Managing Opportunities in Infrastructure Projects

"How to increase client value in the planning and realization phase"

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Preface

This report is the product of a research on opportunity management in infrastructure projects. It marks the final milestone of my master study Construction Management and Engineering. Almost 12 months of work have come to an end with the finalization of this report. Of course many thanks go out to the various people that have assisted and guided me through this period. First off all my colleagues at AT Osborne for the warm welcome and interest they showed in me and my research. Special thanks go out to my fellow graduates students at AT Osborne, Timon Bruggema and Matthijs Winkelaar, for their support and friendship.

On a more personal note I would like to thank the following people. Mr. Halman for giving me the right directions at the right moments. Even if I may not have always understood the direction at that moment in time. To Mr. Al-Jibouri I would like to show my gratitude for always being available and providing me with constructive feedback. Furthermore I would like to thank my supervisors at AT Osborne. Ellen Gehner, for being 3 supervisors in one: company supervisor, university supervisor and a critical reader! Paul Brinkman thanks for your enthusiasm and your ability to always ask the right questions. You have both been a tremendous support and I'll always be grateful for the time and energy that you have contributed in the past year.

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Marcel van der Wal

Summary

This research focuses on opportunities and opportunity management in the planning and realization phase of infrastructure projects. Opportunities are uncertain situations that can be exploited by the project team in order to create added value for the client and opportunity management is the systematic identification, evaluation and exploitation of those opportunities. It is expected that a better understanding of what opportunities are and how to manage these, can support project managers not only in achieving their project objectives, but also by exceeding them. In addition, this understanding can provide short and long term added value for the client. Objective of this research is to provide new knowledge on opportunities and the management of opportunities.

In order to achieve the above objective, three research methods were applied. (1) A literature study in the field of opportunity management by consulting and studying entrepreneurial and project management literature. (2) Empirical data gathering by conducting interviews with twelve experienced project managers of infrastructure projects. (3) Validation of the answers derived from the interviews in a workshop with project managers from the interviews and additional project managers.

On the basis of the research approach described, the research has shown that little literature is available on opportunity management for projects, especially for infrastructure projects. Using information from experienced project managers it could also be concluded that opportunities are more likely to be discovered than created. This means that project managers are more inclined to respond to change for identifying opportunities, than to pro-actively search for opportunities without a direct cause.

In the literature on opportunity management, identification of an opportunity is followed by an evaluation, whereby the added value is weighed against time and effort necessary for exploiting the opportunity. Although evaluation and exploitation are regarded as two separate steps in the literature, empirical information collected in this research suggest that both steps are very interrelated. From practice several important aspects were identified for opportunity evaluation and exploitation.

In addition to the conclusions on opportunities and the way they can be managed, two other conclusions can be drawn on the information received from the interviews and validation workshop. (1) Within practice, different interpretations on opportunity management exist. (2) Project managers are eager to learn more on opportunity management, but have little tools and knowledge available to assist them in this process.

To conclude, opportunity management is a part of project management that has always been done implicitly or not at all. This research aimed to provide an understanding of opportunity management by looking at both the theory and practice. It is the belief of the author that consciously applying opportunity management helps project managers in realizing added value for the client.

Recommendations for practical usage of opportunity management and opportunities for further research are listed in chapter 7 of this report.

1. Introduction

1.1 Research context

This master thesis is the last part of the master study Construction Management & Engineering (CME) at the TU Delft. Usually conducted in collaboration with a company, it constitutes the final work of a student before graduation. The CME master was established as collaboration between the three technical universities in the Netherlands: Delft, Twente and Eindhoven. This research is done in collaboration with the University of Twente. The company involved in the master thesis project is AT Osborne.

AT Osborne works in the field of real estate and spatial development as a consultant and management company for both public as private clients. In addition to consulting, the company also works for clients in various project roles, such as project manager and risk manager. There is a demand within both these two roles to have a better insight in the management of opportunities in infrastructure projects. This research investigates how to manage opportunities, therefore it is specifically written from the perspective of the project managers, as they are responsible for managing these opportunities in their projects. However, this research is also highly interesting from a scientific perspective, because it is one of the first studies done on opportunity management in infrastructure projects. Additionally, the literature study presents an interesting elaboration on opportunities from the entrepreneurial literature.

1.2 Structure of the Report

This report is structured according to the framework described by Kempen and Keizer (2000). This framework divides the research into three main phases: (1) (orientation, (2) research and (3) solution. This is shown in Figure 1-1. Kempen and Keizer (2000) also describe an implementation phase, but this phase is not part of this research. In the report the three phases are addressed as follows:

Orientation phase
Chapter 1 gives an introduction to the subject. In chapter 2 the research design of the study is discussed. Additionally the research problem, the objectives of the study and the research methods are presented.

Research Phase
In chapter 3 the literature study is described. Literature from the field of entrepreneurship and project management is used to formulate several hypotheses on opportunity management in infrastructure projects. Chapter 4 presents the empirical data that was gathered in the interviews, furthermore the information from the validation workshop is presented for every hypothesis.

Solution Phase
Readers who are mainly interested in the outcome of the research should read chapter 5 and 7 from the solution phase. In chapter 5 we elaborate on the implications for practice that can be drawn from the analysis. Before the conclusions and recommendations of the research are presented in chapter 7, a discussion can be found in chapter 6.

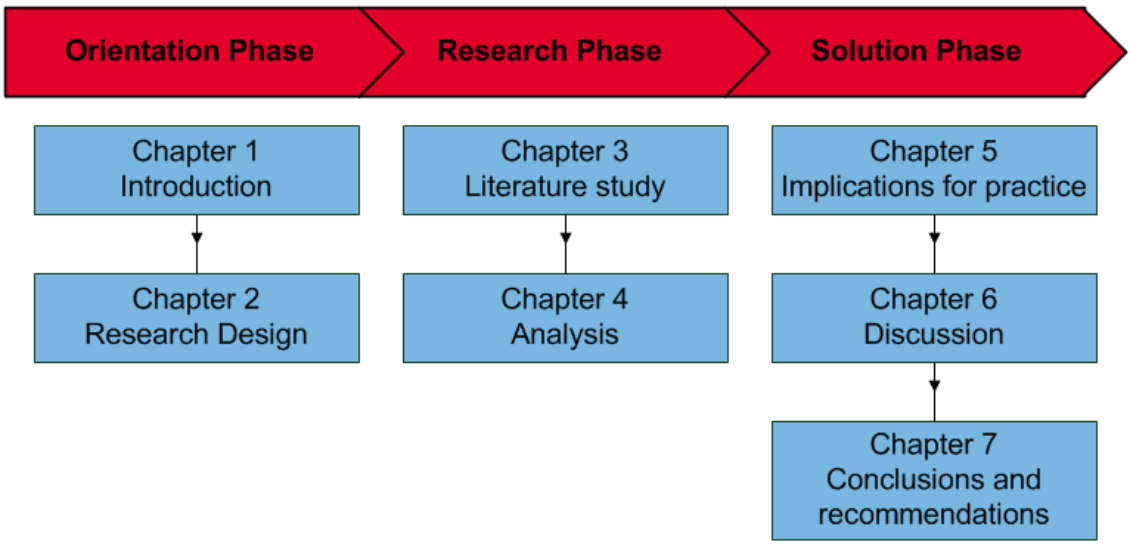

Figure 1-1: Structure of the report

2. Research design

In this chapter the research design is described. Section 2.1 starts with the problem analysis, which is the basis of the research design. The demarcation of the problem is explained in section 2.2, the problem definition is made in section 2.3. Section 2.4 defines the research aim. Finally the research questions and the methodology are described in section 2.5 and 2.6. The research methodology also incorporates information on how the empirical data for this research was gathered.

2.1 Problem Analysis

Literature on project opportunity management is limited and few studies have been performed in this field. This is probably because it is not part of the standard project management practice. In their evaluation of 15 large infrastructure projects Hertogh et al. (2008, p. 41) state the following recommendation on opportunity management:

"It is important not just to assess risks systematically but also to identify opportunities which may arise or be achieved within a project."

However, there is a lack of empirical studies that deal with project opportunity management (Perminova et al., 2007). This is an important observation, because it raises several questions:

i. *What are project opportunities exactly?*
ii. *What types of opportunities are there?*
iii. *How can opportunities be managed according to the literature?*
iv. *How do project managers, manage opportunities in infrastructure projects?*

Answers to these questions are important in order to understand how opportunies are managed[1] in projects. If project managers focus solely on reducing risks, while overlooking the opportunities in uncertainty, they might fail to exploit a significant potential for project value generation (Ward & Chapman, 2003). While risk management is meant to reduce the possibility of underperformance (Chapman & Ward, 2003, p. 4), opportunity management is about more than only achieving project objectives. *Therefore it is expected that a better understanding of the management of opportunities can support project managers not only in achieving their project objectives, but also by exceeding them as well as creating short and long term added value for the client.*

Because of the shortage of literature on project opportunity management, it is useful to investigate other fields of research, as this might provide extra knowledge on the subject. One area of research that deals with opportunities is the field of entrepreneurship. The theory of entrepreneurship dates back to the beginning of the 20th century and opportunities have always played a pivotal role within it.

This can already be seen by looking at the definition of entrepreneurship: "Entrepreneurship is an activity that involves the discovery, evaluation and exploitation of opportunities to introduce new goods and

[1] Project Opportunity management is the systematic process of identifying, evaluating, and exploiting of project opportunities.

services, ways of organizing markets, processes, and raw materials through organizing efforts that previously had not existed" (Shane, 2003, p. 4).

According to this definition, entrepreneurship involves three main areas: (1) the study of sources of opportunities; (2) the processes of discovery (hereafter identification), evaluation, and exploitation of opportunities; (3) and the set of individuals who identify, evaluate, and exploit opportunities (Shane & Venkataraman, 2000).

Literature on entrepreneurship mainly deals with the sources of opportunities and the identification, evaluation and exploitation of opportunities (Shane & Venkataraman, 2000). These steps can also be recognized in the process of opportunity management reported in construction literature. Entrepreneurial literature may therefore be highly relevant in contributing to the knowledge of opportunity management in projects.

2.2 Demarcation of the Problem

The problem analysis has already partly demarcated the research. However, two explicit choices with regard to the boundaries of the research should be pointed out before continuing:

Firstly, the research focuses on the perspective of the *project manager* that works for the *client* in *infrastructure projects*. Secondly, there is a demarcation with regard to the *project phases* for infrastructure projects. This research will examine the management of opportunities in the phase following the establishment of project objectives and the appointment of a project manager by the client. Interesting is whether or not this phase still holds opportunities for the client and how project managers can manage them.

For Dutch infrastructure projects, the Meerjarenprogramma Infrastructuur, Ruimte en Transport (hereafter MIRT) gives a strict division of the various project phases (Rijkswaterstaat, 2009). According to the MIRT, the *planning phase* can not start until the financial means have been allocated and the stakeholders agree on the preferred alternative regarding the scope. This decision is made at point 2, "Preference decision". We therefore demarcate our research for projects for which the "Preference decision" has been made, this is shown in Figure 2-1.

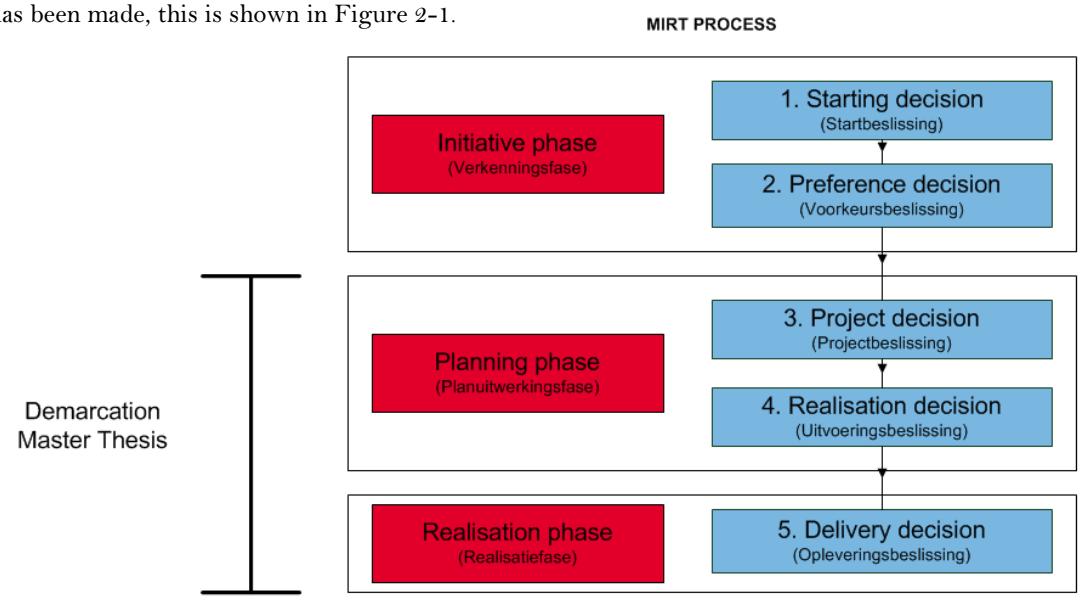

Figure 2-1: MIRT Process (Adopted from Rijkswaterstaat, 2009, p. 9)

2.3 Problem Definition

To summarize the problem analysis, the practical problem statement and the scientific problem statement are formulated as follows.

