of Haaren, representative of the municipality, N65	Interview 13
Astrid van 't Hof and René Papavoine	26 January 2017, 10:00 – 11:30	Municipality of Vught, representatives of the municipality, N65	Interview 14
Ad Verhoeven	26 January 2017, 13:00 – 14:00	Foundation (Stichting) A58, representative of the businesses, InnovA58	Interview 15
Tim Artz	1 February 2017, 12:00 – 13:00	Antea Group, consultant for the exploratory phase of the N65	Interview 16
Niek Albers	7 February 2017, 9:00 – 10:00	Infram, consultant for the exploratory phase of the InnovA58	Interview 17

Table 13: Respondents of the survey

Survey	Position	Survey type
1	Rijkswaterstaat, consultant	Criteria + Methods
2	Ganto, consultant	Criteria + Methods
3	Rijkswaterstaat, consultant	Criteria + Methods
4	Rijkswaterstaat, consultant	Criteria
5	Witteveen+Bos, consultant	Criteria + Methods
6	Rijkswaterstaat, consultant	Criteria + Methods
7	Ministry of I&E, project secretary	Criteria + Methods
8	ProRail	Criteria + Methods
9	Rijkswaterstaat, consultant	Criteria + Methods

Appendix F: Interview reports

Report of interview 6

Name: Marijke Dirkson
Organisation: Ministry of I&E
Position: Project manager DG Bereikbaarheid
Date: Monday December 19, 2016, 9:30 – 10:30 h
Subject: MIRT exploratory phase N65 Vught - Haaren

Introduction
Marijke Dirkson was the project manager of the MIRT exploratory phase of the N65 Vught – Haaren and had the goal to put all interests of the stakeholders forward. She became involved in 2012, but already in 2008 an ambition document was published where the urgency of the problem was stated. This problem covered both A58 and the N65. With mutual agreements between the regional parties, it was decided to set the focus on Vught and Haaren. Initially it was the idea to use quick wins as measures. However, the accepted resolution from the parliament in 2011 stated that more substantive solutions should be analysed. In the next BO MIRT meeting, it was decided that the minister of Infrastructure & Environment would invest €55 million, provided that the region would add another €45 million, which leads to a total budget of €100 million. The region analysed several alternatives and further elaborated the alternative of a sunken road around Vught. It was estimated that this would cost around €90 million, whereby another €10 million remained for measures in Haaren. Rijkswaterstaat tested this budget estimation and concluded that this estimation was too positive. However, as the budget was available and the stakeholders agreed that something had to happen all parties were ready for a Start Decision. Due to political decision on the budget cuts of the Infrafund in end of 2012, a Start Decision was delayed and made in May 2013.

Exploratory phase
The exploratory phase of the MIRT project N65 is not considered as an integral, spatial challenge, as the ambition document and the province of Noord-Brabant already spent much attention to spatial quality and for example included the history of the landscape. Additionally, extensive research had taken place before the start decision, which led to the early drop out of measures, such as changes in speed and number of lanes of the road. This led to the decision to state more precise project alternatives in the start decision. The exploratory phase therefore did not start with the integral question what is happening in the area, but took the existing N65 where problems in liveability were experienced. Traffic safety and the N65 as a barrier leads to a lower liveability. Solving this leads to a better connection of both residential areas, this increases the liveability of the areas.

The exploratory phase was connected to the spatial challenges of the province of Noord-Brabant. This led to several interfaces, such as the spatial quality of the N65, the character of the road, recreational cycling and walking routes. As spatial challenges were included, this led to consideration of the ecopassage as a measure in the exploratory phase. The outcome of the exploratory phase had probably not led to other solutions, as the current preferred alternative (decided in June 2016) meets the goals well.

Project alternatives
It was the desire of the region to further analyse and elaborate the alternative of a sunken road. The region often prefers a sunken road within the city centre, as this leads to fewer nuisances for people that are living in the centre or around the road. A ring road would lead to nuisances for other residents and it is often not possible to construct a road through preserved nature if an alternative solution is available.

However, as a completely sunken road did not fit within the budget, it was determined to consider other alternatives. Generating other alternatives gives more insight in other alternatives and helps to analyse the added value of a (partly) sunken road. The four project alternatives were developed in a session with the province, municipalities, Rijkswaterstaat and the ministry. This brainstorm session started with a problem analysis, where the ease of crossing was considered as problematic. Hereby, the project team decided to look at the problems and possibilities of the intersections. In December 2013, overpassed intersections were considered as most promising alternative. However, exceeding of budget estimation happened, as the impact on real estate was not fully included. As the design of the possible solution became more detailed, more information about the impact and costs became available. This led to adjustments in the design and number of overpassed intersections. Several building blocks or variants were put on the table and were further discussed. These aspects were put together and formed a preferred alternative. Although the MIRT guidelines assume alternatives, this project used components that lead to a composite alternative.

The program high frequency rail (PHS) was in study parallel to the MIRT exploratory phase of the N65. As it was decided that the railway was deepened, the part of the project scope that contains the crossing between the N65 and the rail was transferred to the PHS project team. The project manager of PHS and the project manager of the MIRT project regularly met to address adjustments and to discuss important considerations that had to be further communicate to the two project teams. Major items were brought to discussion in the 'steering committee'.

Stakeholder preferences
The project alternative of overpassing intersections would include closing down several access and exit points to the N65. Although this would not lead to a substantial increase of traffic in the centre, the municipal council of Vught did not agree with this because it did not agree with the idea of decreasing barrier of the N65. The resistance was carried out by different parties and was rather based on the idea than on facts, as the access and exit initially did not carry much traffic. This led to additional research, where it was concluded maintaining the accesses had a positive effect on the local traffic flow and that it was possible to maintain the access and exit within the budget. Another aspect that led to resistance was to make the intersection at the Martinilaan only accessible for cyclists. Based on research, it was concluded that the number of cars passing the N65 at that point did not make it necessary to keep this cross open for cars. However, this did not fit within the goals of the project, as the starting point was to diminish the barrier function of the N65. Removing an intersection for cars does not fit within these assumptions.

Project organisation and stakeholder involvement
The Ministry of I&E, Rijkswaterstaat, the province of Noord-Brabant and the municipalities of Vught and Haaren were involved in the project. Next to that, a participation process was included in the project. There was no formal sounding board, but several representatives were regularly consulted. Representatives from Platform Vught Noord Structureel (PVNS), cycling bond, walk and horse association were about four to five times consulted and informed during the process.

Platform Vught Noord Structureel was proponent of the sunken road, and did not think that the other available alternatives were sufficient. They advocated to wait until a larger budget was available, so an alternative could be implemented that would completely solve the problem. The cycling bond and walk organisation were satisfied about the process, as much attention was paid to slow traffic. It was noted that this project had caused less discussion, as impacts were less than the adjustments of the rail, as the whole centre would experience nuisances.

Also the closely concerned parties in the project team experienced differences in goals and interests. The municipality of Vught was a strong proponent of the sunken road. The municipality of Haaren was open about its interests and consequently acted to that. The government wanted to come to a balanced decision realising the goals of the project within the determined budget. This was also in the interest of the province, thus the province and the government were on the same line. It was experienced that the parties and people involved influenced the process. An example is the willingness to work towards a decision, as there was already much energy invested.

Although the parties had a strong role in the process, it was agreed to objectively elaborate the alternatives. An example is the alderman of Vught, as he took the lead and stepped off the idea of the sunken road. He stated that it was important to solve the problem, and that one should be open for other alternatives that would solve these problems.

The renewal of the MIRT had no influence on the project, as the project started before the renewal took place. However, participation and co-clients are aspects of the renewal of the MIRT that are visible in this project. It is considered that the involved parties influenced the process. An example is the division of the budget early in the process, where €90 M was assigned to Vught and €10 M to Helvoirt. As an integral trade off was considered as more important, this division was released later in the process. This took some efforts and led to negotiations.

Usefulness of the guidelines

It must be noted that this project is not a typical MIRT project. The NRM model, that calculates traffic flows, was not always suitable to deal with the number of traffic lights and the intersections. Another discussion was held about the use of other models and means. A visualisation program was prescribed, while another program was used. This led to discussions about the use of the program. This gave the idea that the rules of the game rather focus on the use of means, such as these models, than the overarching goal of a MIRT project. Another aspect that makes this project not a typical MIRT project, is as there was no congestion problem or problems in travel time according to national standards. However, much money was invested in this project. This can be allocated to political lobby, as the resolution has been the cause to put this project on the agenda. It can be concluded that the project would not have been executed if there was no resolution or political lobby.

The guidelines are not considered as a canvas of how a project is supposed to go, as the process is often different in reality. It is considered as a tool to see how the project can deal with practice. It is noted that it would be good to make a remark that the situation in practice is often different. The guidelines assume a higher abstraction level than what was done in this exploratory phase. An example is the number of details in the starting document of the exploratory phase, as several elements were already set in the beginning. The narrow scope was influenced by the fact that it is a local problem and it has a direct impact on people. This led to a high level of details in the designs, which would be suitable for the destination plans. Also other aspects lead to a higher level of details, such as the cost estimation to stay within the budget. Another aspect is the number of people and interests that were involved, as it is likely that it influences people in the centre. Another unique aspect is that the government, province of Noord-Brabant and the municipalities Vught, Haaren and Den Bosch financially contribute to the project. As many parties invest, this makes the position of these people different. This cooperation leads to different roles and the urgency for the project came from the region.

Report of interview 7

Name: Jonneke van Keep
Organisation: Ministry of I&E
Position: Authorized supervision, Ministry of I&E
Date: Monday December 19, 2016, 10:30 – 11:30 h
Subject: MIRT exploratory phase N65 Vught - Haaren

Introduction
Jonneke van Keep is the authorized supervisor of the project and had the goal to look after the interest of the minister and the government. Projects often start as bottlenecks in accessibility, traffic safety or liveability are observed and experienced. Although the people in Vught experience nuisances from the road, this project was irrelevant based on stated norms and priorities of these bottlenecks. A resolution from the parliament set priority for the minister to tackle the liveability problems in Vught, which gives the project a more governmental or political cause.

As this resolution was accepted, money was reserved to invest in the project. This also led to the desire of a co-investment from the region, since the region experienced this problem. As the region made money available for the project, the start decision was prepared for the exploratory phase. Based on reprioritization of projects by the government, the start decision was delayed. Nevertheless, the project N65 stayed on the agenda because of its coherence with the program high frequency rail (PHS). It is doubted if the project would have made it without the coherence with the rail project, as the project had little prioritisation within the government.

Exploratory phase and project alternatives
Before the resolution was executed, a pilot was executed to analyse what interventions are possible for the N65. This kept the project on the agenda and contained more structural assumptions that set the scope for the exploratory phase. By then it was not certain how much budget would be available. Nevertheless, it was clear that tunnelling of the road would not be possible, although this was the desire of the region. This led to the start decision in may 2013, while the start document was already finished in October or November 2012. At the start, the available money was known. Although the rule concerning the view on funding changed recently, it is considered difficult to estimate what 75% of the estimated budget is. It is uncertain what the project alternative, and the corresponding budget, is going to be.

The total project budget was determined on the outcomes of the pilot and resulted in €100 million. The government had already made €10 million available. Additionally, the minister would add €45 million if the region would also add €45 million. This allocation was based on the pilot, that estimated €90 million for the deepened road in Vught. €10 million would be made available for measures in Helvoirt, which led to a total budget of €100 million. However, afterwards it became clear that this was a rough estimation, taxes were not included and the costs of the sunken road were estimated too low. Nevertheless, there were a few alternatives that would fit within the €100 million and that continued to the exploratory phase. The tunnel alternative was excluded in the exploratory phase.

There were four project alternatives included in the exploratory phase. One of them was a sober alternative that required little investments and it had a sufficient or good score on solving the problem. However, as there was the idea that strong measures were needed and that €100 million was available, this alternative did not make it. When there is a budget available, it is considered by the municipalities that this budget should be spent and preferably, that more money becomes available. In the end, another €7 million became available from the province, to make sure that all parties agreed and to continue the

process. The preferred alternative that will be executed now leaves room for further investments. It is experienced that the municipality of Vught still has the hopes that more investments are possible on the longer term.