Practical problem statement:	Little is known about the management of opportunities in infrastructure projects. It is expected that a better understanding of the management of opportunities can support project managers in exceeding their project objectives and thereby creating short and long term added value for the client.
Scientific problem statement:	In the existing literature the theories and practices on the management of opportunities by project managers in infrastructure projects are incomprehensive.

Figure 2-2: Problem Definition

2.4 Research objective

On the basis of the formulated problem statements an objective for the research is defined as follows.

Providing new knowledge on the management of opportunities, in order to support project managers in infrastructure projects in exceeding their project objectives. (*Objective of the research)*

doing so by,

providing a typology of opportunities and the way in which they can be managed in infrastructure projects. (*Objective in the research*)

Figure 2-3: Research objective

2.5 Research questions

After defining the problem and clarifying the objective, the research questions are derived.

How can opportunities and the process of opportunity management in infrastructure projects be described?

Figure 2-4: Research question

Three sub-questions are defined to answer the research question. Additionally, sub-question 1 is divided into four questions. For every sub-question a brief explanation is given of what will be discussed and why.

1. **How can the studied literature be used to provide information on the management of opportunities in infrastructure projects?**

1.1. What are opportunities?

Sub-question 1.1 gives a description of the general concept of opportunities by using entrepreneurial literature. Because it is used as the foundation for the rest of the literature study, an explanation of the concept of entrepreneurship will be given.

1.2. What are project opportunities?

Sub-question 1.2 aims at narrowing down the concept of opportunities to project opportunities. Project management literature is used to create a definition of project opportunities that can be used for this research.

1.3. How can opportunities be managed according to the literature?

Sub-question 1.3 presents the processes for managing opportunities. From the entrepreneurial literature two perspectives on opportunity management will be explained. Describing these two perspectives on opportunity management is very important, because they form the basis for the hypotheses and the rest of the research.

1.4. How can the existing literature be translated for the management of opportunities in infrastructure projects?

Sub-question 1.4 synthesizes the information from questions 1.1, 1.2 and 1.3 by making several hypotheses on opportunities and the manner in which they are managed in infrastructure projects. The use of hypotheses for the research is necessary for testing several expectations on opportunity management from entrepreneurial literature. These hypotheses give direction to the research and will be used for the empirical part of the research.

2. How do project managers, manage opportunities in infrastructure projects?

Sub-question 2 presents the empirical part of the research. As stated in the problem analysis (section 2.1), very little empirical data can be found on opportunities. It is therefore chosen to conduct interviews with project managers in order to investigate the manner in which they handle opportunities in their projects. The information is used to verify or nullify the hypotheses that were formed in sub-question 1.4. Additionally, a validation is done of the outcome of the interviews. More information on the empirical data gathering can be found in section 2.6

3. What typologies of opportunities can be derived when looking at the information given by theory and practice and how can those opportunities be managed?

Sub-question 3 presents a typology of opportunities and the manner in which they can be managed on the basis of literature on opportunities and practical examples of opportunities from infrastructure projects. Thereby this question presents the answer to the research objective.

2.6 Empirical data gathering

2.6.1 Interviews

Interview protocol

For conducting the interviews, an interview protocol was created as described in Appendix VIII. The interview basically consisted of three parts: The introductory part in which the purpose of the interview was explained to the interviewee and in which the interviewee was given the opportunity to introduce himself and the project. In the second part the interviewee was asked about his perception and his idea of opportunities and opportunity management in infrastructure projects. Finally specific opportunities were discussed in the third part. Due to the explorative nature of the research, open questions were asked to prevent giving directions to the interviewees during the interviews. This procedure resulted in a broad variety of described opportunities.

Interviewees

A list of the people interviewed for this master thesis can be found in Appendix III. In total 12 interviews have been held. The interviewees were selected on the basis of the following criteria: (1) senior project management position, (2) experience with infrastructure projects and (3) availability.

Validation workshop

For the validation workshop, six of the project managers that were interviewed were invited to discuss the results of the analysis. During a two-hour workshop most of the hypotheses were discussed and valuable information was exchanged among the participants. Appendix XI shows the most important sheets that were used during the two-hour workshop. Furthermore a Dutch translation of the hypotheses that were discussed can be found in Appendix XI.

3. Theoretical Background of Opportunities

How can the studied literature be used to provide information on the management of opportunities in infrastructure projects?

In order to answer the research question above, it is divided into four sub questions, which will be answered in sections one till four.

Section 3.1 What are opportunities?

Section 3.2 What are project opportunities?

Section 3.3 How can opportunities be managed according to the literature?

Section 3.4 How can the studied literature be translated for the management of opportunities in infrastructure projects?

3.1 Opportunities

What are opportunities?

To answer this question, knowledge in the field of 'Entrepreneurial Research' will be drawn upon. To start, an explanation on entrepreneurship will be given. Then the entrepreneurial opportunity is discussed and a division is made between two basic types of opportunities. This information leads to a basic understanding of opportunities.

Entrepreneurship

Before diving into the theory on entrepreneurial opportunities, it is useful to create a basic understanding of entrepreneurship. As we need to apply the theory to project management later on in this research, understanding the basics of entrepreneurship will be helpful.

Several definitions of entrepreneurship will be given below. The purpose of this is not to generate an own definition from the various sources, but to give an overview of how entrepreneurship is viewed.

- "Entrepreneurship is an activity that involves the discovery, evaluation and exploitation of opportunities to introduce new goods and services, ways of organizing, markets, processes, and raw materials through organizing efforts that previously had not existed." (Shane 2003, p. 4)
- "Entrepreneurship is the process of changing ideas into commercial opportunities and creating value." (Leach & Melicher, 2006, p. 5)
- "Entrepreneurship is a way of thinking, reasoning, and acting that is opportunity obsessed, holistic in approach, and leadership balanced." (Timmons & Spinelli, 2004, p. 47)

For this research, the definition of Shane (2003, p. 4) will be used: Firstly, because this has been the most dominating theorem in the entrepreneurial literature and it is therefore by far the most widely explored. Secondly, because the definition includes a process approach to opportunity management. As this research investigates the management of opportunities, such a process approach will be useful later on in the research.

Shane (2003, p. 6) defines several conditions and non-necessary conditions for the entrepreneurial phenomenon. Appendix IV provides a reflection on these (non-necessary) conditions against the reality of infrastructure projects and it can be concluded that they are not conflicting.

Entrepreneurial Opportunities

The entrepreneurial opportunity is defined as:

"a situation in which a person can create a new means-ends framework for recombining resources that the entrepreneur believes will yield a profit" (Shane, 2003, p. 18)

This definition states that the entrepreneur has to be creative, because he either constructs the means, the ends, or both (Eckhardt & Shane, 2003). Entrepreneurial decisions can therefore not be optimizing or satisfying decisions, as in those decisions both the ends and means are given. Kirzner (1997) states this as a crucial difference between situations in which profit can be made by optimizing in established means-ends frameworks and entrepreneurial opportunities. "Thus, while non-entrepreneurial decisions maximize scarce resources across previously developed means and ends, entrepreneurial decisions involve the creation or identification of new ends and means previously undetected or unutilized by market participants" (Eckhardt & Shane, 2003, p. 336).
Important for the reflection towards infrastructure projects is the use of the word optimizing in the entrepreneurial context. This research also regards "optimizing" opportunities as opportunities, if and only if the means are constructed for optimizing the opportunities. In that case, project managers need to be creative to establish the conditions in which the opportunity is exploited.
For example, if a project manager is able to optimize his planning by simply looking at it and by shifting some activities, this is not regarded as an opportunity because both the ends and means are given. However, if certain conditions need to be fulfilled before the activities can be shifted, the project manager is creating the means to exploit the opportunity and it is therefore regarded as an opportunity.

Kirznerian and Schumpeterian opportunities

Based on two central premises that have dominated entrepreneurship, opportunities can be divided into two types: Kirznerian and Schumpeterian opportunities. Venkataraman (1997) calls these premises the *weak* and the *strong* premise of entrepreneurship. The fundamental discussion is on whether or not new information or differential access to information is the basis for entrepreneurial opportunities (Shane, 2003, p. 20).

The *weak* premise has been defined by Kirzner. He states that the existence of opportunities requires only differential access to information (Shane, 2003, p. 20). According to Kirzner, the market is in a constant form of disequilibrium. This disequilibrium in the market is caused by wrong decision-making frameworks, which lead to shortages and surpluses. Those shortages and surpluses are where the Kirznerian opportunities are found. (Shane & Venkataraman, 2000).

The *strong* premise is related to the Schumpeterian opportunities. Schumpeter believes that *new* information, and not the differential access to current information, is the key in explaining the existence of entrepreneurial opportunities (Shane, 2003, p. 20). This new information comes from changes in the environment, such as political or technological changes, and can be used to develop innovations. These in-

novations destroy established, outmoded ways of business, Schumpeter therefore named this process "creative destruction" (Venkataraman, 1997). Figure 3-1 shows a quick overview of both types.

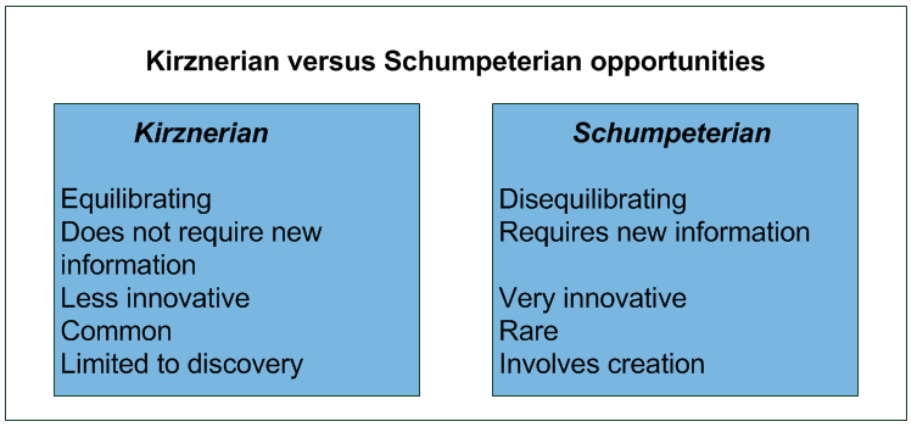

Figure 3-1: Kirznerian versus Schumpeterian opportunities (Adopted from Shane, 2003, p. 21)

Although Kirzner and Schumpeter initially advocated that only their forms of entrepreneurial opportunity exist, not all researchers agreed to this. Shane and Venkataraman (2000) argue that both types can be present in the economy at the same time. In his later work, Kirzner also acknowledged this:

"The reconsideration here undertaken indeed permits us to see how both the Schumpeterian view of the entrepreneurial role and my own view can both be simultaneously accepted." (Kirzner 1999, p. 16)

This research work will also use the assumption that both Kirznerian as well as Schumpeterian opportunities exist. From a first perspective, Kirznerian opportunities can be regarded as opportunities that arise within the predefined boundaries of the project. Optimizing work schedules of different subcontractors can be an example for this. In contrast, Schumpeterian opportunities are far stronger and will usually have a higher impact, for example the use of a new way of contracting.

Even though they might exist simultaneously, the differences between Kirznerian and Schumpeterian opportunities will most probably have an impact on the identification, evaluation and exploitation of opportunities (Shane, 2003, p. 21). At this point it is important to know that the information on Schumpeterian opportunities is far more abundant than the information on Kirznerian opportunities. Shane (2003, p. 22) gives two reasons for this:

1. The potential value of Schumpeterian opportunities is bigger and therefore more interesting to investigate.
2. The sources of Kirznerian opportunities are perceived to be idiosyncratic. With idiosyncrasy meaning the unique circumstances from which they evolve, which can be in a special environment or project.

Summary - What are opportunities?

Opportunities are thus situations in which a person acts creatively in order to achieve a profit. The opportunities are divided into two broad categories, namely Kirznerian and Schumpeterian opportunities. When defining these in a project management context, Kirznerian opportunities can be regarded as opportunities that arise within the predefined boundaries of the project. In contrast, Schumpeterian opportunities are far stronger and will usually have a higher impact, for example expanding the scope of the project.

3.2 Project opportunities

What are project opportunities?

After having described the general outline of opportunities, we now turn to project opportunities in this section. We will start off by looking at what constitutes a project, with special emphasis on project objectives, value and project scope. Building forth on this a definition of project opportunities will follow.

Project

"A project is a temporary endeavor undertaken to create a unique product or service." (PMI, 2000, p. 4). Two words are important within this definition, first temporary and the second unique. Temporary entails that every project has a beginning and an end. Unique means that every project distinguishes itself in some way from another project. Although all infrastructure projects have certain characteristics in common, no two projects are entirely alike. Project opportunities have an impact on project objectives, value and project scope, these topics are therefore explained in more detail.

Project objectives and value

In a project time, cost and quality are considered the "Iron Triangle" to which the objectives are usually related (Atkinson, 1999). Although it is possible to define time and cost objectively, defining quality is more difficult as it is linked to several other objectives. In infrastructure projects quality can be for example: the limitation of noise during construction, improvement of the environment, sustainability, image of the client. Opportunities can have an impact on one or several of those objectives and often a trade-off between several objectives is necessary (Atkinson et al. 2006).

For this trade-off it is important to realize what is of value for the client, for the project is not realized for the sake of the project, but to create *added value*. This added value can even be in things that were not initially stated in the project objectives. Opportunities should therefore not be directly related to the project objectives but to the *added value* they create for the client.

Project scope

The most commonly used definition of scope is the one formulated in The Project Management Body of Knowledge (2000), which divides scope into two parts: 1. *product scope*: "the features and functions that characterize a product or function" (PMI, 2000, p. 51). 2. *project scope*: "the work that must be done to deliver a product with the specified features and functions" (PMI, 2000, p. 51). For this work, both the product and the project scope are of importance, as both have the possibility to contain opportunities.

Changes in product scope always have an effect on project scope. By changing the features and functions of the product, the work that needs to be done in order to deliver the altered product also changes. In contrast, changes in project scope do not necessarily need to change the product scope. For example a different way of constructing a road does not need to alter the product that is delivered.

Project Opportunity Definition

Section 3.1 presented a definition for the entrepreneurial opportunity. "A situation in which a person can create a new means-ends framework for recombining resources that the entrepreneur believes will yield a profit" (Shane, 2003, p. 18). This section focused on projects in particular. Combining these two fields of literature, a decomposition of the project opportunity can be made.

It starts with some form of change that *creates* a new situation. This change can be from inside or outside the project environment. This new situation *creates* uncertainty about the future. The uncertainty can be used by project managers to *create* something new that has added value for the client. This is shown in Figure 3-2.

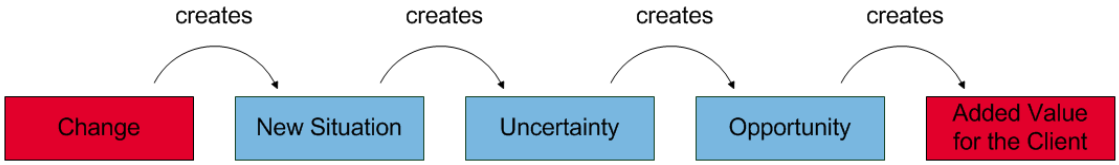

Figure 3-2: Decomposition of the opportunity

From this decomposition, a definition for project opportunities is made. Because this research focuses on infrastructure projects from the client perspective, this definition can only be used in the context of this research. A project opportunity is:

An uncertain situation that can be exploited by the project team

in order to create added value for the client

Summary - What are project opportunities?

After explaining the broad topic of opportunities in section 3.1, this section focused on project opportunities. The characteristics of a project were discussed and the relationship between project opportunities, project objectives and value was discussed.

With this information a new definition for project opportunities was made. This will be used in the remainder of the research, where we will look at *how* to manage the project opportunities. This will be the subject of section 3.3.

3.3 Management of project opportunities

How can opportunities be managed according to the literature?

After looking into opportunities and project opportunities, the manner in which they can be managed will be investigated. To do so, the theory of uncertainty is related to various perspectives on opportunity management in section 3.3.1. This results in two perspectives on the management of opportunities and those will be explained in detail in sections 3.3.2 to 3.3.6.

3.3.1 Uncertainty in Projects

Uncertainty

Uncertainties lead to potential risks and potential opportunities in projects. But what exactly is uncertainty? Walker et al. (2003, p.5) define uncertainty as: "any deviation from the unachievable ideal of completely deterministic knowledge of the relevant system". Several studies have tried to clarify the concept of uncertainty by dividing it into *aleatory uncertainty* and *epistemic uncertainty* (Ollson, 2007; Meijer, 2008).

"Aleatory uncertainty arises because of natural, unpredictable variation in the performance of the system under study" (Daneskhah, 2004, p. 2). Other terminologies used for aleatory uncertainty are variability, strong, fundamental, stochastic, random, primary, external, procedural or ontological uncertainty (Meijer, 2008). Aleatory uncertainty is therefore related to variability; this variability can be seen within the context of rolling dice (alea means dice in Latin): the range of possible outcomes is clear, but not the outcome itself. Because it is certain that the event will occur in the future – only the variation is uncertain – this statistical uncertainty or variability uncertainty is therefore not regarded as an opportunity or risk.

"Epistemic uncertainty is due to the lack of knowledge about the behavior of the system that is conceptually resolvable" (Daneshkhah, 2004, p. 2). Other terminologies used for epistemic uncertainty are knowledge, weak, internal, secondary or substantive uncertainty (Meijer, 2008). Because both the information on the outcome as well as the probability of an outcome is unknown, we can define these as opportunities and risks.

Levels of uncertainty

The level of uncertainty relates to *how* uncertain the situation is. The level of uncertainty can be seen as a spectrum, running from statistical uncertainty to total ignorance (Walker et al., 2003). In Figure 3-3 the levels of uncertainty have been visualized, with the red parts being uncertainties that we regard as opportunities or risks.

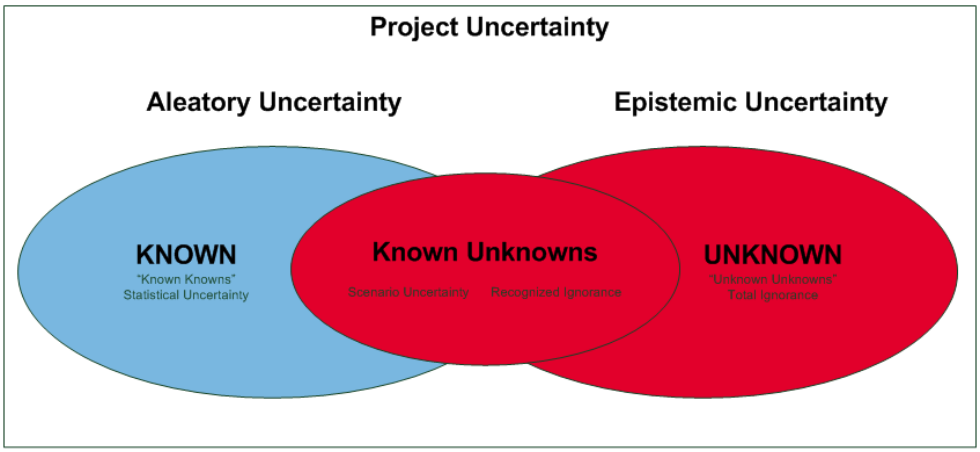

Figure 3-3: Project Uncertainty (Adopted from Joustra, 2010, p. 46)

Uncertainty and opportunity processes

In the entrepreneurial research, uncertainty plays a major role. Before Schumpeter in 1934, Frank Knight already realized in 1921 that uncertainty has far reaching implications in the economy (Sarasvathy et al, 2003).

Knight defines three types of uncertainty which are directly related to the levels of uncertainty from Figure 3-3. In addition Sarasvathy et al. (2003) states that these three types of uncertainty are also linked to three perspectives[2] of entrepreneurial opportunities. Table 1 shows the relations between the levels of uncertainty, types of uncertainty by Knight and perspectives on entrepreneurial opportunities.

Table 1: Uncertainty and perspectives

Levels of uncertainty	Type of uncertainty according to Knight	Perspectives
1. "Knowns"	Uncertainties of which the distribution of the future exists and is known.	Allocative perspective
2. "Known Unknowns"	Uncertainties of which the distribution of the future exists, but is not known in advance.	Discovery perspective
3."Unknown Unknowns"	Uncertainties of which the distribution of the future is non-existent and unknown.	Creative perspective

[2] Although the word "views" is used by Sarasvathy, this research uses the word "perspective" as Berglund (2007) does.

Perspectives

In section 3.1 the observation was made that opportunities require project managers to be creative. This means that project managers either need to create news means or new ends. In the preceding section we stated that statistical uncertainty is not regarded as an opportunity or risk, because it is certain that the event will occur in the future and only the variation is uncertain. Both the means as well as the ends are therefore already clear and they are not regarded as opportunities. The *allocative perspective* will therefore not be considered in this research.

In addition to the *allocative perspective*, Sarasvathy et al. (2003) distinguish between two main perspectives on entrepreneurial opportunities, see Table 2. The first is the *discovery perspective* in which opportunities are identified and whereby opportunities exist prior to the entrepreneurial activity (Eckhardt & Shane, 2003). Here the process starts with opportunity identification and uses predictive strategies to achieve preselected goals (Sarasvathy, 2001).

The second perspective is called *creative perspective*; here opportunities are the effects of the process. The process starts with means available and it is shaped and guided through interaction with different stakeholders and exploits contingencies as they arise leading to unexpected outcomes (Sarasvathy, 2001).

In the following sections the two perspectives on the entrepreneurial process will be discussed. Predominantly the research done by Shane will be used to discuss the *discovery perspective*. Afterwards the *creative perspective* will be elaborated by using the work of Sarasvathy, who has been the main advocate of this view on the entrepreneurial process. One important note should be made beforehand: The literature review on the discovery process will be more extensive then the review on the creative process, because the literature on effectuation has only been developed in the last 10 years.

Table 2: Discovery vs. Creative Perspective (Adopted from Berglund, 2007, p. 251; Sarasvathy, 2001, p. 251)

	Discovery	Creative
Ontological status of opportunities	Have real existence before being discovered.	Are the emerging result of a creative social process.
View of uncertainty	Hides existing opportunities.	Made irrelevant by 'effectual' action.
Basis for taking action	Goal-oriented. In the causal frame, goals, even when constrained by limited means, determine sub-goals. Goals determine actions, including which individuals to bring on board.	Means-oriented. In the effectual frame, goals emerge by imagining courses of action based on given means. Similarly, who comes on board determines what can be and needs to be done. And not vice versa.
Role of the individual	Discoverer and exploiter of opportunities.	Facilitator of creative social processes.
Practical implications	Individuals should pursue promising industries and ideas, staying focused on areas where they are most likely to succeed.	Individuals should, together with others, nurture exciting ideas found in their immediate environment.
Competencies employed	Excellent at exploiting knowledge.	Excellent at exploiting contingencies.

3.3.2 The Discovery Perspective

This section discusses the first opportunity management process, the *discovery perspective*. Starting with the sources of opportunities, it will describe a very linear approach to managing opportunities. Also the sections 3.3.3 to 3.3.5 are part of the discovery perspective.

Sources of Opportunities

The entrepreneurial process for the discovery perspective begins with the sources of opportunities. According to Venkataraman (1997), the question where opportunities come from is one of the most neglected in entrepreneurial research.

Entrepreneurial opportunities come from an almost unlimited number of sources. Shane (2003, p. 23) focuses on the following three categories: (1) social and demographic changes, (2) political and regulatory changes and (3) technological changes. Although these three categories might be very useful for entrepreneurship, within a project environment they might be less relevant, depending on the type of project. Research done by Topper (2010) in the field of spatial development projects shows that projects are subject to changing circumstances in the environment. He defines the categories as economical, political, social and legal. Apart from that Drucker (1985, p. 35; 1998) developed a taxonomy where entrepreneurial opportunities can be found in seven broad sources of change[3] (Berglund, 2007). Table 3 lists those sources of change and puts them in the context of project management for infrastructure projects.