Project organisation and stakeholder preferences
It was not experienced that the stakeholders influenced the process of generating project alternatives. However, the environment wanted rigorous interventions that did not fit within the available budget. It can be concluded that the parties cooperated well together. Nevertheless, there was some tension between Vught and Haaren, as these two municipalities fell within the project scope. These two municipalities had opposite interests when it comes to the availability of money for the municipality of Vught and Haaren. In the beginning, it was determined that 90% of the budget was allocated to Vught, and 10% was allocated to Haaren. This led to discussions such as why intersections in Vught are deepened and intersections in Helvoirt are not tackled and improved. This leads to friction when more money is allocated to Haaren, less money will go to Vught and vice versa. Concluding afterwards, it would have been better to not secure the budget in the beginning of the project.

Political factors also influenced the cooperation between the municipalities. The lobby of Vught in the parliament led to a focus on Vught while little money went to Helvoirt, although they experience the same inconveniences of the road N65. This led to an unfair feeling, as some interests seemed to predominate the interests of the others. As a result, this led to tensions between the municipalities.

The municipalities were not part of the project team, as the province took part as a representative of the region. Later on, the municipalities were more involved by the project team, as more practical and details were discussed. The aldermen responsible for traffic and mobility of Vught and Haaren took place in the steering committee. The municipalities took also part in the civil servants committee that prepares the steering committee. It is the responsibility of the parties itself who takes part in these committees. However, the representative of the province who was responsible for spatial challenges N65 attended the committee most of the times, although his colleague on traffic and mobility was also a member. Nevertheless, as the focus was more set on the road of the N65, the representative of traffic and mobility of the province was more present. This led to a shift from spatial challenges to a focus on road projects and intersections. Additionally, spatial challenges often take much more time as spatial aspects have to be changed. Mobility and traffic alternatives can be implemented more easily.

Influence of political factors
There are several political choices and governmental factors that influenced the project. Next to rational outcomes of, for example a Cost Benefit Analysis, there are other factors that play a role in the decision making process. It is reckoned that the mayor of Vught played an important role in the lobby to make the N65 a prioritized project in the parliament. It was beforehand clear that the proposal would have a negative outcome based on rational and cost effective assumptions. Nevertheless, as the parliament, the second and the first chamber are the decision makers, it is possible that projects are prioritized that are not the best projects based on its efficiency and effectiveness.

Although it is considered important to argument the project alternative on the outcomes of a Cost Benefit Analysis, in practice this has little influence. In this project, it did not play a role in the decision making process. Also the letter to the chamber adds attention to this, as it says that the cost benefit outcomes were not decisive in this preferred decision.

Report of interview 8

Name: Steven Voest
Organisation: Ministry of I&E
Position: Project manager DG Bereikbaarheid
Date: Monday December 20, 2016, 10:00 – 11:00 h
Subject: MIRT exploratory phase Corridor Amsterdam - Hoorn

Introduction
The group of project managers was founded in 2010 and was launched by the desire to divide the roles of Rijkswaterstaat and the Ministry of I&E. The group of project managers is one of the effects of the Sneller and Beter approach. Steven Voest is part of the group since 2014 and now leads the exploratory phase of corridor Amsterdam – Hoorn as a project manager. The corridor Amsterdam – Hoorn started with an initiative phase and is currently in the exploratory phase.

Initiative phase
The Ministry of I&E uses the Nationale Markt en Capaciteitsanalyse (NMCA) to analyse bottlenecks in road capacity. This provides a first step to prioritise projects for the policy process. The NMCA showed two bottlenecks for the A9, A7 and A8. This led to the initiative to analyse the accessibility problems in further details to gain more insights in the location of these bottlenecks and identify potential solutions. It is not the goal to generate solutions, but experience shows it is necessary to explore alternatives to have an idea about the order size and the scope for the exploratory phase. However, attaining a budget for the exploratory phase gives the perception to the region that the money will be available. It is noted that the initiative should be a problem analysis with identifying solution spaces, but the initiative for the corridor Amsterdam – Hoorn went one step deeper and concluded with an alternative including the costs and the budget for the exploratory phase. This initiative paid little attention to participation with the environment and did not include measures for the public transport. It is considered that there is a strong dynamic to dive into details. This dynamic is driven by complex challenges, as there are uncertainties in for example the impact of spatial development in Amsterdam on the road network. This leads to a dilemma: better answers require more information. However, it is often considered irrelevant to dive into this much detail in the beginning of the project. This leads to difficulties to stay on a more abstract level and make decisions on global information.

It is interesting to see the development of the initiative, as it is a relatively new aspect. The initiative becomes more extensive and leads to discussions about the function and the connection with the exploratory phase. This is on going and it will be interesting to see how practice responds to this.

Exploratory phase
The exploratory phase started with a well-defined alternative from the initiative phase, but included the task to reflect whether this was the best alternative. This resulted from the wish to take a broader perspective and look for alternative measures. This led to some friction with the region, as they were initially glad that the process went efficient and that budget was available. However, since the public transport, spatial development and environmental aspects were not yet considered in the initiative phase, this would likely lead to resistance during the process. This led to a broader start document and a sort-of MIRT initiative in the first part of the exploratory phase, where the outcomes of the MIRT initiative were temporary put aside. This first part of the exploratory phase includes the involvement of regional parties and other organisations, not only involved with traffic and mobility. This led to a broad sectorial approach, but not an integral approach, as this caused resistance from the region. For example, this includes analysing the effects of spatial planning on traffic, but this does not include the judgment

whether spatial plans are undesired. This explicit consideration had to be made, as the ministry was a proponent of the integral approach.

Project organisation and stakeholder involvement
This project had a governance structure of a steering committee, which was used for the formal decisions. A civil servant committee, or director consultations, prepared these decisions. Most practical decisions and directions were made within this civil servant committee. In this committee resistance towards the integral approach was enounced, the municipalities did not want the involvement of the government in spatial planning and the province did not want to change plans that were already decided.

Organisations decide themselves who takes place within the committees. The role of the participants is to represent the interests of the organisation. However, the input comes often from a mobility view, as there are only participants involved that are involved with traffic and mobility. It is considered that the composition of the committees and teams influences the dynamics of the project. It is unlikely that another team would lead to other outcomes, although accents and focuses might differ when other people are involved. The attitude and enthusiasm of organisations is decisive for the success of a project. However, it is difficult to capture this in rules or procedures.

The exploratory phase is considered more as a process, than a project. This includes a focus rather on the quality of the decision making, than a focus on finishing the exploratory phase within two years. Although it is aimed to do this project based, with a team and predefined desired outcomes, it often involves a political process with organisations and negotiations that causes delays in the process. Later on, in the plan elaboration phase and more in the realisation phase, it becomes more project-based as agreements are already made.

Differences in interests in the corridor Amsterdam – Hoorn are observable on different levels. This contains dilemmas on measures and nuisance. For example, a car from the northern part that drives on the ring road of Amsterdam means less capacity for people from Amsterdam. This causes friction between municipalities. Another example is between residents, as one alternative is located closer to a dwelling than the other. These conflicting interests are also observable in money, as spending money in one municipality leads to less money for another municipality. Spending money in rail infrastructure means less money to be spent on roads. This leads to complexity, as no one is right or wrong. Balancing the satisfaction between these groups is a puzzle and is a matter of compromises. This leads to a balance of opportunities and alternatives. The broad approach of involving al forms of transportation and infrastructure makes it a more complex proces, as there are more parameters and more decisions to be made. It is acknowledged that decisions become more difficult. But at the other hand, all stakeholders find it a positive development that there are more solutions considered than only asphalt.

The larger municipalities contribute within the project, either financially or with personnel. The smaller municipalities are a partner, but are not contributing. There are different gradations in involvement. What they bring in or their investment is not operationalized and is a little fuzzy. However, parties with a positive attitude in the process are likely to make the best out of it. It is sometimes difficult to keep the small municipalities well involved. The project requires a balance and often results in a compromise.

Usefulness of the guidelines
Concerning the preferred decision, it is clear what information should be available and on what aspects this decision is made. The guidelines are useful and provide basic information of the elements of the documents and memos. Nevertheless, every project is unique and relations between the cooperating organisations are different. It is important for a project manager to know its wiggle room within the

guidelines and practice, this makes the role challenging and exciting. The role of the project manager is to deliver information on which the committees and decision makers can make the right decisions.

Project alternatives and stakeholder preferences
The exploratory phase is considered as a filter, where a zero filter was added to apply a broader look. The memo of promising alternatives is used to formulate six challenges around Hoorn, Purmerend and Zaanstad. These challenges are formulated on different sectors, such as main roads, railways and the cycling roads. Based on this document, many measures are identified that might solve the problems. This is done within sessions with public bodies and other stakeholders. This resulted in a long list of about 220 measures that were scored on the criteria from the assessment framework. This contains for example costs, support and improvement of accessibility. Showstoppers were filtered out and these measures were reflected together with the civil servants committee and steering committee. This resulted in a list of 140 measures. These measures are combined and bundled and resulted in 65 design challenges. These design challenges are considered as building blocks that can be combined to packages of measures. They are currently working on building these packages of measures. This will be presented to the decision makers where the undesired measures are filtered. It is expected to have a set of these measures left that are considered as promising. These measures will be further defined and elaborated, so trade offs can be made about the impact of details. This will be done in close cooperation with the decision makers, as they are being asked to weigh the elements of the measures. These considerations are subjective and implicit. Cost Benefit Analysis and plan MER are considered as instruments to filter the measures based on their impact and cost effectiveness. The decisions that are made beforehand are build on logical reasoning and lead to a political decision afterwards.

The stakeholders filtered measures that were considered as useless. There are some measures that did not receive full support, but there are no measures in the shortlist that receive full resistance. By executing this filter together, it is expected to create support and goodwill with the other stakeholders. Although all stakeholders agreed with this, it is uncertain to see how this results when a preferred alternative has to be chosen. It might be a politic strategic reason to wait and see and block a specific set of measures at the end of the process. It is not yet possible to say whether promising measures did not make it to the end decision. Nevertheless, it is tried to continue the process and have little moments to bring back filtered measures, as it is easy to fall within a loop where one keeps arguing about a specific details. There is always a chance that decision makers start arguing about different perceptions of the right measures.

A point that is considered as important is that the project should to stop when issues occur. When one continues to remain progress, it becomes more difficult to involve that disagreeing aspect later in the process. It often happens that parties do not want to give in something in the negotiation. This makes the success of the project dependent on governmental constellations and the political situation. This requires a positive attitude of all and a for the project manager a good relation with the stakeholders. As the project manager is impartial, it is possible to manage all interests and dilemmas and come up with the best set of options.

An outcome can be considered as successful when the right information is put on the table, within reasonable time, when all the important parties are involved and when a qualitative outcome can be presented. It is noted that this might be dependent on the background of the project manager, as it is a personal preference in this project to make an integral trade-off. However, this is dependent per person, as there are other project managers that consider an outcome successful when a specific alternative is chosen.

Report of interview 9

Name: Tom van Tilborg
Organisation: Ministry of I&E
Position: Project manager DG Bereikbaarheid
Date: Wednesday December 21, 2016, 14:00 – 15:00 h
Subject: MIRT exploratory phase InnovA58

Introduction
The project InnovA58 covers two routes: from Sint Annabosch to Galder, which is about 7 kilometres and from Tilburg to Eindhoven, which covers about 25 kilometres. Before the exploratory phase started, several researches and initiatives were executed. For example, Rijkswaterstaat started with a research from Zeeland until Eindhoven. This was paused in 2008 due to a re-prioritization within the government. After the decision to develop a subpart instead of the whole A58, the start decision for Sint Annabosch – Galder was made in September 2010. This scope was set as the bottleneck there was considered the biggest and the size of the project was smallest. Nevertheless, Tilburg – Eindhoven remained a problem in the area. Businesses kept insisting to invest in this trajectory, as this route is important for freight. This led to the willingness from the government to tackle both routes with the note that the budget for these projects would only be available in 2021 (later postponed till 2023). The province Noord-Brabant agreed, under conditions, to pre-finance this project under certain conditions, which led to the (early) start of the exploratory phase in 2013.