Table 3: Sources of Change

	Drucker (1985)	Infrastructure Project Management Context
1	Unexpected success, failure, or outside event.	The unexpected occurrence of a positive/ negative internal project event or external event.
2	Incongruity between what is and what "ought" to be within an industry or market.	A discrepancy between the product or current method of working and the one desired by the project stakeholders.
3	Innovation based on a process need (supplying the missing link).	Need for a project solution.
4	Changes in industry structure or market structure.	External boundary conditions that change. For example safety regulation.
5	Demographics or population changes.	Changes in spatial development can have an impact on an infrastructure project.
6	Changes in perception, mood, and meaning.	Opportunities can develop when changes occur in the perception and mood of project stakeholders towards the project.
7	New scientific and non-scientific knowledge.	New insights from outside the project.

[3] Drucker (1998) uses the words opportunity and innovation without clearly describing the difference between both.

These categories for change should not be confused with the categories that are used in risk management practice. Those are used to aid in the systematic identification of project risks and are not concerned with the actual source of the risks.

Process of opportunity management

The opportunities that arise from the sources first need to be *identified* by individuals. Opportunities are then *evaluated* and a decision is made to exploit the opportunities. After this the *exploitation* involves the assembly of resources, setting up an organization and setting out a strategy for exploiting the opportunity. The latter point *performance* is the result of the opportunity and is not discussed by Shane.
A linear image of the entire process is given in Figure 3-4. The dotted line has been set were the three main steps can be distinguished: (1) identification, (2) evaluation and (3) exploitation.

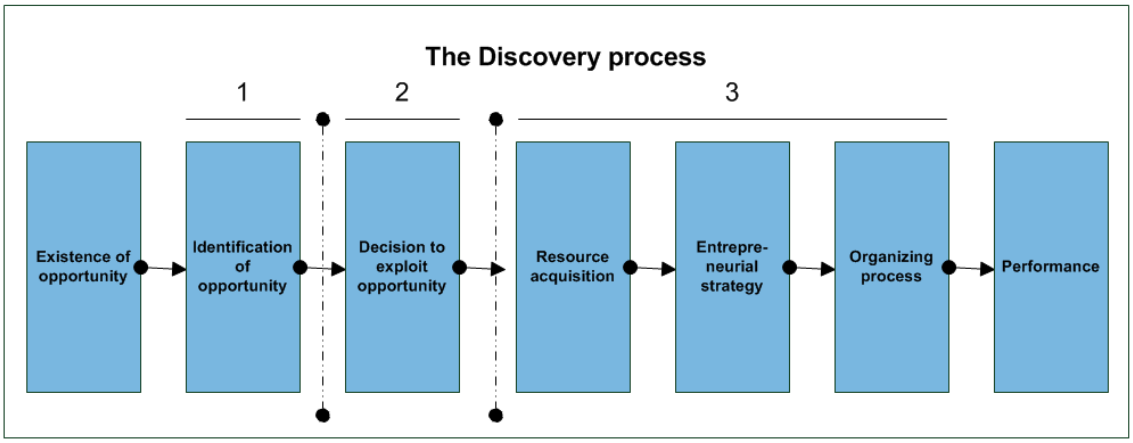

Figure 3-4: The Discovery Process, linear (Adopted from Shane, 2003, p. 12)

3.3.3 Opportunity Identification

In the previous parts of this research work information has been given on the sources of opportunities. The next step is the identification of those opportunities. The various factors that influence this identification process will be discussed in this section. For this section it is important to reiterate that the process of opportunity identification is cognitive. Cognitive processes are individual and cannot be a collective art. "Therefore, individuals, not groups or firms, discover entrepreneurial opportunities" (Shane, 2003, p. 45). However, two notes should be made to this statement. First, the identification of the opportunity can happen in a group process, because the individual is triggered by other members. Second, after the first identification of the opportunity it can be refined by other team members (Shane, 2003, p. 45).

The identification of opportunities can be divided into two parts. The first part is concerned with the *access to information*. As stated in the discussion on Kirznerian and Schumpeterian opportunities, information plays a vital role in opportunity identification. The second part is the *recognition of the opportunity* by an individual. Even when people have access to exactly the same information, some people are able to recognize opportunities and others are not, because of the differences in cognitive capabilities (Shane,

2003, p. 45). This research will not focus on the *recognition of the opportunity*, because it is a research from a construction management approach and not psychological.

Access to Information

Different people have different access to information. Because information is the key to identifying opportunities, everybody has a different likelihood of identifying opportunities. Researchers have identified three important factors that influence somebody's access to information for opportunities (Shane, 2003, p. 46).

1. Life experiences

   One's experience in life is a major contributor with regard to access of information. This can for example be the experience that somebody has acquired in a previous job.

2. Social Networks

   Interaction with other people is also a way to get access to information. The diversity of the information thereby depends on the structure of the social network. As an example, people with very homogeneous networks have the tendency to receive little new information over the course of time.

3. Search processes

   The last factor is the search for information. By actively searching for information in newspapers or professional journals, people are enabled to identify opportunities.

When we refer these three factors to a random project manager, it is interesting to see that it is impossible to change point 1 after a project manager has been assigned to a project. Only point 3 and to a lesser extend point 2 are factors that project managers can change if they want to get access to information that can lead to opportunities. Setting up a social network in the project environment and reading local newspapers could therefore increase the likelihood of identifying opportunities. In a study that evaluated 15 large infrastructure projects, Hertogh et al. (2008, p. 45) even found that the project manager should not only monitor the environment, but also become part of it. This is also relevant for other project team members.

Tools for search processes

Entrepreneurial literature focuses on the individual, however this does not mean that the process steps within the discovery perspective are undertaken by a single individual (Shane & Venkataraman, 2000). This is especially true for the management of opportunities in infrastructure projects, because the project is realized with a project team. Search process for identification of opportunities should therefore also be aimed inwards, to the project team. Methods for identification of opportunities are interviews, brainstorm sessions, checklists (Well-Stam et al. 2003, p. 46).

3.3.4 Opportunity Evaluation

After the identification of an opportunity, a decision on whether or not to exploit the opportunity has to be made. According to Shane (2003, p. 61), two main areas are important with regards to the evaluation of opportunities: the *individual attributes* and the *context* in which the opportunity is identified. Both areas can be divided into two parts, namely "psychological" and "non-psychological" for *individual attributes* and "industry" and "environment" for the *context*. As with opportunity identification, this research will not cover the psychological factors in the management of opportunities. Literature on the *individual attributes* is therefore not explained in this section.

Context

The context in which the opportunity is identified can be divided in two parts, the industry and the environment. Those two are of importance for evaluation of the opportunity (Shane, 2003, p. 61). This research work only looks into one industry, namely the construction industry, therefore the differences in industries for stimulating the decision to exploit opportunities is not of interest for this research.

Shane (2003, p. 147) divides the environment in the economical, political and social context. These determine the willingness of people to engage in entrepreneurial activities. For each of the three environments the aspects that influence the decision to exploit opportunities are listed. To avoid an overlong elaboration on each aspect and its possible relevance to the project management context, only the aspects considered most useful for this research are discussed in the following.

- Economical environment: wealth, economical stability, *capital availability*, taxes
- Political environment: freedom, property rights, *centralization of power*
- Socio-cultural environment: *desirability of entrepreneurial activity*, *presence of role models*, cultural beliefs

For the economical environment, *capital availability* is an important aspect because opportunities in projects often require an extra initial investment for the creation of profit or value in the long run. These investments require the availability of capital.

Centralization of power influences the decision to exploit an opportunity, because central actors lack all the knowledge and information to make decisions. Decentralization of power should therefore increase the number of opportunities that are exploited.

In the socio-cultural environment the project team is the relevant attribute to look at. The manner in which it is found *desirable* for team members to engage in activities that support exploitation of opportunities and the presence of *role models* both influence the decision to exploit opportunities.

Even though industry and environment from the entrepreneurship are sometimes difficult to relate to project managers, the broader idea that the context of the opportunity has an impact on the decision to exploit an opportunity is very logical. This is especially true when looking at the contractual context of infrastructure projects.

Contracts and opportunities

Entrepreneurial opportunities are evaluated before contracts exist on the exploitation of the opportunity. Other stakeholders that will become part of the exploitation might not even be found by the entrepreneur. Comparing this to the reality of infrastructure projects, the *initiative phase* closely resembles this situation. However, this research looks into the *planning and realization phase* of infrastructure projects. These phases are strongly influenced by the contracts that have been signed or that will be signed between the project parties.

Four different contract models can be distinguished (Bruggeman et al., 2008, p. 26):

- The traditional model
- The building team
- The integrated model
- The alliance form

From these four types, the building team model is not considered in this research because the two major infrastructure clients in the Netherlands, Rijkswaterstaat (Road) and Prorail (Rail), do not use this model.

Traditional model

In the traditional model, the client is responsible for creating a design. Usually this will be done by an architect or a consulting engineer. He would then find a contractor to build the object. Because the client makes a design, it is only possible for the contractor to influence the working method and not the project scope. Any error in the design that causes more work for the contractor has to be compensated by the client (Bruggeman et al., 2008, p. 26). For opportunity evaluation this means that the client has the possibility to incorporate opportunities in the design, without taking into account the contractor. The results of the opportunity will therefore solely be for the client.

Integrated model

Integrated models have become a popular way of contracting in the previous years, because of the desire to shift responsibility from the client to the contractor. Starting with *Design & Build contracts* (DB contracts), experiments are now being held with the *Design - Build – Finance – Maintain & Operate contracts* (DBFMO contracts) (Rijksoverheid, 2011). By shifting the responsibility towards the contractor, the clients only has to deliver the functional requirements of the project. The contractor is then free to design a solution for the client, only limited by the functional requirements. The reason for this shift is the assumption that the contractor, as a private company, is more cost effective and innovative then the client. Because the contractor is earlier involved in the design process, the client is basically 'out of the game' in the planning and realization phase. The contract is awarded at the end of the initiative phase and the client only has a supervising role afterwards.

These integrated contracts have an impact on opportunity evaluation in comparison to the traditional model, because of earlier involvement of the contractor. Opportunities that require an addition or alteration of the contract are therefore problematic, because those additions or alterations are costly for the client. These extra costs have a negative effect on the cost-benefit analysis for the opportunity.

Alliance form
In alliance contracts, the client has a far greater involvement in the design and execution (Bruggeman et al., 2008, p. 27). The client and the contractor enter into a partnership based on equality, whereby the risks are born collectively and profit and loss are shared (Bruggeman et al., 2008, p. 189). This means that the result of the opportunity is shared equally between the client and the contractor. Opportunity evaluation is in such case done in cooperation by both client and contractor.

Interesting to note is that a difference exists in the use of contract models between road and rail infrastructure. In road infrastructure the integrated contract model is preferred, while in rail infrastructure the alliance model is often preferred. Because this difference creates confusion towards the contractors, Rijkswaterstaat and Prorail intend to enhance cooperation on the use of contract models (Cobouw, 2011).

Level of detail in evaluation

Opportunities need to be acted upon before they have an impact. However, several uncertainties surround the decision on whether or not to act. First, whether or not the opportunity turns out to be feasible. Second, the impact of the opportunity. Third, the amount of work that is necessary for exploiting the opportunity is uncertain. These uncertainties can be reduced during the decision making process by investing time and effort in the investigation of the opportunities, thus reducing uncertainty by gaining new knowledge (Meijer, 2008).
The question is to which extend project managers investigate all the ins and outs of an opportunity before deciding to act upon the opportunity. Kahneman and Tversky (1979) found that people are risk averse when dealing with possible positive outcomes. This would imply that project managers try to reduce the amount of uncertainty as much as possible before taking a decision.

3.3.5 Opportunity Exploitation

In the previous sections the first two steps of the entrepreneurial process, the identification of the opportunity (1) and the decision to exploit an opportunity (2), have been explained. The last step (3) is the actual exploitation of the opportunity itself. Exploitation received the lowest attention from all the steps in the entrepreneurial process (Phelan & Alder, 2005; Shook, Priem, & McGee, 2003).

This section first explains the key problem in opportunity exploitation and afterwards gives several strategies to counter this problem.

Information asymmetry and uncertainty

Two problems exist in opportunity exploitation; *information asymmetry* and *uncertainty* (Shane, 2003, p. 164). Appendix V discusses these two problems in relation to project management in infrastructure projects, thereby keeping in mind two fundamental differences between the two areas:

1. Exploitation in business opportunity is often about venturing creation. The steps to the creation of a new venture are very different from opportunity exploitation in projects, because the project organization and the boundaries in which it operates are already clear.
2. Competition is usually not an issue in project opportunities. For entrepreneurial opportunities competition is very important, because it can make your opportunity obsolete.

Result of the discussion is that *information asymmetry* is not regarded as a problem for opportunity exploitation in infrastructure projects. However, *uncertainty* is still a problem to be handled.