Exploratory phase
The exploratory phase for Sint Annabosch – Galder was content wise ready. However, this was done without any participation or involvement of other parties. In May 2013 the exploratory phase of Tilburg – Eindhoven started. As both projects had an accessibility bottleneck, the goal of the projects was to facilitate a capacity expansion within a short time, on both trajectories. Both trajectories became two projects within the InnovA58, as the pre-financing could be funded with innovations. Next to that, research would incorporate the analysis of financial arrangements over different distances of the A58, where operations and maintenance could be added in the contract. This was supported and initiated by the businesses. As the project is divided in three workflows, one of them covers the exploratory phase. The first part of the exploratory phase of Tilburg – Eindhoven took about ten months. It was decided to do the first part of the exploratory phase for Tilburg – Eindhoven, as Sint Annabosch - Galder was already elaborated. The second part, where the Cost Benefit Analysis would be executed, the two projects would be carried out on the same level of details.

Project alternatives
The start document for both Tilburg – Eindhoven and Sint Annabosch - Galder describes a third lane as the most promising solution. However, other parties noticed that other measures might be useful to increase capacity. This led to the use of participation to identify these measures. Together with municipalities, the water board and the province, a long list of potential measures was conducted in several workshops. Also the assessment framework was further elaborated in these workshops. This led to additional variants, next to the two times three lanes variant. These variants were tested and scored based on the assessment framework. These outcomes were presented and tested during information sessions with the residents. Although residents were not directly involved in conducting the measures, after every step they were informed and their opinions were asked.

The workshops to identify solutions followed the Value Engineering methodology, which was a new instrument for the project manager. Although it was useful to look at solutions from their functions,

other developments or instruments could have been used to come up with a set of measures. There was a influence from stakeholders to take a broader look and incorporate other alternatives. In the start document it was decided to have a regular tracing procedure, as the third lane does not require the extensive procedure and this is easier and faster. However, this brought some tension, as there were also measures taken into account that required the more extensive procedure. This contradicted with the earlier decision in the start decision and the wish to realize the project in a short time frame. Therefore another criterion was added, that states whether the alternative fits within the regular tracing procedure or not.

Incorporation of innovations is not influenced by the *Beter benutten* approach, but this was a request from the businesses. It was a desire from them to use innovations as a funding, by analysing the actual effects and profitability of innovations. It was difficult to make a judgment about the impact of the smart solutions, as opinions differed. There were some people who considered the effects of the innovations on congestion problems as substantive, while others assessed these effects to be less. There is too little research available to say something about their problem solving capacity.

The faster the market and companies can be consulted in a tender, the more innovations will be put forward. This follows the face that companies do not want to share their innovative ideas if they are not becoming part of the project. It was analysed how these tenders can be put forward early in the process, so innovations can be early collected. Additionally, the risks of the innovations were estimated higher than the chances. When considering innovations with a higher certainty of profitability, fewer new innovations and more developed applications are considered. This interfered with the desire to apply new innovations and this led to the discussion whether innovations should be a goal, an ambition or just a mean to earn money in this project.

After that, filter two took place. There were two promising measures depicted for Tilburg – Eindhoven, the two times three lanes and a peak hour lane. The peak hour lane was cheaper than the other alternative. Since only two times three lanes was analysed for Sint Annabosch – Galder, the peak hour lane was also analysed. Additionally, since the region valued the parallel structure as high, a mixed solution was further considered in a solitary research. Next to that, several contracting structures were analysed to consider the operations and maintenance over the distance of the A58.

Stakeholder preferences

Preferences of the residents were considered within the different variants. For example, they preferred an aqueduct instead of an expansion of a bridge. These extra costs of these variants were further analysed and presented, so decision makers can make a trade off with the allocation of who is willing to pay the extra costs.

Although the two times three and the peak hour lane resulted as the most promising alternatives, the region wanted to further analyse the parallel structures. Although there were few arguments to choose it, a mixed alternative was developed for Tilburg – Eindhoven, this contained a parallel structure at one side and an extra lane at the other side. The municipality of Eindhoven was interested in this, as they were developing the airport and the brainport. They were already working on a connection to the A58 and it would be beneficial if this could be incorporated in the project. This alternative was neglected since it would be too difficult for drivers, it was more expensive and it did not have a higher impact on solving the problem.

The preference for two times three lanes was already evident in the first filter. Only the ministry considered the peak hour lane as an interesting alternative, as this would save money. The peak hour lane

came out to be sufficient in solving the problem. Rijkswaterstaat considered this lane as a temporary solution and reconstruction costs was added as a criterion, so the costs to convert the temporary lane into a third lane were included. There was overweight for the third lane and this did not change in the continuation. The project alternative also fitted within the budget and had a higher cost benefit balance than the peak hour lane alternative. There was much consensus about the alternative.

Project organisation and stakeholder involvement
The involvement of businesses is also visible in the project organisation. The steering committee contained the Ministry of I&E, the province, but also stakeholders of the A58 (a delegation of the businesses) had a spot at the table. The advisory committee contained local politicians that were concerned with the A58, but they were not part of the steering committee. For example, municipalities and water boards were part of this committee. The steering committee has been the same for both projects, as there were no municipalities involved.

The project contained three workflows. One is the exploratory phase, which was the responsibility of the ministry. Another workflow was to analyse innovative measures and quantify them in their expected yield. This fell under the responsibility of the businesses. The last workflow analysed the financial feasibility and possibilities to facilitate the project. The province was mainly responsible for this. The last element that touches all workflows is the management of the environment. This was the responsibility of the ministry.

After the exploratory phase was content wise ready, the provincial council elections were held which led to changes in the council. This led to the cancellation of the diamond around Eindhoven. This was already a little predictable, since the region of Eindhoven became opponent of this project because of an earlier change in the town council. Now in both the municipality and the province, the opponents were bigger than the proponents. This meant that a financial contribution of €271 million from the government became available. Since there was no project for this budget, the region published a bid book with alternative projects with the goal to keep the €271 million for investments in the region. This available budget was connected to the A58 project, but a decision still had to be made. During these six months of waiting, an internal decision was made that two times three lanes was preferred, including four innovation measures and a living lab for experiments. The pre-financing from the province was not necessary any more, because of internal shifts of the MIRT budget. This led to the conclusion that innovations were no longer necessary to pre-finance the project. Not all of the €271 million was kept within the region. About €170 million stayed within the region, of which the A67 project is partially financed.

Dilemmas during the process and usefulness of the guidelines
Several dilemmas occurred during the process of the project. The first observed dilemma is including or excluding elements of the scope. For example the regular tracing procedure that was decided in the start decision, but automatically excluded the more extensive project alternatives, which were supported by the other parties. If a decision had to be made today, it would have chosen the more extensive tracing procedure although this does involve more procedural steps and would take more time.

Another dilemma is the level of details. The guidelines prescribe a cost estimation of +/- 25%, but this requires a lot of detailed research. Nevertheless, it is often not necessary for the decision maker to have this much information available for their decision. It might be a statement that the assessment framework from the first filter provides enough information to decide on a preferred alternative. Another dilemma is the involvement or participation of the environment early in the process. However, it is sometimes difficult for people to brainstorm on this abstract level, while they are more interested in the specific

impact on their situation. This information is often not available during that part of the process. Additionally, the participation moments influence the speed of the process.

A third dilemma is the interpretation of innovation and whether this should be a goal or means to achieve a goal. This also influenced the focus in the workflows and this changed over time. First, innovation was necessary to yield money but that became less urgent after money was available. Another aspect is handing over the tasks to the market. It is sometimes faster to do things yourself since the procedures that are required take sometimes as much time as a MIRT phase itself.

Cooperation in the A58 was considered as an example for the renewal of the MIRT, especially cooperation with businesses. A broader, more integral approach is considered as a good development, as it focuses less on asphalt. However, the new guidelines show other and maybe dilemmas. An important aspect is to increase participation and involve the environment in the process. At the other hand, it explains the desire to apply an adaptive approach, where a definite decision is made as late as possible. This is contradictory, as it gives the environment less certainty about the impact on their situations. It is the question how this will develop in practice.

Report of interview 10

Name: Marco Bakermans
Organisation: Rijkswaterstaat Noord-Brabant
Position: area manager (exploratory phase InnovA58) and project manager (plan elaboration phase InnovA58)
Date: Friday January 13, 2017, 10:00 – 11:00 h
Subject: MIRT exploratory phase InnovA58

Introduction
A project has different phases, of which the exploratory phase is one of the earliest phases. The project often starts on the governmental table, continues to the initiative phase that leads to an exploratory phase. The project is currently in the plan elaboration phase, where spatial decisions are made. The InnovA58 contains four components. The first component is a road widening between Eindhoven and de Tilburg. Second, a road widening between Sint Annabosch and Galder. Third, there is an innovation challenge over the whole trajectory. The fourth and last component is the expected bottleneck on the part of the route that is not widened. Smart solutions that can be combined with maintenance are further analysed. It is not yet certain what this will contain, although this will probably consist small measures.

The whole A58 was initially analysed by Rijkswaterstaat but due to budget cuts the project fell off the priority list of the MIRT agenda. This led to a lobby from the province and municipalities, as the research did not result in a project while capacity problems are experienced. This lobby led to questions in the parliament to see if a part of the A58 could be analysed. This resulted in the project for the route between Sint Annabosch and Galder. Improvements in this part were expected to lead to positive effects. In the meanwhile, two things happened. First, the traffic between Eindhoven and Tilburg grew faster than expected, so the problems between Eindhoven and Tilburg would become bigger than Sint Annabosch – Galder. Second, the Foundation A58 initiated a bidding book. Their goal was not to wait until money would become available, but to take the project in their own hands. This was at the right time, as the trend to involve the market was current. This led to a discussion about the role of Rijkswaterstaat. It could lead to inefficiencies if the A58 would fall out of the road portfolio. At the other hand, businesses stated that they could make the exploitation of the A58 cost efficient by applying innovations. This led to an adjusted initiative, where the province of Noord-Brabant, the government and the Foundation A58 would be co-clients. However, money would be only available in 2024. The province of Noord-Brabant had an interest in developing the project quickly and would pre-finance the project from their Essent funding. The interest for the funding would be earned from innovations. This led to the start decision. The start decision for Sint Annabosch – Galder was ready, but was put on hold until all stakeholders agreed for Eindhoven – Tilburg. As both start decisions were ready, there was budget to widen both trajectories. The projects were combined into one project, the InnovA58, to consider approaches for the market and technical innovations.

Exploratory phase
The exploratory phase contains three workflows. First, the ministry was responsible for the exploratory phase. Second, the province Noord-Brabant focused on integral considerations and on financial arrangements. Third, the businesses focused on the innovations. Rijkswaterstaat was responsible to manage the environment. This covered all the workflows and contains the link between the project and the environment in which the project is being realised. The environment can be considered physical (if we're going to intervene, who is present in the environment?) or organisational (which sectors are present and who are the important stakeholders?). Based on these perspectives it is possible to involve people. This is necessary, as drafting a project from the drawing table is often not successful.

Project alternatives
The goal was to widen the two trajectories in 2020, thus a short time frame, potentially with additional measures on the other parts of the A58. A secondary goal was applying the innovations, in order to finance the pre-funding. Over time, it became evident that many innovations were available, but little of them would yield money. The innovations that could yield money involved risks and often desired pre-financing. Yields were earned on the longer term. This did not fit within the desire to pre-finance the project from the innovations. Current innovations are not this far developed yet, that it can prevent asphalt expansion. Not only technical innovations, also governance innovations were considered. However, this interfered with existing rules and would likely delay the project. This caused a dilemma with the goal to quickly realise the project.

Many innovations are available, but this involves property rights and knowledge, that companies are not willing to open up without getting anything in return. It could possibly influence the marketposition of these companies negatively. This was also considerable in the Foundation A58, where businesses got out of the organisation to prevent the dilemma between client and contractor. The representatives of the businesses stayed within the foundation, but they had difficulties to influence the businesses open up their innovations and put their cards on the table. Although there were little innovations that were financially promising, there were several interesting alternatives societally and politically. This led to an available budget in the preferred alternative of €10 million to invest in innovations. Innovations did not have to generate money, but innovations may cost money.

The start document from both Sint Annabosch – Galder and Eindhoven – Tilburg consider a two times three lanes as the preferred alternative. Especially for Sint Annabosch – Galder, smart solutions were not yet considered and the alternative is mainly based on the expected traffic. Next to this alternative, a peak hour was considered. However, this would not be much cheaper, as operations and maintenance is more expensive. The decision for the preferred alternative was early made, to increase the speed in the decision making. The exploratory phase became broader for both trajectories because of the desire to apply innovations and the interest of the region to consider other project alternatives. However, these alternatives focus on asphalt, as it is easier to calculate their costs and effects. The smart mobility and innovative initiatives were more qualitatively considered.