Strategies for opportunity exploitation

Besides identifying the problems, Shane (2003, p. 167) also identifies several strategies that can be applied to tackle the uncertainty problem. Most of those strategies are specific for entrepreneurship and therefore not applicable to the project management context, an example is the partial self-financing of the opportunity by the entrepreneur. However, in total seven strategies are regarded as useful for overcoming possible problem with uncertainty in infrastructure projects.

1. Real options approaches to investing

First strategy to overcome the uncertainty problem within opportunity exploitation is the use of real options. In venture finance this real option is the right, but not the obligation to make further investments. Because uncertainty about the value of the opportunity decreases over time, staged financing decreases the possible negative impact in a later stage (Shane, 2003, p. 178).
Real options in infrastructure projects are strongly linked to flexibility in projects (Zhao & Tseng, 2003). An example will be given below.

"Enhancing the foundation of construction at the time of initial construction involves a significant extra cost. However, the increased flexibility for future expansion may offset the initial cost of the extra enhancement. If the foundation of a facility were not designed to support expansion, it would be either technically prohibitive or extremely uneconomical to expand the facility. The foundation selection problem can be viewed as an investment problem, such that a premium has to be paid first for an option that can be exercised later" (Zhao & Tseng, 2003, 89).

Furthermore Pender (2001) identified several categories of real options: option to defer, time to build option, option to alter operating scale, option to abandon, option to switch, growth option and multiple interaction options.

2. Social, direct and indirect ties

Another way to address the uncertainty problem in the resource acquisition process is to look at the social, direct and indirect ties between the project manager and the client. Shane (2003, p. 181) sums up

various positive ways in which ties can benefit the uncertainty problem in opportunity exploitation. The main point he focuses on is the fact that good relationships have a positive effect on interindividual trust and make people use less opportunistic strategies. If a client trusts the project manager and believes he will act in the long-term good of the project, he will be more inclined to provide the resources for exploiting the opportunity.

3. Communication strategies

The third strategy is using communication strategies to minimize the problems uncertainty created in the acquisition of resources are communication strategies. Shane (2003, p. 185) also calls this "impression management"; good communication strategies aim at overcoming the resistance of other stakeholders and thereby creating consent. This can be done in four ways: (1) open communication to create trust; (2) framing risks in such a way that they are more acceptable for investors; (3) creating a sense of urgency, for example by providing short term benefits; (4) stressing the similarity between the opportunity and activities that are already know to stakeholders.

4. Adaptability

Because it is not possible to exactly predict the future, investing into solutions that can also be redeployed in other areas is a strategy that uses adaptability to limit the effect of uncertainty on opportunities.

5. Forming Alliances

Forming alliances can be a strategy to cope with uncertainties. For entrepreneurs this is described as forming alliances with established firms (Shane, 2003, p. 213), however for infrastructure projects an alliance contract is an agreement between several parties to work cooperatively to achieve agreed outcomes on the basis of sharing risks and rewards (Clifton & Duffield, 2006). Because several parties agree to share risks and rewards (thus bearing the uncertainty together), the uncertainty for the client or project manager decreases.

6. Legitimating

The last method of dealing with uncertainty is using reputable authorities, such as certified organizations, to assess the opportunity. If such an authority shows that the opportunity is possible to exploit, uncertainty diminishes automatically.

7. Planning

Planning helps to overcome some of the problems that arise due to the uncertainty in opportunity exploitation (Shane, 2003, p. 221). Firstly, planning tests the accuracy of the information on which the opportunity is based. Secondly, because humans have a limited cognitive capacity, planning aides in making decisions for complex tasks. Thirdly, planning focuses attention on important matters and thereby aids in the gathering of new useful information. Fourthly, planning clarifies the goals and objectives, so that they are easier to achieve. Fifthly, planning aides in communicating information towards people.

Opportunity exploitation is the last step from the *discovery perspective* on how to manage opportunities. The next section will deal with the second perspective on how to manage opportunities, *the creative perspective*.

3.3.6 The Creative Perspective

The entrepreneurial process of the *discovery perspective* follows a very orderly process of identification, evaluation and exploitation of the entrepreneurial opportunity. However, for the creative perspective, the process will look differently and it will therefore not be possible to describe it in the way we did the discovery perspective. According to Sarasvathy et al. (2003), the discovery process uses *causal logic*, while the creative perspective uses *effectual logic*.
The section will be split into three parts: First the differences between causal logic and effectual logic will be explained. Second, the process elements that describe effectuation are elaborated on. Third and lastly the usability in a project management context will be examined.

Causation vs. Effectuation

"Effectuation is the inverse of causation" (Sarasvathy et al, n.d., p. 5). Effectual reasoning is not merely a deviation from causal reasoning, but it is a distinct mode of reasoning based on an entirely separate logic. Causation models are based on prediction: to the extent that you can predict the future, you can control it. Effectuation is based on a logic of control: to the extent that you can control the future, you do not need to predict it (Sarasvathy et al., n.d.; Sarasvathy, 2001). The differences between the *discovery* and *creative perspective* were summarized in Table 2, in addition a short example will be given to illustrate the difference between the two types of processes.

> "Imagine a chef assigned the task of cooking dinner. There are two ways the task could be organized. The first case would be where the host or client has picked out a menu in advance. All the chef needs to do is to list the ingredients needed, shop for them and then actually cook the meal. This is a process of causation. It starts with a given menu and focuses on selecting between effective ways to prepare the meal.
> The second case would be when the host asks the chef to look through the cupboards in the kitchen for possible ingredients and utensils, and cook a meal. Here, the chef has to imagine possible menus based on the given ingredients and utensils, select one, and then prepare the meal. This is a process of effectuation. It starts with given ingredients and utensils, and focuses on preparing one of many possible desirable meals with them."
>
> Sarasvathy et al, n.d., p. 6

Process elements

There has not been much research focusing explicitly on opportunity creation (Berglund, 2007). Therefore also the research regarding processes is not as elaborated as in the *discovery perspective*. However, Sarasvathy (2008, p. 20) identifies six elements in the entrepreneurial process for effectuation. Because the first five elements are rather self-explanatory, only element 6 is explained in more detail.

1. Expert entrepreneurs begin with who they are, what they know and whom they know, and immediately start taking action and interacting with other people.

2. They focus on what they can do and do it, without worrying much about what they ought to do.
3. Some of the people they interact with self-select into the process by making commitments to the venture.
4. Each commitment results in new means and new goals for the venture.
5. As resources accumulate in the growing network, constraints begin to accrete. The constraints reduce possible changes in future goals and restrict who may or may not be admitted into the stakeholder network.
6. Assuming the stakeholder accumulation process does not prematurely abort, goals and network concurrently converge into a new market and a new firm.

This converging happens because new stakeholders come with new goals. Those new goals are simultaneously also constraints for the next cycle of development. So with each cycle more constraints are added, resulting in a converging effect, see Figure 3-5.

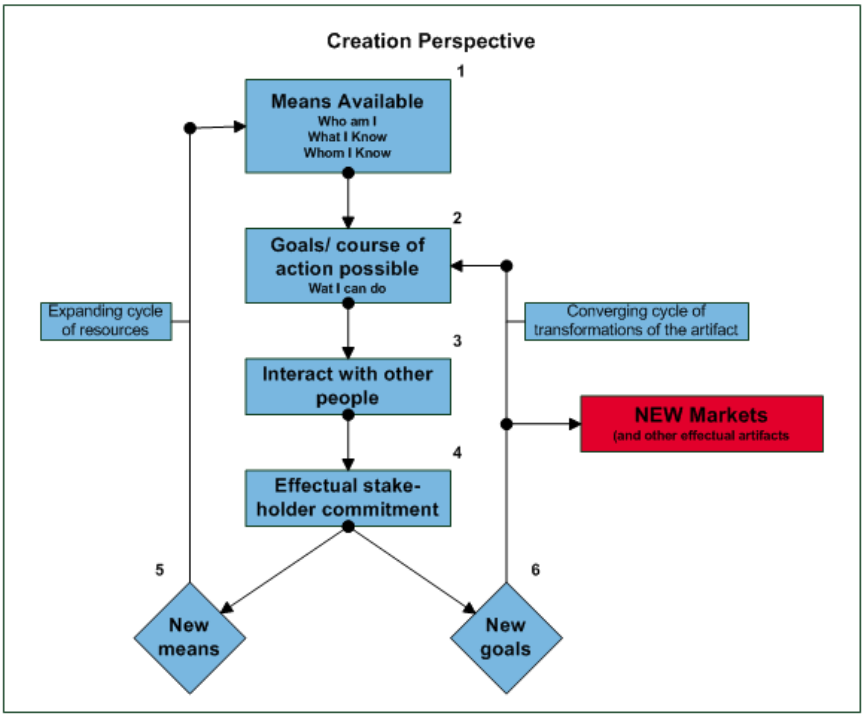

Figure 3-5: Dynamic model of effectuation (Adopted from Sarasvathy & Dew, 2005, p. 391)

Decision making principles

At each step of the process, expert entrepreneurs use certain principles. Each principle inverts key decision making criteria from traditional theories and conventional management practices (Sarasvathy, 2008, p. 21). These decision making principles are: (1) non-predictive control, (2) the affordable loss principle, (3) commitment of stakeholders, (4) leveraging as opposed to avoiding contingencies, and (5) humans as the prime drivers of opportunities. They are further elaborated on in Appendix VI.

Note on Creating New Markets

Reflecting the theory on effectuation back to the project management context in infrastructure projects, one important note should be made on the possibility of creating new markets: Project managers in infrastructure projects are assigned by the client to realize a project scope under given boundary conditions. This may be a piece of highway or a new railroad connection. Finding new markets, for example a new way of transportation, is therefore not a possibility for the project manager because he already has received guidelines on the scope and boundary conditions. Although those might be altered during the course of the project, possibly even by exploited opportunities, they will not alter the project into something *radically* new. For example ending up with a metro connection between Utrecht and Amsterdam while only the broadening of a highway was asked.

It can therefore be concluded that the possible results of an effectual approach by project managers in infrastructure projects will not be as radical as described in entrepreneurial literature. Due to the boundary conditions in which the project manager operates, his flexibility is not endless. However, it might be possible for project managers to reach ends (read: project objectives) that were not previously given or considered by the client.

3.3.7 Summary - How can opportunities be managed according to the literature?

Section 3.3 focused on the management of opportunities. Thereby two perspectives within the entrepreneurial literature were explained.

Firstly, the *discovery perspective* that is related to a *causal view* in which opportunities are discovered and where opportunities exist prior to the entrepreneurial activity (Eckhardt & Shane, 2003). In causation, the process starts with opportunity identification and uses predictive strategies to achieve preselected goals (Sarasvathy, 2001). Various steps were distinguished and the important elements in those steps have been explained.

Secondly, the creative view that is linked to *effectuation*, in which opportunities are considered to be the effects of the process. The process starts with means available and it is shaped and guided through interaction with different stakeholders; furthermore it exploits contingencies as they arise leading to unexpected outcomes (Sarasvathy, 2001). However, using this theorem for project managers in infrastructure projects causes some problems, because finding or developing new markets is not in the scope of the work of the project manager. The primary goal for project managers in infrastructure projects is the task assigned by the client, everything they do extra might be received as positive but is not their core activity.

3.4 Hypotheses on the management of opportunities in infrastructure projects

How can the studied literature be translated for the management of opportunities in infrastructure projects?

The goal of the previous sections was to explore the theory on opportunities in infrastructure projects. This has given rise to several expectations on opportunity management in infrastructure projects. Purpose of this chapter is to use the information from the previous chapters to create several hypotheses. These hypotheses give direction to the research and will be used for the empirical part of the research.

The hypotheses are divided into three major groups. First, hypotheses 1a and 1b concern the difference between the discovery and creative perspective. Second, hypothesis 2 divides project opportunities in endogenous and exogenous opportunities. Third, hypotheses 3a to 3e deal with the various steps in the discovery perspective.

Hypotheses 1a – 1b: Discovery and Creative Perspective

One of the major difficulties in the entrepreneurial theory is the practical distinction between the discovery and creative perspective. Shane (2003, p. 23) states that opportunities are created through demographic, regulatory and institutional changes. However, those changes themselves can also be the result from entrepreneurial drivers, intentional or unintended (Sarasvathy & Venkataraman, 2010).

"Even when opportunities may originate in demographic, regulatory and technological changes, they are subject to the Panglossian fallacy—namely that they can be claimed to pre-exist the process and deemed "discoverable" precisely because the process discovered them. Counterfactually, it is virtually impossible to prove the existence of opportunities that did not come to be. Finally, it is also possible to conceptualize opportunities in different ways so that what appears as discovered at one point in time may be shown to have been co-created at another." (Sarasvathy & Venkataraman, 2010, p. 118)

Thus, if we want to distinguish between the two perspectives, a strict line must be drawn between the two. For project managers the main differences between the discovery and creative perspective is the fact that with the discovery perspective changes occur to which the project manager responds, in contrast to the creative perspective in which the project manager induces the changes. Often in cooperation with other shareholders. To summarize:

The discovery perspective requires a **re-active** approach to opportunities in which the project manager responds to changing situations from both in and outside the project environment by searching for opportunities.