The innovations distracted the project from other important aspects that could have been of added value in the project. For example, the environment and recreational aspects are not considered until the end of the exploratory phase.

Project organisation and stakeholder involvement
Although the stakeholders committed themselves to cooperation, it was not possible to find a feasible financing structure. The cooperation had to become a success, as this was partly the reason why the government prioritised the project. When another project in Eindhoven was released, budget became available. This led to a new bidding book, initiated by the representative of the province. This contained a program with different projects in Brabant, with the goal to keep the money in the region. This is now considered as Smartwayz.nl, that contains 7 or 8 projects. Also money became available to finance the InnovA58. Therefore, pre-financing from the province and seeking for innovations became unnecessary. This saved the image of the project, where innovation became a sub part of the project, instead of the initial goal.

It was rare that businesses were involved in the project. It was considered that the foundation A58 tried to get more of the A58 developed, while not (financially) contributing in this. It was expected that they

would contribute with knowledge, but this contribution was disappointing. Their ambition was to expand the scope and conduct interventions for the whole A58.

Stakeholder preferences
Increase cooperation, as described in the renewal of the MIRT is nothing new and should be considered as normal. This can involve a financial contribution, but also the desire to integrate the infrastructural aspects within area development. Cooperation can then be considered as a mean to realise an integral spatial development. This happened before, but this was often accidentally or occasionally and depended on the project manager. By seeking this cooperation consciously, it is possible to bring the project further by seeing chances early in the process. However, it must be noted if there is no urgency, it should be accepted to leave the initiative for what it is.

This is dependent on the situation and the organisations that are involved. Other organisations see a MIRT project often as a chance to finance their wishes or desires. It requires a stand from the government to only cooperate if the other party is willing to (financially) contribute to the project. Another possibility is to take a broader look, by realising a program with a set of projects. In one project it is possible to give in a little, while in the other project it is possible to take the longer end. By having a set of projects, it is possible to achieve more because parties are mutual dependent.

A dilemma is existent in the integral approach, as spatial development is often a responsibility of the region. Some municipalities accept this involvement, while others do not want to be interfered in their business. Win-win situations must be found for the regions to keep them on board.

Usefulness of the guidelines and the renewal of the MIRT
In order to generate alternatives, Value Engineering was used to analyse a broad set of interventions. It is considered that the Value Engineering instrument was not well used, as the outcome is dependent on the people who are part of the session. In this situation, traffic experts from municipalities were involved. This led to disagreements and an unsuccessful outcome with a strong focus on accessibility problems, but little attention for other perspectives. The session led to discussions about the details of the nodes, but not about the relation to innovations. It is considered that Value Engineering has added value when it involves a broad diversity of people. It is experienced that in order to apply the tool effectively, the participants should have certain pre knowledge about the project and what benefits is in it for them. This requires a good preparation.

In the plan elaboration phase, the instrument of social design is used. Where Value Engineering is considered as a tool for professionals, social design is applied to involve the environment with the potential adjustments in their area. This goes back to the experiences of people. It stimulates the contribution of the people to think about possible interventions. Another instrument is the omgevingswijzer. This is useful to determine the priorities of the project. This is especially applicable when there is little knowledge about the problem and the desires of the environment.

A dilemma that is considered in the integral approach from the renewal of the MIRT is the ascription of money. It is difficult to redistribute money that was initially assigned to traffic, to other elements of the project. Especially if integration becomes a national responsibility, it requires additional attention for the implementation. If it is possible to have some space in the budget, it is possible to give in a little money on aspects that were not incorporated initially. This also makes it is easier to ask a financial contribution from other parties. Currently, this money is often redistributed in an unofficial way.

As it often becomes vivid what integral challenges need to be tackled during the process, this requires several evaluation moments where also the possibilities and budget is evaluated and determined. It is currently experienced that budgets are often based on simple calculations and these calculations do not change. Although budget is considered as indicative, it often results in an ascertained budget. This limits the playing field within a project.

Report of interview 11

Name: Bas Hoogeboom
Organisation: Ministry of I&E
Position: Authorized supervisor
Date: Tuesday January 17, 2017, 14:00 – 15:00 h
Subject: MIRT exploratory phase InnovA58

Introduction
The Ministry of I&E determines whether a project will be executed and whether the money is available. The ministry is the client and is responsible for the governmental decisions. Additionally, it was in 2010 decided that the ministry would pull the exploratory phase of MIRT projects. This led to the start of the project pool with project managers. The project manager is responsible for the project team. The minister is in the end responsible for the decisions, but the daily management and decisions fell within the responsibilities of Bas Hoogeboom. These roles are separated and the relation with the project pool and the ministry as a client is not fully formulated. Bas Hoogeboom took the role as client. This involves determining the budget and the timeline and communication to the project manager. They state the problem and the scope together with other parties.

The national market and capacity analysis (NMCA) is considered as the most important instrument to identify bottlenecks. The outcome of the analysis showed that the A58 would be a bottleneck, but only in a scenario with high growth. It was decided to continue the project due to political pressure. The region wanted to execute this project and preferably as soon as possible. This was experienced during the BO MIRT, a yearly meeting where regional parties discuss the priorities and investments considered necessary, together with the government. This led to the proposal of the province to pre-finance the project. As the province was willing to pay or invest in the pre-financing, the government was willing to participate in the project. Organisations that represent businesses started a lobby in the parliament, by sending letters or generating attention from the media. This led to debates and questions, as the politicians concern about the economic losses, caused by traffic jams of freight.

Exploratory phase
The two times three lane alternative was prefiltered in the start decision. Other project alternatives were little considered. Although the analysis to other alternatives was little provided, it was already known that alternatives could not be found in other sectors. The accessibility of the province by car is considered as problematic, thus adjustments to the road are necessary. Additionally, the region wants to increase capacity of the road otherwise they are not willing to invest their money. This leads to mutual dependencies on the willingness of other parties and this resulted in a sectorial exploratory phase. If the exploratory phase would have started a little later after the start of the renewal of the MIRT, it might have been possible that a broader look would consider other alternatives.

The use of innovations was decided at the start of the project. In order to cover the loss of the pre-financing of the province the innovations would capture the missed interest. Afterwards, it turned out that this was not realistic, as innovations often cost money in the beginning of the project. Although it can lead to cost savings innovations have to be tested before they can be applied. This leaves to uncertainties of which it is difficult to estimate the effects and the costs. The innovations analysed within this project were not yet this far developed that it was certain that it could obtain money. It was incorporated beforehand that innovations could not be cost effective, however it was not captured how to deal with this. It was made clear that the government would not pay for the pre-financing.

Project alternatives
Support for project alternatives can be achieved by Value Engineering. The instrument is also used to save money and to get the stakeholders on board. It can be used to see how things can be done more efficient and how to gain more support for the project. This leads to more innovative solutions. These solutions can contain simple elements, which were not considered before or were considered as non-negotiable. The ministry was involved to represent the interests of the government so their desires and ideas about the preferred solution were included in the process. It stimulates to share the thoughts behind the decisions and to reconsider the impact of the preferred alternatives. It was considered that the parties were not open for other alternatives than asphalt, however variants were open for discussion.

Project organisation and stakeholder involvement
The guiding group made decisions. This also contained other parties. For example the province, as they would pre-finance the project and the businesses, as they would contribute with innovative ideas. The businesses wanted to decrease the economic losses due to traffic jams. They would not financially contribute, but it was their responsibility to get the companies engaged to bring in their innovations. It turned out that the business analysed the innovations as more promising as it turned out in practice, as the companies did not bring in their innovations. The province wanted to decrease the cut-through traffic, going through the municipalities. An extra lane leads to less traffic on secondary roads and is in the interest of the municipalities. For the government, less traffic jams leads to higher economic profits, as the road is an important road from Rotterdam to the Ruhr area. These interests contain more than cost benefit thinking, where a positive outcome shows a good investment.

It was beforehand clear that capacity should be added, as all parties supported this. In the beginning, innovations were considered that would not lead to an extra lane. After conversations with the market, it was clear that there were no innovations that prevent an extra lane. Early involvement of the market is also important for the procedure. Early involvement of the market leads to more space for these parties to come up with solutions. The later these market parties are involved, the less space there is to create innovative solutions. Cooperation with businesses was considered as positive, as there is easy access to these people. Also another view led to new insights, this was considered as useful. Additionally, it led to faster decisions, as challenges were fast tackled. A disadvantage is that businesses were strongly economically focused, where the interests of the environment came second. They had little understanding for the importance of support. However, support can make or break the project, as it is desired that everyone can see the added value of the project.

The municipalities were more concerned what an extra lane would mean for there accesses. They make their considerations more on a micro level. They were also proponent of the parallel roads, as they thought this would be more effective. Local traffic would be separated from the going through traffic and this would be beneficial for the governments. Nevertheless, the traffic model showed that this had little impact. This led to discussions, where the outcomes of the model were questioned. Also the costs of the parallel structure were significantly higher and this did not fit within the budget. If it was desired to further elaborate this specific alternative, the higher costs should be allocated to the region. This often appeases the discussion. Nevertheless, it is possible to further consider the wishes of the municipalities by optimising the details and analyse effects in the plan elaboration phase.

The government fully finances the project. The pre-financing structure became unnecessary and the province contributed financially to the program SmartwayZ, particularly the project A67. This led to a deal where the government would early realize the A58, but in return the province would invest their money in the A67. This leads to a common goal that improves the cooperation of the parties, as both

sides are willing to help each other and contribute to bring the projects further. Although SmartwayZ covers a large area, it cannot be considered as an integral project. Incorporating smart mobility and the cooperation structure is innovatory, but the projects focus on accessibility of the roads. The program would become too complex when spatial development and public transport would be included.

The living lab of the project gives opportunities to seek for innovations that might be applicable, together with the region and other parties. Although interventions might not be cost effective for this project, it might give potential for other projects. It would be a loss if the knowledge and willingness of the parties would not be used. The willingness to apply innovations was high in this project, although it requires substantive changes in the organisation. Even if the government and region are on board, it is considered necessary that businesses should participate and invest, as it is up to them to take the lead in the market.

The management group contained the Ministry of I&E, Rijkswaterstaat, the foundation of the A58 and the province of Noord-Brabant. They decide upon the alternatives that should continue from the first to the second filter. This leads to the preferred decision. Also implementation questions were considered, for example an aqueduct or the connection to the airport. The project group prepares these decisions and proposes the outcomes of the products to the guiding group. The guiding group reflects on these outcomes and prepares the decisions for the management group. There was easy agreement about the decisions, partially because the preferred alternative, the two times three lanes in the start document, turned out to be the cheapest and most effective solution. If this alternative had not fit in the budget, additional money would have been necessary or another, more sober alternative should be chosen. This often leads to discussions.

Usefulness of the guidelines and the renewal of the MIRT

The project followed two tracks of which one is the traditional exploratory phase. Next to that, an innovative trajectory was executed parallel. If this would be unsuccessful, it was possible to revert to the traditional track. Eventually, the project continued with the traditional exploratory phase and elements from the innovative trajectory were added. If the renewed guidelines were of use, the project would have started with an initiative or taken a broader perspective with other solution spaces. It is not sure if the scope would have been different and if other solutions were considered. Nevertheless, the steps to leave spatial development or public transport out of the scope would have been more explicit.