The creative perspective requires a **pro-active** approach to opportunities in which the project manager actively engages with one or more project stakeholders from both in and outside the project environment in order to create opportunities, thereby inducing his own change instead of waiting for it. Figure 3-6 shows this distinction graphically.

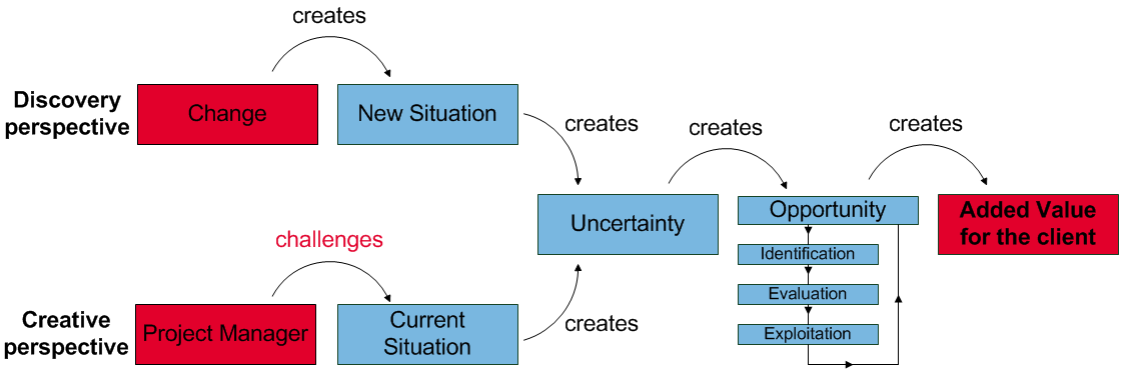

Figure 3-6: Opportunity management process

Just as in entrepreneurship, this research assumes that in the project management context also both perspectives are present. But are opportunities equally divided among the two perspectives? Inducing change yourself is more difficult than merely responding to change, it is therefore expected that the discovery perspective is more present than the creative perspective for project opportunities in infrastructure projects. This results in hypothesis 1a.

Hypothesis 1a: Opportunities in the planning and realization phase of infrastructure projects are more likely to be discovered than created.

The discovery perspective requires change before an opportunity can be identified. Important to know is where this change comes from, because it can help project managers to identify changes that might contain opportunities.

Section 3.3.2 listed several taxonomies for categorizing change. For this research, the seven broad sources of change defined by Drucker (1985, p. 35) will be used, because of the practical applicability. Subdivisions in 'functional categories' such as technical, social, political, etc. (Shane, 2003, p. 23; Well-Stam et al., 2003, p. 74; Topper, 2010) are regarded useful for subdividing the opportunities, they are less useful for subdividing the change that precedes the identification of the opportunity.
The seven sources of change defined by Drucker (1985, p. 35) are presented in Table 3 and directly placed in the context of project management for infrastructure projects. Below an elaboration on each of the sources will be given.

1. The unexpected occurrence of a positive/ negative internal project event or external event.
   New situations are created by the occurrence of unexpected events. These situations contain new opportunities.

2. A discrepancy between the product or current method of working and the one desired by the project stakeholders.
   When planning the construction of a road or railway the project team decides on a working method. This construction method might not be best solution for all project stakeholders.

3. Need for a project solution.
   This source is self-explanatory. Only the difference between this point and point 1 should be clarified. The main difference is in the fact that point 1 refers to *unexpected* events and that the need for a project solution refers to a possible *expected* event for which a solution needs to be found before occurrence.

4. External boundary conditions that change.
   Infrastructure projects are planned and constructed within the boundaries set-up by the outside world. An example of such a boundary condition are the safety regulations for tunnels in the Netherlands. While constructing a tunnel, these regulation might change due to new insights from the regulatory organization.

5. Changes in spatial development can have an impact on an infrastructure project.
   Infrastructure is made to facilitate people in moving from one place to the other. Spatial development can for example be building new houses. Changes in spatial development can therefore results in a change in the need for infrastructure.

6. Opportunities can develop when changes occur in the perception and mood of project stakeholders towards the project.
   The perception and mood of project stakeholders towards the project can change during the project. This is especially the case when working in populated areas where realizing new or expanding existing infrastructure might have negative influence on the living conditions of the people living nearby. For example by increased noise or fine dust.

7. New insights from outside the project.
   As projects progress, more information becomes available over time. This can be either project information or scientific knowledge that can be used for the project.

Looking at the seven sources, it can be expected that some sources will result in more opportunities than other sources. Looking at the infrastructure projects, the planning and realization phase usually takes several years. Because the changes in source number 4 and 5 are not expected to occur frequently, the probability that such a change occurs during the planning and realization phase of an infrastructure project is regarded as low.
It is assumed that in the planning and realization phase, most of the wishes of the stakeholders have already been taken into account and therefore source number 2 is suspected to occur less likely in those phases. Also the perception and mood of project stakeholders is not expected to change significantly.
In contrast, risks occur a lot in the planning and realization phase of infrastructure projects. Due to the dynamics in these phases, project solutions are constantly needed. Lastly, the planning and realization phase generates vast amounts of information, these can be a highly important source of change. This results in hypothesis 1b.

Hypothesis 1b: The most likely sources of discovered opportunities are:

1 The unexpected occurrence of a positive/ negative internal project event or external event.
3 Need for a project solution.
7 New insights from outside the project.

Hypothesis 2: Endogenous and Exogenous Opportunities

In the literature Kirznerian opportunities and Schumpeterian opportunities are defined. Kirzner (1999) acknowledged that both views can be simultaneously accepted, whereby Kirznerian opportunities come from internal market processes and Schumpeterian opportunities from externally driving forces. This internal and external view is also shared by Shane (2003, p. 20), who states that Kirznerian opportunities reinforce established ways of doing things (internal), whereas Schumpeterian opportunities disrupt the existing system (external).

In the elaboration on the entrepreneurial theory the first link between project opportunities and entrepreneurial opportunities was already made. Section 3.1 described this link by giving examples for both Kirznerian and Schumpeterian opportunities. This division of opportunities becomes a very intriguing notion if we combine it with the dynamics in project scope that we see within infrastructure projects.

The scope of infrastructure projects is defined during the entire project life cycle. Starting very broad and often with several possibilities, it is gradually getting shape in the course of the project. This research focuses on the planning and realization phase of infrastructure projects, in which the scope is already largely clear and set. However, it might still be possible that the scope is adjusted in the planning and realization phase because opportunities might arise that add extra value to the project. Still, it would be more likely to identify the opportunities that have an impact on the scope in the earlier phases of the project.

The suggestion is therefore to divide opportunities in two groups, endogenous and exogenous opportunities. If an opportunity does not change the scope of the project, it is called an endogenous opportunity. Opportunities that do change the scope of the project are exogenous opportunities. Figure 3-7 shows the relation between Kirznerian and Schumpeterian opportunities and project scope.

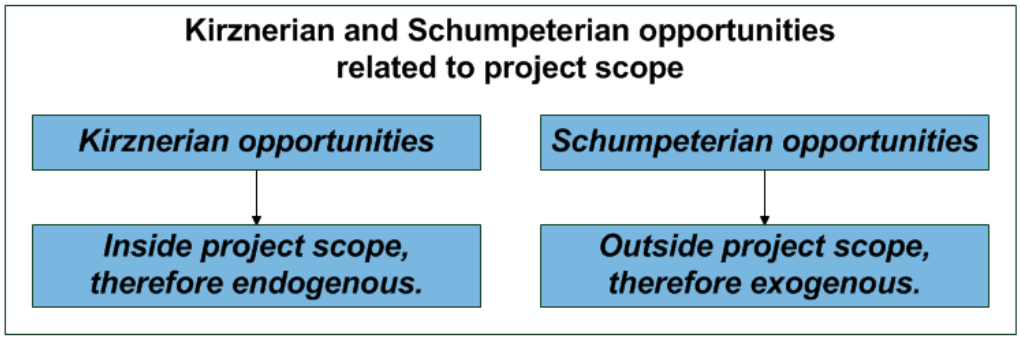

Figure 3-7: Endogenous and exogenous opportunities (author)

This results in hypothesis 2.

Hypothesis 2: endogenous opportunities are more inclined to be identified in the planning and execution phase of infrastructure projects than exogenous opportunities.

Hypotheses: 3a – 3e Management of Opportunities

The next relevant question is whether endogenous and exogenous opportunities are managed differently. Important for this distinction is the statement made by Shane (2003, p. 21): *"the discovery, evaluation and exploitation of opportunities should differ between Schumpeterian and Kirznerian opportunities"*
If the conjuncture on the relation between Kirznerian and Schumpeterian opportunities and endogenous and exogenous opportunities is right, this means that differences should also be observed between the management of endogenous and exogenous project opportunities. This conjuncture will be used in some of the hypotheses to come.

Three steps in the management of opportunities have been defined: (1) *identification*; (2) *evaluation*; (3) *exploitation* (see 3.3.2). For the *exploitation* step no separate hypothesis will be made. The information from this section will be used in hypothesis 3c, because they both cover the topic of reducing uncertainty.

Opportunity identification (hypothesis 3a)
The first step in the opportunity management process is *opportunity identification*. In section 3.3.3 three ways to access information were described that might lead to opportunity identification: (1) life experiences, (2) social networks and (3) search processes. This information is summarized in Figure 3-8. For this step it is important to know which of these ways results in finding the most opportunities.

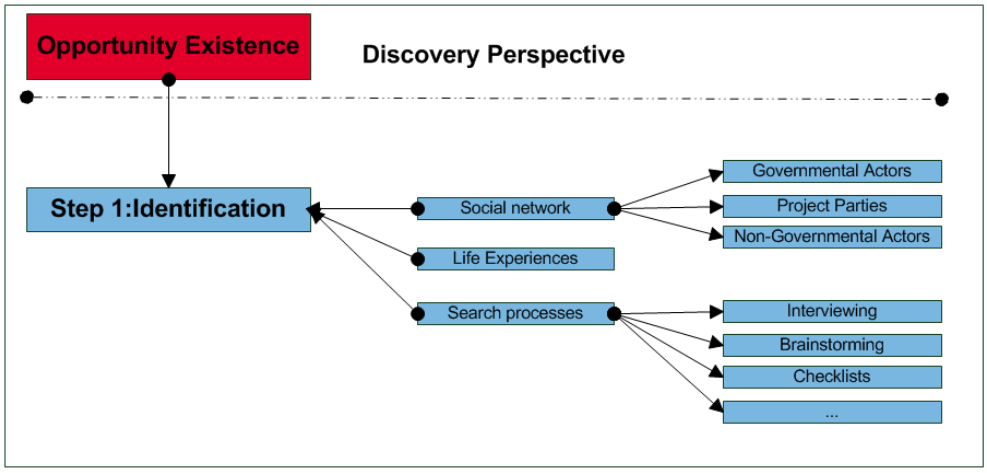

Figure 3-8: Hypothesis on opportunity identification

It is assumed that search processes are mostly used for identifying opportunities, because opportunities from the discovery perspective are identified after a change has occurred. Such a change triggers a search for opportunities. This results in hypothesis 3a.

Hypothesis 3a: Search processes are most effective for identifying opportunities.

Opportunity evaluation and exploitation (hypotheses 3b – 3e)

The second step in the opportunity management process is *opportunity evaluation* (see 3.3.4). In this step it is the goal to make a decision on whether or not to exploit the opportunity. The hypotheses for this step are therefore concerned with the process that leads to a decision. Four hypotheses are made to cover all topics: (3b) the manner in which the evaluation is done implicitly or explicitly, (3c) how project managers deal with uncertainty in evaluation, (3d) responsibility for decision making and (3e) influence of contracts on the decision making.

The first question that arises is the extent to which opportunities are evaluated in an explicit manner by project managers. It is expected that they make a conscious decision in which they make a trade-off between the various project objectives, before they start to exploit the opportunity.

Figure 3-9 gives a visualization of possible trade-offs for an opportunity. In this case, the expected result of the opportunity is less time and more quality (positive). It is the expected that the costs are increased as a result in the opportunity (negative). In explicit decision making, this trade-off is made by weighing these three objectives.
However, keep in mind that opportunities create value for the client and therefore might have an impact on objectives besides time, cost and quality which are mentioned in this example (see Section 3.2).