Although the project was not influenced by the renewal of the MIRT, this project contained a new organisational structure. This led to re-identifying the roles and responsibilities of the stakeholders. Several developments were also in line with the renewal of the MIRT, such as working together with different parties, analysing a broader set of alternatives by incorporating smart mobility and considering another market approach. The interests concerning the renewal differ per organisation. For example a change in scope for another market approach is beneficial for businesses, but leads to disadvantages for Rijkswaterstaat and smaller contractors. Also innovations can be promising, but this requires many adjustments to other aspects

Report of interview 12

Name: Janny van der Heijden
Organisation: Province Noord-Brabant
Position: Representative of the province of Noord-Brabant (N65 and InnovA58)
Date: Thursday January 19, 2017, 13:00 – 14:00 h
Subject: MIRT exploratory phase N65 and InnovA58

Introduction
As the representatives of the province had to make decisions, Janny van der Heijden involved him/her in the process and she gave advice considering the interests of the province, for both projects N65 and InnovA58. Although the highroads are both owned by the government, the province contributed in both projects. The province was involved in the N65, because of the spatial challenges in this area. The aspects of the N65, such as ease of crossing, the accessibility and the safety of the road, had to fit in the goal to maintain an appealing landscape. Another objective of the spatial challenges is to improve spatial, ecological and economical quality. These objectives are attached to the N65 project. Next to that, the province financially contributed in the project. Last, the experiences of the province were beneficial as the N65 has a strong provincial character. For the InnovA58, the province was responsible for the pre-financing to realise the project in advance, and was therefore an important organisation for the project.

N65 Vught - Haaren

Cause
Initially, the whole N65 from Vught to Tilburg was considered as problematic. But as the trains and traffic crosses the municipality of Vught, especially this municipality advocated having liveability on the political agenda. Especially as traffic on both road and rail increases, the liveability and safety decreases in the municipality. They influenced the government to start an exploratory phase. The scope, from Vught to Haaren was decided, as an intersection at Berkel Enschot was recently upgraded and the problems between these municipalities were considered as most important. Next to that, there was a spatial challenge for the area to improve the road concerning securing recreation, environment and nature.

It was considered difficult to connect the spatial challenge with the road project. The projects were initially combined as it was thought to be easier to secure a, for example, sustainable and safe road and combine it with ecological and economical aspects. The goal was to maintain the open character of the road. Additionally, it was aimed to improve recreation and the economical aspects, such as the arboriculture sector. Landscape architects made a spatial vision, with a preview of how interventions would influence the area.

Exploratory phase
A MIRT exploratory phase usually focuses on improvement of traffic safety or accessibility. However, as this exploratory phase focuses on the liveability, aspects on improvements are difficult to compare. The ministry admitted that the energy and money that was spent in the project was a loss, as problems were considered to be higher in the western part. Although it was desirable to improve the liveability and character of the road from a regional perspective, it interfered at the other hand with the urgency and not optimal use of energy and money.

Project alternatives
Although it was strongly desired to adjust the road, there was little understanding that adjustments would lead to removal of the trees. Additionally, the view and character of the road would be completely

different. These insights developed over time. Initially, the municipality of Vught made plans of a deepened tunnel, with trees and green spaces above. However, when the budget of €100 million was determined, it became evident that a lot of elements were cut and that sound walls were still necessary based on norms and regulations. The wishes from the surrounding did not fit within the determined budget. With the plans to adjust an intersection, dwellings had to be demolished. As this became clear, people resisted towards the plans. This also gave a mixed sound to the ministry, as the wishes of the surrounding changed over time. The surrounding wished to have more money available and during the development of the plans, they opposed these plans. This made the process difficult and this led to irritations and misunderstandings.

Project organisation and stakeholder involvement
The surrounding was proponent for interventions to improve liveability, as it was unbearable for the people living close to the N65. This was specifically influenced by the people from a part of the centre that knew well how to attain attention from the mayor. Their wishes were heard and the mayor influenced the national politics to make things happen at the N65.

There were discussions about dividing the money, as €90 million was accounted to Vught and €10 million was accounted to Haaren. Vught invested €10 million themselves and Haaren would invest €3 million from their budget. Initially, the municipality of Haaren was happy with the available money and the planned interventions. Additionally, as the project was considered as a spatial challenge where the whole area is developed, the money should to be invested in the most urgent parts. Later on, it became distinct that the municipality of Vught would get more yield for the money they invested. As Haaren also had liveability problems, this led to the desire from Haaren to analyse a deepened intersection. Although this would not be possible for the earlier determined €10 million, it was requested to take some of the budget of Vught. However, Vught strongly disagreed and wanted to use the extra money for spatial quality. This led to discussions about the fixation of the budget per municipality.

The municipality of Den Bosch stayed on the side-line, which led to frustrations. Due to changes in the council, they did not want to financially contribute to the project. The province desired to improve the area by its spatial challenges. It was desired to make the N65 a road with a beautiful open character. As parties were in a deadlock and could not find an agreement, the recently elected representative of the province wanted to pursue the project and end the discussion. The extra available money made it possible to make decisions and continue. When it would be decided to end the exploratory phase without an outcome, this would be unsatisfying, as nuisances of the road would only become bigger. Additionally, sound walls should be placed nevertheless to decrease the noise nuisances.

InnovA58

Cause
Expansion of the road was only available after 2023. However, the province considered capacity expansion as urgent, as accessibility of, for example, the brainport Eindhoven was under pressure. Next to that, the employers' association said that funding could become available earlier by the use of innovations. By having money available before 2023, this could lead to earlier execution of the project. The province was convinced to participate and the ministry also agreed. Accessibility and traffic flows were considered as problematic and with this financing structure this could be solved faster. After the reveal of the bid book, it became evident that there were uncertainties whether these innovations could be considered as innovative and whether this would generate money. However, all parties were on board and the project started.

Exploratory phase
Next to looking for innovations, there was a continuous discussion whether innovations were a goal or an instrument to look for financing. This is a dilemma, because when a cost effective innovation is applied after five years, it might not be considered as an innovation. These discussions led to delays and a slow process. Later on, a company came on board to come up with innovations. They helped find where to start with innovations and they became part of the project team. Additionally, his brought new energy for the project team to look for project innovations.

If it comes to integration and participation of the residents and surrounding, much attention was paid to the Annaville tree. The Annaville tree is an old and famous tree, which is located in between the roads. Whether the tree would stay or move to another location involved a lot of communication with the surrounding and public. These aspects concerning implementation and attention for innovations were also important for the minister, as she was known for the use of asphalt. With these elements, it was desired to pay extra attention to the character and integration of the road.

Project alternatives
The start document states that the extra lane that result in a road with two times three lanes is preferred. However, municipalities influenced the project organisation to consider other alternatives. The province of Noord-Brabant represented the interests of the region. The province communicated these interests to the Ministry of I&E and Rijkswaterstaat. This led to incorporation of an extra set of alternatives in the exploratory phase such as parallel roads. Analysing parallel structures was preferred as it would decrease the traffic in the municipalities and it would improve the connection to Eindhoven airport. The project organisation was experienced to be positive. The lines between organisations were shorter and organisations were consulted indirectly, it was experienced that this resulted in a smooth exploration phase.

Project organisation and stakeholder involvement
It was experienced that the wrong people from the businesses were sitting at the table, as most people came from the construction sector. It was difficult to expect them to consider innovations, when this was not their business. Additionally, it was their goal to have the exploratory phase of the road expansion on the agenda. This hindered the project to come up with innovations, as it took a lot of time to get the innovations on the table. After calculations, it turned out that it was difficult to generate money from the innovations thus fund the pre-financing of the province. It is possible that the process would have been different if there were people from the beginning on board that had real experience with innovations.

The cooperation with the ministry and Rijkswaterstaat was considered as very positive. As the province would pre-financed the project, they were considered as an important organisation with influence in the project. Close cooperation led to more understanding. The information and experience was passed on to the decision makers, which led to useful preparations and smooth steering meetings. As she took place in both steering committee and counselling committee, it was easy to use the feedback with other meetings. This improved preparations and made it easier to make decisions.

Differences between the projects
The main difference lies in differences in the location of the projects. The InnovA58 is a highway that does not cross municipalities, thus the involvement of municipalities relates in finding advantages. At the other hand, as the N65 crosses the municipalities, the liveability and safety problems are of a larger influence. This led to a higher urgency. Additionally, there are more groups involved, as the problems and interventions directly impacts the surrounding. This led to more emotions in the process. Next to that,

the relationship between the municipalities Vught and Haaren was disordered. They both had a different attitude in the process. Haaren was more awaiting and cooperative. The municipality Vught invested a lot of money in the project themselves and desired to have the outcome that was desirable for them. This also made that information was published from Vught' side, instead of an adjusted message that was shared with all organisations.

Report of interview 13

Organisation: Municipality of Haaren
Position: Representative of the municipality of Haaren
Date: Thursday January 19, 2017, 16:00 – 17:00 h
Subject: MIRT exploratory phase N65 Vught - Haaren

This report is available on request

Report of interview 14

Name: Astrid van 't Hof en René Papavoine
Organisation: Municipality of Vught
Position: Representatives of the municipality of Vught
Date: Thursday January 26, 2017, 10:00 – 11:30 h
Subject: MIRT exploratory phase N65 Vught - Haaren

Introduction
René Papavoine was only recently involved in the project of the N65. In the exploratory phase, he was responsible for the content of the project. Later on, in the plan elaboration phase, he became the project manager for the municipality of Vught. The experiences from other projects in Vught are useful, as it is possible to add nuances to developments in the process. The aim for the plan elaboration phase is to combine the MIRT project N65 with the regulation for noise (MJPG project), to make sure that this has to be executed only once. Astrid van 't Hof became project manager of governmental infrastructural projects in 2009. This contained the A2, the N65 and the rail project (PHS). As it was a lot of work, these projects are separated now and she is responsible for the rail project.

Several people switched over time. It is considered better for the process to have one person accountable for the whole process, as the process was capricious especially when decisions had to be made. It would have been better to sometimes stick to the decisions. Additionally, it is considered that it is easier to work towards a common goal, when the project team would not change over time.

Exploratory phase
The region initiated the exploratory phase. The municipality of Vught took a leading role in denouncing the liveability problems and problems in traffic safety, specifically the ease of crossing. The region combined their efforts in a lobby, which led to an accepted resolution in 2011. This resolution aims to re-connect the four parts of Vught, as the municipality is divided by 2 railways and 2 highways. This brought a solution and the involved budget closer.

Before the exploratory phase took place, there was a pilot N65. This pilot was form free and different variants were considered. This included a change in speed limit and the effect on the surrounding. Next to that, in a program of ambitions all regional parties stated their ambitions. This led to the desire to construct a tunnel, as this connects the municipality well. Additionally, this would lead to less noise and dust, also safety and ease of crossing would improve. However, these ambitions were too high and this would cost too much money. Nevertheless, this led to exploration of opportunities and considerations of what could work.

Project alternatives
The current exploratory phase was strongly focused on infrastructure. Little attention was attained for spatial quality. The N65 and the spatial challenge were two on-going projects. The spatial challenge, initiated by the province, desired to improve the spatial quality of the whole area. It is experienced that this spatial challenge was insufficiently secured in the exploratory phase, as the MIRT process assumed that spatial quality was a wish and therefore responsibility of the province of Noord-Brabant and the municipality of Vught. An integral approach is considered as the best. At the other hand, it is understandable that these elements are not connected in one project, as this leads to increased complexity that might hinder working towards an outcome. This requires identifying chances and opportunities.

It was difficult to incorporate the subjective elements in the discussions. For example liveability and spatial quality were not considered as a problematic, because it did not exceed the norms. It is doubted whether the norms are sufficient. It is experienced that these norms do not cover the problems and one holds on to those norms and rules too strictly. Another example is that, although all aspects are below these norms, the accumulation of the effects of these factors is not calculated. This leads to an incorrect view of the situation. It is understandable, as considering all these effects disjointed and sectorial makes it easier to make a trade off, but it makes it more difficult to justify a decision towards the residents. It was always aimed to give the decision makers sufficient information where the accumulation of the effects is considered, to make a careful trade-off and decision.

A first step towards making these decisions on integral aspects is the omgevingswet. This law takes the area and location as starting point, after that, it is analysed what effects impact this location. This was difficult during the project, as the rail project and the N65 were different projects. As these projects cross, the effects from both modalities should be considered. It was experienced that the national government strongly holds on to the rules and procedures to approach things. However, it is necessary to have consistency between the projects and think about this before the planning and construction starts.

The engineering companies had difficulties to objectify the aspects of liveability and spatial quality. Even so that the project was transferred to another company. It is not accountable to the companies, but instruments should be developed to deal with the subjective elements from spatial quality. Next to that, one should seriously consider the surrounding, instead of the rules and norms. This brings us to the desire to apply a custom approach, as not all residents want the same intervention. Additionally, it is desirable to start intervene at the source as this is more effective. However, as this is often more expensive, these interventions are not considered as cost effective. It is considered that money is often leading in decisions, instead of the impact on the surrounding.

The bottlenecks are nowadays mostly prioritised from capacity problems and accessibility, based on the NMCA. Projects are not prioritised from liveability, although it would be desirable to incorporate this. It is considered that problems and projects closer to the Randstad are prioritised over other problems, as economic interests are larger in this region. The reason that the N65 made it to the MIRT program, is because the game was played well. If the game was less successful, the N65 would not have made it to the prioritized MIRT projects. It is experienced that this political element should be of lesser impact.

Project organisation

The exploratory phase contained a lot of cooperation and this was unique for the project. Usually, it is the Ministry of I&E and Rijkswaterstaat that are responsible for a MIRT project, now other parties and municipalities were also involved in the project. The financial involvement leads to joint-client and this led to other dynamics, where more interests play a role in the process. It was experienced that the distribution of the financial contribution sometimes influenced the roles and responsibilities of the stakeholders. However, it is not possible to distribute the voting power based on this, as the load on the budget is different for all parties. Each party should have the same full influence and decisions should be made on consensus.

As the budget was estimated up front, the budget allocation led to mutual discussions between the municipalities. The budget should be discussed at decision moments with decision makers. Continuous discussions led to distractions from the process and did not lead to full effort to solve the problem and generate the best set of alternatives. This took a lot of energy. It would have been preferred to first look at the problem and the content, and then allocate and determine the budget. It was experienced that the

project was controlled based on the money, instead of the process and cooperation. It is questionable if the final result is the best achievable result.

The ministry and Rijkswaterstaat had little interest improving the N65. Based on the accessibility norms, there was no problem. The ministry considered this project as less urgent and this was reflected in the energy. This led to a force from Vught to look after their interests concerning liveability. It is difficult to weight out liveability aspects and express these problems with quantifiable measures. It is difficult to consider spatial quality and also the consideration between spatial quality and liveability. Noise is for example often considered in liveability, but a view on sound walls can have a bigger impact on liveability. However, this last aspect is difficult to quantify. This leads to a trade-off between these aspects, which is often based on subjective elements.

Stakeholder involvement
A sunken road was a wish of the municipality and this was considered to be a good solution. However, money was leading in the process and this did not fit the expectations. It is noted that expectations were not well managed. Even after the preferred alternative, some residents thought that a sunken road was being constructed. Although opinions differ, it is experienced that the surrounding was too little involved in the process. Especially since the N65 strongly affects the surrounding, they should have been involved more. There was little participation of the residents in the process. The people that were on board were representatives from the horse-riding organisation, cycle organisation and walking organisation.

The ministry experienced that they executed the exploratory process well, considering the usual MIRT procedure and the guidelines. However, from the perspective of the municipality of Vught participation of the surrounding was insufficient. Additionally, there was too little commitment about the goal and objective of the project. The ministry reasoned rather from a mobility-orientated perspective, where all aspects functioned well. This led to disagreements about the experienced problem. The differences in attitudes influenced the process and cooperation. This is noted as remarkable, as the minister stated during the start decision that participation of the surrounding would play an important role.

Participation of the surrounding could have done better by a clearer communication. Additionally, the process could have been more open. Only after the process, the end products are put up for discussion. However, if the people were involved earlier in the process, their desires could have been added and it would feel more as a joint product. This leads to more involvement and a more positive attitude of the surrounding and local politics. This required much more energy and effort from the project organisation. However, it is not always easy to represent the residents as they do not always want the same.

Next to that, there are strong differences in the interests between local, regional and national parties. Every organisation has another role. Initially, it was the aim to solve the problems in Vught with the start decision for a project. Later on, the role changes over the process to co client and co decision maker. Although national interests are important for the municipality, they are initially representatives for the local residents. This leads to the desire to work towards the best solution for the surrounding in the municipality. It was considered difficult to combine these two interests as these roles sometimes interfere with each other. As you become member of the project organisation, you have to make decisions opposed to the interests of residents to work towards project alternatives. The actions that are best for the surrounding are not always the best from the perspective of national interest. It is considered difficult to work towards a joint decision and also justify these decisions towards the surrounding.

The municipality of Vught had to fight for their position, as they had to represent the local politics and residents. The situation and problems in the area were considered unique. Although it would be easier

and cheaper to leave the rails and place sound walls, standard measures were insufficient to solve the problems. These sound walls would separate Vught, and therefore decrease the liveability, even more.

It is necessary to influence the situation and do the right things as civil servants, as this affects the local politics. This has always been like this in Vught. It is necessary to put the decision maker in the right position. Next to that, it is important that the alderman can tell the story right. The mayor also used his instruments, such as his political network, to raise awareness. The parties in the council were very aware of the situation in Vught and have always voted unanimously, this led to a strong power from the council. It is considered that a less powerful council can get less done. This is unfortunate, as decisions should be made on more objective factors.

Informal evenings were organised to talk about what is going on and what problems in the process are occurring. In this sense, the council and the civil servants were always closely involved. However, at some point as situation escalated on the rail, little attention was given to the process of the N65, where the sunken road was dropped as a promising alternative. The process continued and this was not continued to the council. Next to that, a decision maker changed. As there was an alternative that had a large influence on nature, this led to strong resistance, resulting in opposition from the council. In order to come to an agreement, decisions in the end were made with little influence of the civil servants. Deciding the preferred alternative took very small and fast decisions that result in the preferred alternative. In order to make all satisfied with the project alternative, the province added another seven million to the project. After that, the decision was made.

This has to be communicated to the residents, and not all residents were satisfied. This is partially the result as residents always had the goal of a sunken road and the long-term goal of a sunken road remains by both residents as local politics. However, although it is possible to construct a complete sunken road, looking at this realistically, it is not likely that this will happen within the next ten years. Next to that, the ministry and Rijkswaterstaat were decisive that a sunken road was not realistic. It can be stated that personal beliefs were of large influence in the process. For example, Vught had to represent the desires of the local politics and residents and therefore the goal of the sunken road. It would have been desirable if the other parties considered this more seriously and had more empathy for the split position, between the goals of the adherents and the desire to find a solution.

Usefulness of the guidelines

The guidelines and rules constrain a more creative process. The process focuses strongly on filtering towards one preferred alternative. It is experienced that generating a broad set of alternatives did not fit in the process.

Report of interview 15

Name: Ad Verhoeven
Organisation: Multi Modaal Coördinatie- en Adviescentrum Brabant (Former: Chamber of Commerce)
Position: Project manager
Date: Thursday January 26 2017, 13:00 – 14:00 h
Subject: MIRT exploratory phase InnovA58

Introduction
The Chamber of Commerce and the employers' association of Brabant and Zeeland started the foundation A58. The foundation A58 offered the minister a bid book to give another perspective on the problems and opportunities of the A58. By proposing a sustainable and innovative approach, it could bring up an interesting business case for the ministry, where the road expansion would be earned back by exploiting the road over several years. Although Rijkswaterstaat was not a partner in this initiative, they were informed about the bid book. Next to the bid book, there was no political influence to trigger the minister. As the minister responded positive, this led to a business case with further estimations to analyse if it would be feasible for the government. The next phase led to the start of the MIRT project, which would carry the name InnovA58. Rijkswaterstaat and the province of Noord-Brabant were involved. Next to that, PwC made a second opinion of the business case. They concluded that the business case could be interesting. This led to reservation of the MIRT funding in 2023 by the minister of Infrastructure & Environment. The province of Noord-Brabant guaranteed a pre-financing of three years, so the executing could start in 2020.

Exploratory phase
Two types of innovations were considered. First, it incorporated how and when the project could be offered to the market. Second, it considers applying innovations. This led to the insight that the current tender procedure leads to difficulties in applying innovations, as the current procedures secure high standards of safety and quality. These discussions led to certain awareness. At the other side, it was very important for parties and politics to show the financial feasibility of the business model. It is noted that this feasibility is only fixed when this is secured in the contract. The businesses keep their cards to their chest and they did not fully open up about their innovations, as other businesses can use this strategically. This leads to a game, where the yield is only certain when the market is consulted. However, early involvement of the market also involves (financial) risks, which were undesired. It is acknowledged that it leads to complexities and difficulties when different parties are involved. It is difficult to estimate the risks and uncertainties concerning the budget of the province.

This leads to a dilemma, at one hand it is desirable to decrease the risks with calculations, but at the other hand it is known beforehand that these estimations will never become true, as calculations are based on current information. Another dilemma occurs, as it might be desirable to leave the project open and ask businesses to increase flow capacity, instead of concrete alternatives. However, in practice the exploratory phase is done in the old, more technocratic, way, where project alternatives are defined. These predefined and static steps are sometimes considered necessary, as the support of the residents increases when clear alternatives are known. Established rules and guidelines are another reason to follow the technocratic way. It is often difficult to think outside the box.

Project alternatives
It is considered that identifying the solution spaces and the exploratory phase was done well according to the guidelines. Elaborating alternatives could be done a little broader. However, this workflow was never a discussion and followed the guidelines well. Nevertheless, involvement of the residents in the phase

before should be done better, as they should have the feeling that the project will have a positive impact on their environment. Co-creation is likely to have a positive influence on the attitude of residents. Next to that, the two innovative workflows had little impact on the exploratory phase. This can be caused as the workflows were executed parallel. It would have been desirable to have the two workflows concerning the innovations ready, before starting the exploratory phase. This led to new insights, but did not have an impact on the exploratory phase itself, as it was not embedded in the guidelines. The structure of the tender will show whether innovations are triggered and it will show whether parties are willing to contribute with innovations and what innovations are considered to be promising. Although there are risks involved, it is often considered that Rijkswaterstaat holds on to too many certainties, in for example budget and solutions. At the other hand, the market is more flexible in looking for possibilities and alternative solutions.

Project organisation and stakeholder involvement
For the community in Brabant it was most important to have the A58 on the agenda. Next to that, it was desirable to have financial means become available, so the project would be forwarded in time. Innovations were only a mean to achieve the goal to improve accessibility in Brabant. However, it often happens that the mean becomes the goal on itself.

The foundation stayed involved until the end of the exploratory phase. Although they were leading in the beginning, it was considered that they had less influence later on in the process. The ministry was leading in the InnovA58, and in the exploratory phase where the exploratory phase was one of the three workflows. It was considered that the project leader of the InnovA58 was accountable for decisions and that some decisions were made in the advantage by the ministry. The process was not completely open, as the process was elaborated on the desired outcomes and decisions.

The competition between construction companies is very strong. It is difficult to get them on board together and open up their innovations, as they want to be sure that they can have an advantage opposite the other companies. It is desirable to involve the parties that are actually developing the innovations, such as for example Philips. These parties are often more leading in innovations.

The project organisation was considered to be positive, as it triggered Rijkswaterstaat and the rest of the organisation to think creative about applying innovations. Next to that, innovations that were addressed in the bid book became part of the budget cuts of Rijkswaterstaat. As innovations, for example the use of road sites, were applied, this could not contribute as an innovation in the InnovA58 project. This led to discussions whether and what innovations could be incorporated in the project. It is noted that actually applying innovations turned out to be much more difficult. It is difficult to say whether innovations are applicable or not, due to the exploratory process. This is caused by the restrictions that are raised, to maintain the scope and contracting structure of the road. It is stated that another way to look to the problem is not incorporated in the framework that one uses to execute the exploratory process. It would be desirable to give the contractor more freedom, so they can come up with innovations. To manage concerning uncertainties, it is possible to draft the contours of the project, such as environmental factors and requirements concerning the traffic flow.

Other parties responded differently on the input of the businesses. Sometimes it was experienced that they did not understand the situation. However, at the other hand, it was experienced that they were able to have another, broader view on the problems. This small scope led on a focus on the technical possibilities and opportunities, instead of involving the people to become part of the process. There is little connection with the different aspects and elements, while the bigger picture and the whole system could improve efficient use of money and resources. This is partly accounted to the decision makers, as

they want to put their own projects and problems forward, instead of taking an integral program with prioritisation of problems and bottlenecks.

Usefulness of the guidelines and the renewal of the MIRT

The guidelines were in some sense blocking the innovations, as it aims to avoid uncertainties. This is oppressing if it is desirable to apply innovations. For example, the existing rules prevent triggers for the market to apply smart or future resilient solutions. It is not allowed to construct an extra lane for the future, when it is not considered to be necessary today. This takes away the advantages for businesses.