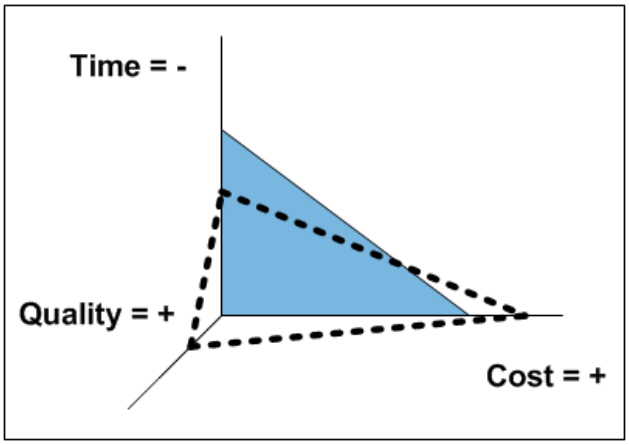

Figure 3-9: Trade-off quality and time vs. cost

This results in hypothesis 3b.

Hypothesis 3b: Decision making on the exploitation of project opportunities in infrastructure projects is done in an explicit manner.

Opportunities need to be acted upon before they have an impact. However, several uncertainties surround the decision on whether or not to act: (1) feasibility of the opportunity, (2) the impact of the opportunity, and (3) the amount of work that is necessary for exploiting the opportunity (see section 3.3.4).
Section 3.3.5 on *opportunity exploitation* presented seven strategies for reducing uncertainty: (1) real options approaches to investing; (2) use of social, direct and indirect ties; (3) communication strategies; (4) flexibility and adaptability; (5) forming alliances; (6) legitimating; and (7) planning.
Because people are generally risk averse when dealing with possible outcomes, it is expected that project managers eliminate as much uncertainty as possible before making a decision on whether or not to exploit the opportunity. The question is to which extend project managers use these strategies to reduce uncertainty and which strategies are regarded as the most useful. This results in hypothesis 3c.

Hypothesis 3c: Decision making on the exploitation of project opportunities in infrastructure projects is done only after using explicit strategies for eliminating uncertainty surrounding the opportunity.

Responsibility for decision making is expected to differ between endogenous and exogenous opportunities. Because exogenous opportunities bring changes into the project scope, it is expected that the client has to make the decision on whether or not to exploit the opportunity. With endogenous opportunities, the scope does not change and although the client might be informed about the opportunity, the decision making responsibility is expected to be with the project manager. This results in hypothesis 3d.

Hypothesis 3d: Decision making on the exploitation of project opportunities in infrastructure projects is done by the project manager in case of endogenous opportunities and by the client in case of exogenous opportunities.

In section 3.3.4 the relationship between contracts and opportunities was explained. It was stated that the ability to exploit opportunities from the client strongly diminishes after engaging in a contractual agreement. The reason for this is that changes in a contractual agreement are usually costly and therefore have a negative impact on the cost-benefit analyses for the opportunity.
With more integrated contracts such as D&C (or DBFM), the contract with the contractor is signed earlier in the process, because besides Construction, Design is also incorporated in the contract. Because the contract is signed earlier, desired changes in the design phase would also mean changes in the contract. This results in hypothesis 3e.

Hypothesis 3e: Integrated contracts make it more difficult for the client to exploit opportunities.

Summary - How can the studied literature be translated for the management of opportunities in infrastructure projects?

In total 8 hypotheses have been created in this section. Those hypotheses try to cover all the important topics on how to manage opportunities. Next part of the research is testing these hypotheses against the information received in the interviews, this will be done in chapter 4.

4. Analysis

How do project managers, manage opportunities in infrastructure projects?

In this chapter the empirical part of the research is described. To answer the research questions empirical data was collected through interviews with project managers of infrastructure projects. The transcripts of the interviews are confidential, therefore they are not presented in this report. Due to these confidentiality reasons, the sources of quotes and examples are not named.

The interviews resulted in the identification of 23 opportunities that are used for testing the hypotheses. The number of 12 interviewees and 23 opportunities is low for making strong claims regarding the verification or nullification of the hypotheses. However, the project managers were often people with extensive experience in the field of infrastructure projects and their examples and opinions have a high relevance for the subject.

For every hypothesis the analysis will be structured more or less the same. First a brief reiteration of the hypothesis will be given, followed by the explanation of the table or figure that represents the data. Second, a more in depth analysis is made of the results and examples will be given to illustrate the analysis. Third, the hypothesis will be validated or nullified. Fourth, the information from the discussion on the hypothesis during the validation workshop is given.

Figure 4-1 shows an overview of the hypotheses and their place in the opportunity management process.

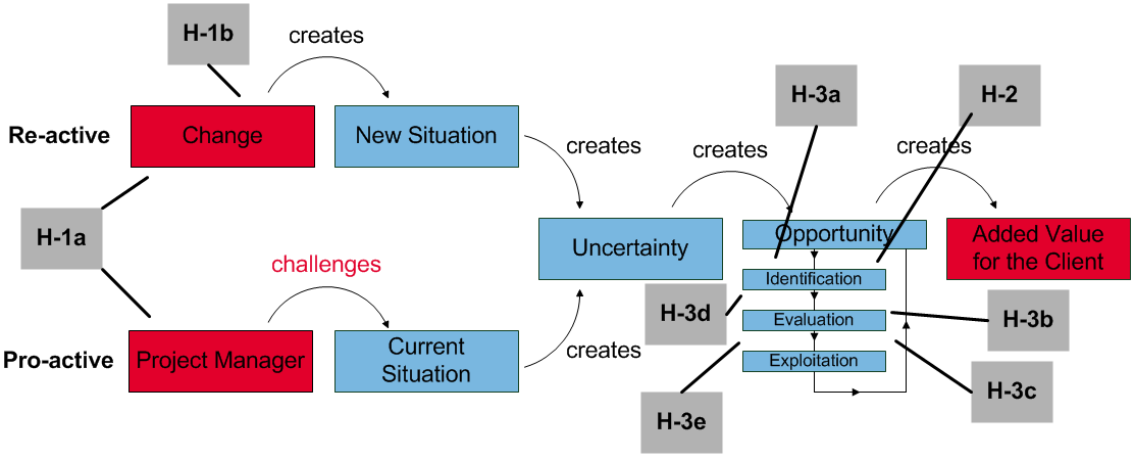

Figure 4-1: Overview hypotheses

In addition to the analyses for the hypotheses, also other interesting information was received. This information is described in Appendix X.

4.1 Hypotheses 1a – 1b: Discovery and Creative Perspective

Hypothesis 1a: Opportunities in the planning and realization phase of infrastructure projects are more likely to be discovered than created.

Depending on the change preceding the opportunity, the opportunities can either be discovered or created. See section 3.4 for a more elaborate explanation of the theory. From the total group of 23 opportunities, 18 (78%) can be described as discovered opportunities and 5 (22%) are defined as created opportunities.

Created opportunities

Before discussing the created opportunities an example will first be given in order to provide the reader with a more tangible feeling of a created opportunity.

Example 1 – Created Opportunity

Context

In one of the projects within a large infrastructure program, a new piece of road had to be constructed. This road would have a connection to an existing road that belonged to a large private company. This project was the most time-critical project of the program, due to some procedural delays.

Opportunity

From an old colleague, the project manager heard that the road to which the connection was being made, was having an extension. The project manager went talking to the project manager of the road extension project and asked if he could take over some of the pre-construction work.

Result

The project manager was able to shift the most time-consuming part of the work, 'ophogen en zetten' to the other contractor. He was therefore able to do work, without having a contractor himself. This saved considerable amount of time, which was very valuable for this time-critical project.

Discussion – why created?

This example shows that although no direct change occurred in the environment of the project, the project manager was able to create an opportunity.

Figure 4-2: Example 1 – Created Opportunity

Some interesting observations about the five created opportunities can be made. Before we go deeper into this it is important to reiterate the small statistical basis. Analyzing and drawing conclusions on the basis of these five opportunities should be done with precaution.

First, from the five created opportunities, four did not require any additional investment while still having a positive effect on time. As a result of the time reduction, most of the created opportunities indirectly had a positive effect on the cost of the project. This is especially true for opportunities in the realization phase, because time is very costly during the realization phase. During construction large amounts of money are spend on manpower and equipment every day. Any reduction in construction time therefore immediately has a positive effect on the cost of the project. Depending on the contract such cost re-

duction are then for the client or contractor. In Example 1, the time reduction was achieved by transferring work to another project. The time that it takes to go through the entire tendering procedure could therefore be saved.

Second, the created opportunities are found in both the planning and the realization phase. Project managers in both phases were therefore able to create opportunities. With regards to the question whether or not they were inside or outside of the scope (i.e. endogenous or exogenous), it could be noticed that all created opportunities were endogenous. It was already noted that the created opportunities did not require an additional investment. Without additional investment it is difficult to exploit exogenous opportunities and it is therefore logical that the created opportunities were all endogenous.

Discovered opportunities

Because hypothesis 1b will make a deeper analysis of the discovered opportunities, this will not be done at this moment. Only an example will be given to illustrate the difference with the created opportunities.

Example 2 – Discovered Opportunity

Context

For a large railway project, a 8 km long railway embankment had to be renovated. For this purpose, a sheet piles was constructed by means of vibration to support the sand.

Change

During construction of the sheet piles, the railway embankment started to fall apart. It was therefore concluded that the current construction could not sustain the induced vibrations.

Opportunity

A new method of working had to be found. Instead of the sheet piling and hydraulic sand fill, it was decided to fill the sand by means of trucks. In addition, also some extra monitoring and testing equipment had to be installed.

Result

The extra turned out to be around 2 million. However, because the sheet piling did not need to be constructed, 8 million could be saved. Resulting in 6 million in savings. Construction time for this part of the track increased, but because it was not on the critical path, it did not have consequences.
In addition, because the project was executed with a "Strategic alliance" contract, the savings were shared by the contractor and the client.

Discussion – why discovered?

This is a clear case of an opportunity that was discovered after the occurrence of a unexpected event. If the vibration would not have caused the current construction to fall apart, nothing would have changed and construction would have continued with the old way of working.

Figure 4-3: Example 2 – Discovered Opportunity

Conclusion

Of the total number of opportunities, 78% of the opportunities are discovered. For this sample of 23 opportunities it can therefore be concluded that opportunities are more often discovered than created.

Validation

During discussion of this hypothesis in the validation workshop, the project managers agreed on the fact that most opportunities are identified when there is a direct change preceding the opportunity. Due to the daily work of the project manager, they do not believe that project managers are looking for opportunities without a direct cause but discover opportunities after a change has occurred.

However, the project managers were looking for means to stimulate proactive opportunity management and creativity in order to do things faster, cheaper or to increase quality. For this, the project managers pointed out several important factors. Incentives, challenging project constraints and the ego of the project manager were regarded as important for proactive opportunity management.

Hypothesis 1b: The most likely sources of discovered opportunities are:

1 The unexpected occurrence of a positive/ negative internal project event or external event.

3 Need for a project solution.

7 New insights from outside the project.

In Table 4 the categories of change are listed once more. For a more thorough explanation of the categories of change, please look at section 3.4.

Table 4: Sources of change

1	The unexpected occurrence of a positive/ negative internal project event or external event.
2	A discrepancy between the product or current method of working and the one desired by the project stakeholders.
3	Need for a project solution.
4	External boundary conditions that change. For example safety regulation.
5	Changes in spatial development can have an impact on an infrastructure project.
6	Opportunities can develop when changes occur in the perception and mood of project stakeholders towards the project.
7	New insights from outside the project.

For every discovered opportunity, the change that occurred before the opportunity was discovered was categorized in one of the seven categories. The results of the analyses are shown in Figure 4-4. In total 18 opportunities were classified as discovered, so this is also the total number in Figure 4-4.
As expected, the sources 1, 3 and 7 occur often and together account for the majority. However, also source 4 and especially source 2 occur often. In none of the opportunities identified for this research were sources 5 or 6 critical for identifying the opportunity. Although Figure 4-4 might seem very conclusive, it should be reiterated that the statistical basis of 18 opportunities is very small.