It is experienced that there was little communication from the project organisation towards the residents and surrounding of the A58 concerning the added value of the interventions of the A58. This led to supporters and opponents, instead of participation and co-creation of project alternatives. It is considered important to involve residents and get them on board to construct something that is beneficial for them too. However, this is often lacking. It is considered that national parties can technically contribute, but that stakeholder involvement is often lacking. However, it is important to make residents part of the success, instead of opponents of something they cannot stop. This is insufficient secured in the guidelines. By involving a smaller, local party for communication and management of the surrounding, it is more likely to have a better feeling for the local situation. Although there is much energy and involvement for different aspects of the project (e.g. the Annaville tree), there is little energy and involvement for realising the whole picture.

Report of interview 16

Name: Tim Artz
Organisation: AnteaGroup
Position: Consultant
Date: Wednesday February 1 2017, 12:00 – 13:00 h
Subject: MIRT exploratory phase N65 Vught - Haaren

Introduction
AnteaGroup was early in the process involved. This involvement started with the pilot study, before the exploratory phase took place. This pilot analysed preferences of the desired interventions of the N65, these aspects continued to the exploratory phase. They got involved in the project just after the first filter, where five promising alternatives were established. AnteaGroup was involved to further elaborate these alternatives and score them, to result in a preferred alternative.

Project alternatives
The process of generating project alternatives is partly influenced by ideas and desires brought up by the municipalities and the residents. The quick scan to come up with new building blocks was necessary as the preferred alternatives that resulted from the first filter were considered to be infeasible and insufficient. It is noted that this says something about the previous process of generating and identifying alternatives, if these alternatives were not promising because of their effects or costs. Within and after the quick scan, new alternatives came up. This turned out to be a very dynamic process, where the input of decision makers was of large influence. In the end, the preferred alternative is decided within four months, especially in the evenings.

Further elaboration of the project alternatives leads to decisions based on details in the design and cost estimations. It is experienced that this comprehensive research is often too extensive for decisions. It is considered to be more important to translate the calculations into information that is useful for the decision maker, with the research as justification of the decisions.

Project organisation and stakeholder involvement
Participation plays an important role in each exploratory phase. This can be divided in two different kinds of participation. First is the participation with the governments or partners. Involvement of these parties is important, as they financially contribute in the project. Second, participation of interest groups or residents is also considered to be important. It is often the question to what extent to involve these groups in the process. It is noted that informing and involving the residents could have been done better. However, this was considered difficult because of the chaotic process where the promising alternatives turned out to be infeasible. This led to a focus on generating building blocks with a quick scan and resulted in for example less attention to sending letters or responding to letters of resident organisations. Next to that, the person who was responsible for the process of involving the residents lacked to involve them in the process. It is noted that the success of such important aspects is also dependent on the quality of people and organisations.

It was considered difficult to involve the municipality of Vught, as their relation with the council was difficult. The council wanted to construct a tunnel, while this project alternative dropped out based on fair motivations. Next to that, the council little supported the project organisation. This made the process difficult, as the measures affected Vught and they were necessary to continuate the process. These situations led to tension in the project organisation, as it was considered that Vught hindered the process. This shows the importance of the relation between the civil servants and the council. A good relation

helps in preparing the decisions, as the ideas and interests of the council are already involved. At the other hand, the council of Haaren had a more positive and constructive attitude. All together, it was a laborious process.

It was difficult to propose improvements to the process, as AnteaGroup had a facilitating and advisory role. It was not their role and it was not in their power to improve participation and inform the residents. Nevertheless, it should be discussed beforehand who is responsible for what. If this is not well identified early in the process, this results in problems later on in the process. Additionally, it is necessary to make a route map for participation, to incorporate how to deal with residents. However, it is also noted that the process of participation and communication is often dependent on external factors, such as a change in aldermen. It was not possible to see this happen beforehand, thus it is difficult to anticipate on this.

Usefulness of the guidelines and the renewal of the MIRT

It is noted that the renewal of the MIRT is slightly different from before. Only differences in accents and regulations are observable in the MIRT guidelines. This follows trends in environmental law, as it overarches different parts. These regulations often follow the changes in practice. For example, participation and flexibility are not new within projects. However, as it was not brought up in the old guidelines, it gets a more prominent place in the new guidelines. What was already done in practice, is now processed in the official guidelines and procedures.

The guidelines were followed well. The quick scan is an improvisation, as the situation changed. This additional step in the process was agreed upon together with the decision makers. This also led to an unorthodox Cost Benefit Analysis, which is rather a (qualitative) sensitivity analysis based on the previous Cost Benefit Analysis. Although this was not completely in line with the guidelines, this was effective and it was sufficient for the decision.

The outcome of the Cost Benefit Analysis was low, as traffic flow was not the primary goal. It is noted that this method works well when travel times decrease for many people on a longer trajectory. The traffic model showed a decrease in travel time on another trajectory, which was not explainable. This resulted in strong benefits in accessibility, while the main goal was to improve liveability. The desired improvements in liveability and spatial quality were difficult to express in monetary values. It is therefore questioned why to execute a Cost Benefit Analysis, if it is known beforehand that there will not be a positive cost/benefit outcome. This outcome of the Cost Benefit Analysis was not of influence in the decision, as the money was already promised. The Cost Benefit Analysis was rather executed because of procedural regulations.

Several ideas were proposed to capture liveability such as spatial quality in indicators within the exploratory phase. For example the increase of the value of the dwelling can express the decrease of barriers or noise nuisance. Although a little extreme, it is also possible to consider the number of people that died earlier due to air or noise nuisances. It was experienced that the Cost Benefit Analysis was not relevant, as travel time decrease was not the goal of the project. As liveability and spatial quality is more important, a more spatial and qualitative analysis is desirable. Although this was done in the N65 project, it is noted that this was not well elaborated as this was rather done on a street level. Although this is often preferred for the people to consider the local impacts, this is undesirable for a less detailed exploratory phase. There were six aspects that were graded with plusses and minuses.

There were two Value Engineering sessions, first in the first filter and the second one as there were no promising alternatives available. It is considered that the Value Engineering study and research in the first filter was not executed well, as the validation to see whether the alternatives are promising is missing. This

was lacking because alternatives came up that did not solve the problem and that did not fit within the financial boarders. Considering the second Value Engineering session, it was experienced that Value Engineering was not necessary in this phase, as most project alternatives were already defined. It did help in improving the project alternatives. The improvements are considered together with stakeholders, but they show minor improvements in costs or performance. It is especially relevant how to present the outcomes, so it is easier to compare the scores. However, it says nothing about the quality as it only shows a score related to another element.

Value Engineering is considered as a useful tool. However, the mind set should be a standard component of the project either way. Value Engineering contains official trainings, after finishing such trainings one is qualified to organise the sessions. However, it is noted that a successful outcome is rather dependent on the quality of the people. The process and procedures should support the session, while the people are of essence for a successful outcome. Although it sounds very straight forward, the importance of the person using the instrument is sometimes underestimated. Next to that, it often starts with a solution, instead of the problem and the goal of the project.

It is sometimes difficult to anticipate, thus it cannot always be avoided to reflect on the process afterwards to do it different next time. For example, situations and the interests of stakeholders can change. Before, all parties agreed to close one of the intersections for car traffic. However, in the end a project alternative is considered where cars can still cross the N65. This shows a change of the alternative compared to the initial starting points. This shows the importance to involve politics from the council, as they often derive at other results than the civil servants or people that are involved with the content. The dynamics of the process is likely to increase, as more stakeholders and more opinions will take place at the table. It is therefore necessary to acknowledge that there is no silver bullet for a MIRT exploratory phase.

It is noted that the guidelines work well, but that it is sometimes necessary to have the freedom to determine whether a Cost Benefit Analysis is necessary or not. Sometimes it would be necessary to do research on a more global level, while sometimes more detailed research is needed. It is also necessary to do more applied research, and only incorporate aspects that are important for that specific area. It is noted that this changes within municipalities. However, it is noted that Rijkswaterstaat has issues adjusting to that, as they often work with standard procedures. Although they secure a certain level of quality, it provides less room for flexibility. Protocols can help, but they rather have to be supportive than leading, as the feeling for the specific situation is considered to be important.

Report of interview

Name: Niek Albers
Organisation: INFRAM
Position: Consultant
Date: Tuesday February 7, 2017, 12:00 – 13:00 h
Subject: MIRT exploratory phase InnovA58

Introduction
Niek Albers graduated in public administration and started within INFRAM during his graduation in 2007. His projects often take part in the early phase, such as MIRT initiative, the MIRT exploratory phase or regional processes. Currently, he focuses more on water projects, but still does projects in the infrastructure domain on the side. To give an example, the Knowledge Institution for Underground Construction asked INFRAM to develop an assessment framework for underground construction. This did not lead to strict guidelines, but this resulted in a set of criteria that should be considered for a good assessment process. This publication is called *Zeven sleutels voor een waardevolle afweging.*

The initiative phase
Next to that, Niek participated in the initiative phase of the A58, N65 and A67. The region wanted to start the project, but the problems were not shared between other stakeholders. This initiative phase focused on elaborating the situation and problems. The Ministry of I&E involved INFRAM in this project to check the quality of the documents and safeguard the interests of the ministry. By taking the lead in this project, it became evident that the MIRT has restrictions. Problems were experienced in estimating the situation based on accessibility norms, from the NMCA. It is being told that another indicator would replace this, but the current norm is still in function. This accessibility norm shows two problems. It only focuses on travel time and it uses pre-defined trajectories. For example, if one takes a longer trajectory, then problems will average out. However, a small trajectory shows large problems. Next to that, the project focused strongly on infrastructure, while there were also problems experienced in functions around the road. For example, the A67 has many surrounding nature areas and it would be desirable to connect these areas. Next to that, service areas next to the road were also considered as problematic, as there are too few areas. Although these aspects were incorporated in the initiative phase and this led to a broad view, in the end one reverted back to the problem of accessibility and travel time norms. This leads to limited integral challenges, as budgets are strictly labelled and politic priorities changes. For example, the money for connecting the nature areas had to come from the Ministry of Economic Affairs. This broad view led to difficulties for the exploratory phase, as financial funding could not be secured.

The initiative of the A58 started, as the problems in safety, robustness and experience of the A58 were not considered as national bottlenecks. The region did experience problems in these aspects. Next to that, it was also desired to improve liveability and nature areas. Another cause was the availability of money from the province of Noord-Brabant. This led to the willingness to invest in infrastructure. Next to that, it is attractive for the Ministry of I&E if they have to pay less, even if the project does not have a high priority. However, this cost a lot of energy from the regional lobby to bring up this problem and initiative. Although there is the intention to take a broad view, in practice this turns out to be much more difficult. It is experienced that the division of the budget often causes this early division in budgets. Also the administrative culture prevents a broad view. It is experienced that the region often desires capacity expansion with asphalt. A lobby with available financial funds often lead to a stronger focus on the desired alternative, such as an extra lane. These strong forces prevents the project organisation to take a broad view and also consider other modalities.

The exploratory phase
The InnovA58 contained three workflows. The three workflows, exploratory phase, innovations in technology and innovations in contracting were considered parallel to each other. As this were three separated tracks, it was considered difficult to bring the outcomes of the tracks together. The exploratory phase was done together with Movares, Goudappel and Decisio. It started with the first phase of Eindhoven – Tilburg. The second phase was done for both Eindhoven – Tilburg and Sint Annabosch – Galder. The exploratory phase did consider other types of measures but these measures from the innovative track would not lead to a solution on itself, as they turned out to have little problem solving capacity. Several variants of expansion were considered, where the two times three lanes came out as most promising alternative. This alternative is considered to be a safe and robust alternative. It was considered that the innovative measures were rather brought up to improve the regional lobby and come up with a distinguished story, so this would lead to capacity expansion of the road.

Project organisation and stakeholder involvement
The first phase of Eindhoven – Tilburg contained a Value Engineering study. It is experienced as a method. More flexibility in the method would lead to more insights in the functions of the area, improvements of the performances and possible reduces in costs. This FAST diagram that contains the functions is helpful to brainstorm about potential measures. However, it is observed that the report pays little attention why alternatives were no longer considered. There was the intention to take a broad view and Value Engineering is considered to be a useful method to do so. Niek Albers also has his certificate in Value Engineering, as many clients desired a study within the projects. As the value engineers are part of cost engineers, it is considered that the instrument is applied strictly following the methodology. This is considered undesirable, as it is up to the decision maker to make a decision. This always involves a trade off between e.g. nature, money or travel times. This is not up to the Value Engineering session, but the decision maker should make this trade off.

The participants of the Value Engineering study are of influence on the outcomes. This study mainly considered traffic experts this also led to outcomes focused on traffic. Considering spatial experts or sustainability experts would likely lead to another FAST diagram. It is noted that this project did not incorporate other experts, as it was desired to keep the project simple. The goal was to keep it sober and expedient and this was of influence for the process. Next to that, it is experienced that the culture of Rijkswaterstaat and the ministry aim to mitigate the risks. Even if it is desirable to try something new, one easily falls back in considering what could go wrong. Mitigation of risks is considered to play a role on the personal level (one risks his own position within the organisation) and on the organisational level (Rijkswaterstaat is used to work with a high level of details).

The Value Engineering study was used to define alternatives and to test the promising alternatives. Afterwards, the traditional process and support the project alternatives was executed. This Value Engineering study was considered useful for the pre phase of the exploratory phase as it maintains a broad perspective. However, it is important to consider the person who leads the session, as this could reduce the energy and the possibilities of the method.

Project alternatives
It was experienced that the three workflows were little connected, as it was the goal to realise the road widening as soon as possible. This made it difficult to come up with innovative or other alternatives. Next to that, the lobby from Brabant was strong which made it difficult to start the discussion and question the current alternatives. It is questionable to what extent this project was put forward in time, as it took

another one and a half years after finishing the exploratory phase before the plan elaboration phase started. If it is desirable to increase the speed of the exploratory phase, one should not take a broad perspective. This dilemma was also experienced in the exploratory phase of Haaglanden, where the exploratory phase could be executed quickly, but then they had to wait for the money. It is considered good to set boundaries to the exploratory phase, because too much details and too little direction will not lead to anything. However, as the infra fund is fully spent until for example 2028, one has to wait 10 years before the money becomes available. This is also undesirable.

Usefulness of the guidelines and the renewal of the MIRT

The renewal of the MIRT was of little influence in this project, as this project started before the renewal took place. The project North-East Amsterdam was one of the eight projects under the '*meer bereiken'* philosophy and INFRAM offered to apply an innovative approach. However, as this was a new method, the client asked what would happen if this approach failed. This attitude resulted in requests where the approach was copied from another request. It is questionable how this would contribute to the renewal of the MIRT, if there were six equal approaches for each project. It is experienced that these risks are avoided as it possibly hinders continuation of the project. Next to that, policy makers of the ministry are used to avoid risks. It is likely that they take this with them once they become project manager.

Although there might be the ambition to do this exploratory phase fast, there are several causes that lead to delays. The desire to have certainties in the project is also one of the causes. Another example is that it would be desirable to incorporate positive impacts for the environment. However, as these positive developments are often uncertain, this is often used to compensate the certain negative effects on the environment, such as a road expansion. This shows that, although parties are able to take a broad perspective, risks, practical issues and rules withhold the project organisation to do so. This requires a cultural change. The A9 shows capacity problems and there are two things possible, either improve aspects in the area, such as public transport and bike lines or improve the capacity of the road. However, adjustments to the A9 might have a negative impact on the secondary aspects. Next to that, interventions in the area show two problems. One of the aspects is that the funds are labelled, which makes it difficult to take use money that was assigned to the road for other modalities. At the other hand, it is difficult to shift the focus from the A9, as the political sphere changes after four years, which is likely to lead to new lobbies. This was also observable when the MIRT was extended for another two years and all individual parties had their specific desires (traditionally) ready. It turns out that the money is allocated to the parties who have the best lobby. Nevertheless, just before the parties considered that a new approach was necessary. It is experienced that this contradicts the assumptions from the renewal of the MIRT. Other rules to allocate the money might help, such as the flexnorm from the IBO and a release of the labels from the money, so the money can be allocated to exploratory phases in general. This leads to more exploratory phases than what can continue to the plan elaboration phase. It is likely that this will lead to more consideration and a better trade off to make decisions.

It is uncertain whether decision makers will accept this, as each executive wants to bring in the project. However, it is noted that the recommendations from Elverding come back in sight. It is desired that a good story for the project is ready after two years. If it takes more than two years, then there is no urgency or no good story line. It is difficult to implement this within the guidelines, as it is overall experienced that the procedures hinder the project. It might be preferable to assign budgets to the area and the challenges within the area. However, this is also exciting, as the areas come up with specific projects, instead of value increase by bundling projects and incorporate private means. Such a program should have an overarching goal, with efforts and projects to meet this overarching goal. However, the current Smartwayz.nl program is rather a bundle of projects that was necessary to keep the money in the region.

It is considered that some projects should be executed differently in line with the renewal of the MIRT, in order to make this renewal a success. It is also necessary to have different projects and processes, to experiment with different approaches. This is difficult to get off the ground, as one is afraid that an approach will fail. Based on this, it is possible to come up with a new standard. In order to do so, it is necessary to leave the process open, so the project organisation can determine the scope together. When capturing this within guidelines, this might decrease the creative process.

Appendix G: Best-Worst Method responses

Table 14: Responses of the survey

Resp. Nr.	C1	C2	C3	C4	C5	C6
1	0,176	0,398	0,176	0,106	0,106	0,038
2	0,164	0,164	0,164	0,073	0,273	0,164
3	0,434	0,261	0,104	0,087	0,075	0,038
4	0,166	0,044	0,358	0,226	0,124	0,083
5	0,389	0,167	0,167	0,040	0,167	0,071
6	0,164	0,164	0,164	0,073	0,273	0,164
7	0,409	0,182	0,136	0,045	0,091	0,136
8	0,163	0,245	0,098	0,070	0,392	0,033
9	0,325	0,129	0,129	0,055	0,325	0,038

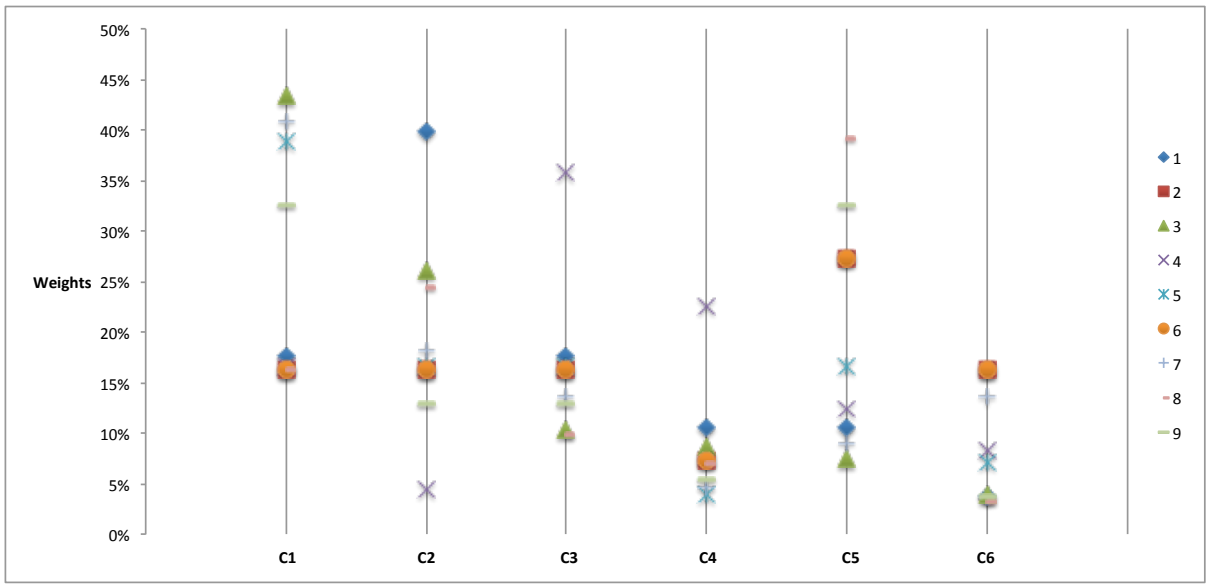

Figure 15: Distribution of the weights of the criteria

Table 15: Average of the scores of the method, given the criterion

	M0	M1	M2	M3	M4	M5
C1	0,145	0,273	0,195	0,144	0,118	0,125
C2	0,071	0,177	0,212	0,137	0,149	0,253
C3	0,109	0,284	0,234	0,133	0,129	0,111
C4	0,110	0,326	0,292	0,084	0,113	0,075
C5	0,126	0,216	0,152	0,105	0,180	0,222
C6	0,182	0,236	0,157	0,115	0,160	0,150

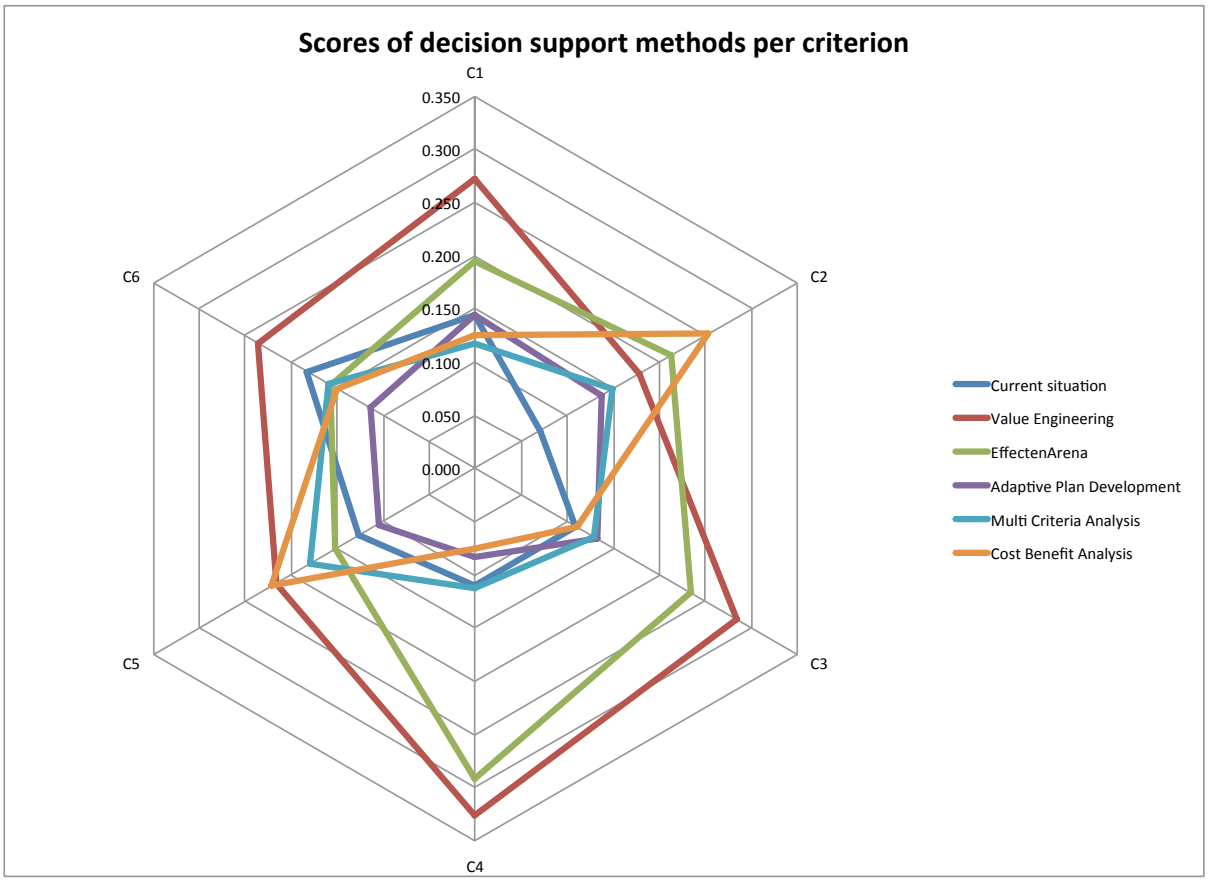

Figure 16: Score of the DSMs given the criterion