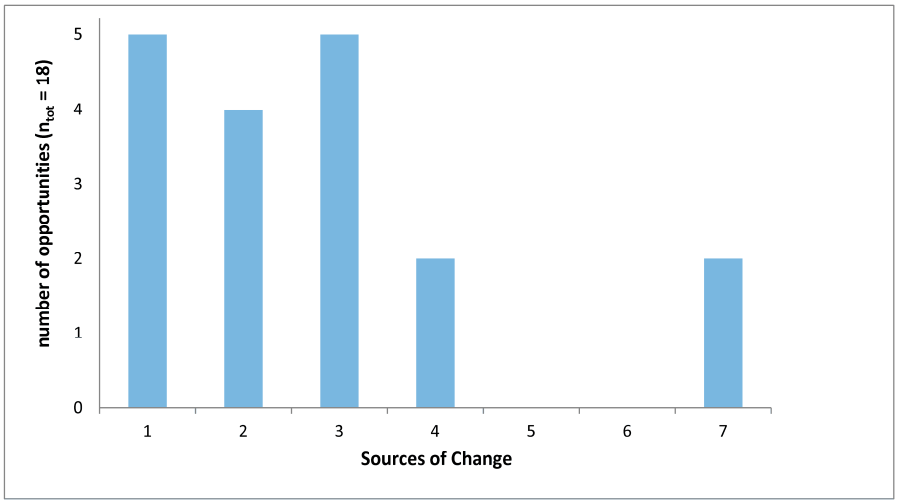

Figure 4-4: Hypothesis 1b – Sources of Change

Sources 1 – occurrence of unexpected events – n=5

In the text leading up to the creation of hypothesis 1b, it was anticipated that unexpected events would be a large source for opportunities and this turned out to be true. Example 2, described in Figure 4-3, shows how an unexpected event was turned into an opportunity.

Source 2 – method of working or product – n=4

Unexpectedly, source 2 turned out to be a major source for opportunities with basically two possibilities. A discrepancy in the *product* or the *method of working*. In 3 of the 4 opportunities the method of working was not regarded optimal by the project stakeholders, because of excessive disturbances made during construction. Limiting those disturbances proved to be an opportunity to provide value to the stakeholders. However, an investment had to be made by the project because the contractor had to be compensated for the changes he had to make. In Figure 4-5 an example is given in which the stakeholder (sales company) even paid a share of the extra cost.

Example 3 – Source of Change 2

Context

In the realization phase of a road expansion project, piles had to be driven for the basis of the foundation. Because pile driving is a very noisy construction activity, the stakeholders living in the area were noticed on beforehand of this construction activity.

Change

One of the companies in the vicinity of the pile driving activity was planning to hold a sales demonstration in that period. The project manager therefore asked the project team if the plans could be changed in such a way that the sales demonstration would not be hindered by noise due to pile driving.

Opportunity

Together with the contractor, the project team then came up with a new plan for the pile driving outside the planning of the sales demonstration.

Result

The contractor wanted to be reimbursed for the extra cost he would be making. These extra cost were shared by the project and the company. The positive result was in the relationship with the stakeholder.

Discussion – why source 2?

The original planning and construction was not preferred by the stakeholder. This was the cause of the change that led to identification of the opportunity.

Figure 4-5: Example 3 – Source of Change no. 2

Although creating value for the surrounding stakeholders is the prime objective of opportunities that limit disturbances during construction, they can also have positive other effects. In Example 3 this was not the case, but one other opportunity showed that the improved relationship with the stakeholder could be used by the project team to alter some restrictions on working times. This eventually saved several weeks and the cost savings made by this reduction of construction time, outweighed the extra that were incurred for changes to the construction method.

Source 3 – need for a project solution – n=5

Although the actual occurrence of an unexpected event was the source for several opportunities, the need for a project solution also acted as a catalyst for identifying opportunities. Although less pressure was on the project team in comparison to the occurrence of an unexpected event, the actual need to provide a solution for a possible problem stimulated to look for opportunities.

Source 4 – external boundary conditions – n=2

It was not expected that changes in the external boundaries would be a source for discovering opportunities, because those changes do not occur regularly. This turned out to be true, but even though they are less common, they still exist.

Source 7 – new project information – n=2

New information that is gathered during the course of the project might hold opportunities. Because it is not possible to know everything on beforehand, it is important to be alert in order to use the information. Figure 4-6 gives an example of an opportunity that was discovered after new information became available.

Example 4 – Source of Change 7

Context

For a large rail construction project, a new tunnel had to be constructed. In the planning phase the Hoogheemraadschap (Water board) had set several requirements for construction of the tunnel.

Change

In the period between the first design made by the client and the detailed design by the contractor, new information on the soil characteristics were obtained.

Opportunity

The new information showed that the requirements that were set by the Hoogheemraadschap were very conservative, because the soil characteristics turned out to be better than expected. By changing the requirements in cooperation with the Hoogheemraadschap, it was possible to make a design that required less tunnel depth.

Result

Less tunnel depth means a smaller construction and a significant reduction in cost for construction of the tunnel. Because the project was executed with a "Strategic alliance" contract, the savings were shared by the contractor and the client.

Discussion – why source 7?

New information on soil characteristics became available after time. Although it is always possible to say "why did we not know this in an earlier stage?", it is not possible to have all information at the start of the project.

Figure 4-6: Example 4 – Source of Change no. 7

Conclusion

The numbers 1, 3 and 7 account for 67% of the opportunities. However, also 2 and 4 are sources of opportunities. Even though these numbers give an indication on the hypothesis, the question whether or not the division of these 'sources of changes' are the right ones, it probably more important than the verification or nullification of the hypothesis. During the validation step in the research, this question will therefore also be asked to the project managers.

Validation

During the validation workshop, the project managers were asked to name triggers for looking at opportunities. This list differs from the 7 sources of change that were discussed in this hypothesis. The identified triggers are listed in Table 5.

Table 5: Triggers for opportunity management

	What	**How**
i	Political pressure	Internal and external stakeholders act more quickly
ii	Hard deadlines	People are triggered in finding innovative solutions
iii	Sense of urgency on project objectives	People are triggered in finding innovative solutions
iv	Problems with stakeholders	New ways of working need to be found
v	Coincidence	In some occasions, opportunities happen without deliberate planning
vi	Change in priority of the project objectives	When the weight of the project objectives changes, opportunities arise for doing things differently
vii	Possible added value outside project boundaries	Opportunities that are not necessarily of importance for the project, but of benefit for the 'Holding Holland'
viii	Self interest/ego project manager	Project managers with a personal drive to exploit an opportunity.
ix	Boundaries of the project	Opportunities always take place on the boundaries of the project. For example legislative, technical, etc.

Due to time constraints it was not possible to discuss the points mentioned in Table 5 against the 7 sources of change. This would probably be difficult, because they are not always on the same level. For example, it is difficult to compare 'change of priority of the project objectives' or 'sense of urgency on project objectives' with 'the occurrence of an unexpected event' (source of change 1), because the occurrence can be a cause for the change in priority or the existence of a sense of urgency.

Only for sources of change 2 and 6, which deal with project stakeholders, is it possible to set them against 'point iv - problems with stakeholders' mentioned during the workshop.

4.2 Hypothesis 2: Endogenous and Exogenous Opportunities

Hypothesis 2: endogenous opportunities are more inclined to be identified in the planning and execution phase of infrastructure projects than exogenous opportunities.

Before looking at the opportunities and determining if they are endogenous or exogenous, it is important to restate the definition we use for the scope in this report. Scope is defined as: "the work that must be done to deliver a product with the specified features and functions" (PMI, 2000, p. 51). Exogenous opportunities are regarded changes to the scope of the project. From the interviews 23 opportunities from the interviews, 16 (70%) were endogenous opportunities and 7 (30%) exogenous opportunities.

Exogenous opportunities

In most occasions (6 out of 7) the exogenous opportunities were additions to the current scope. This could be the addition to the scope of a project by taking over some of the work from a simultaneously executed infrastructure project. By taking over this extra work, the amount of interfaces and interdependencies is lowered and both projects become more manageable.

Example 5 – Exogenous opportunity

Context

On the same location where also a new road had to be constructed, a new (separate) bus lane was planned. Initially, the bus lane would be finished well ahead of the new road that needed to be constructed. However, the planning of the bus lane had several delays.

Opportunity

Because of the delays, several activities that were first planned separately, could also be done simultaneously. This started with expropriation of the grounds, but ended up with the integration of the bus lane in the road construction project.

Result

Two major result can be identified with this opportunity. (1) Less interfaces and interdependencies between the projects makes the scope easier to execute. (2) Although it is impossible with hindsight to state that integrating has led to a reduction of construction cost. It can be assumed that cost reduction has been achieved in the overhead of the bus lane project, because this was integrated in the far bigger road construction project. It was not necessary to have two project teams on site with the facilities that are required for them.

Discussion – why exogenous?

For the road construction project this was an exogenous opportunity, because it took the scope of the bus lane project within its own project.

Figure 4-7: Example 5 – Exogenous opportunity

Also interesting to note is the fact that most exogenous opportunities identified in this research were from the planning phase. The most obvious reason for this would be that any change (addition or decrease) in scope is more likely to be done earlier in the project.

Endogenous opportunities

As expected, endogenous opportunities were more common than exogenous opportunities. In the analysis of the previous hypotheses, several of those endogenous opportunities were already given as examples. In contrast to exogenous opportunities, it is difficult to find any common characteristics for endogenous opportunities. As described in section 3.1, they seem to be idiosyncratic.

Conclusion

Fifteen out the twenty-three opportunities are regarded as endogenous opportunities. Although this is a majority, still a considerable number of opportunities are exogenous. It is therefore very difficult to make a strong conclusion on this hypothesis. Especially regarding the fact that the interviews will most probably have resulted in discussing the most important opportunities, this could have influence on the ratio endogenous/exogenous opportunities.

Validation

The fact that endogenous opportunities are more often identified than exogenous opportunities was also expected by the project managers in the validation workshop. However, two other important points regarding endogenous and exogenous opportunities were discussed more thoroughly.

First, the project managers expected exogenous opportunities to be opportunities with a bigger impact than endogenous opportunities. In a way, the relative larger impact offsets the smaller number of opportunities. Second, the project managers regarded the management of endogenous opportunities as being part of good project management work.

In contrast, exogenous opportunities were regarded as seeking the boundaries of the work and trying to find opportunities by altering or challenging these boundary conditions. From a project management perspective, this is not part of the normal work of the project manager and therefore demands more effort. Because exogenous opportunities ask a lot of effort, the project managers advised only to look for exogenous opportunities in projects that are running smoothly.

This can be regarded contrasting, because with opportunity management it is possible to improve a bad running project by exploiting exogenous opportunities. Still, the project managers would be more inclined to focus on risk management and endogenous opportunities instead of looking for exogenous opportunities.

4.3 Hypothesis 3a – 3e: : Management of Opportunities

Hypothesis 3a: Search processes are most effective for identifying opportunities.

Three ways of identifying opportunities were elaborated on in section 3.3.3, search process, life experience and social network. For each of the opportunities, the manner in which they have been identified has been investigated.

Figure 4-8 shows the results of the analysis. The total number of opportunities is 18, because for 5 opportunities no information was obtained on the identification.

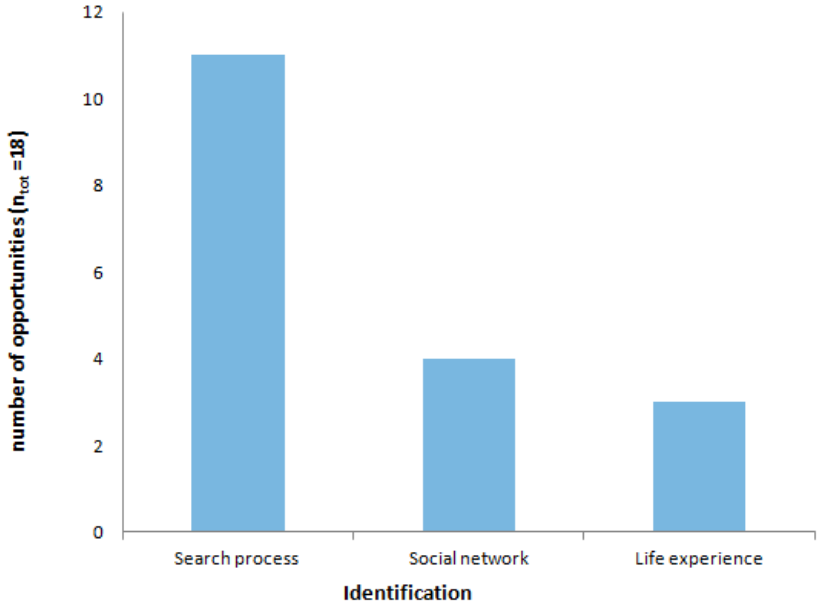

Figure 4-8: Hypothesis 3a – Opportunity Identification

Search processes

Search processes are by far the most common manner for identifying opportunities. For opportunities that originated from unexpected events such search processes are facilitated by creating special task forces. Although this might be regarded as 'crisis management', it may result in the identification of opportunities. Example 2, explained in Figure 4-3, is a perfect example of how something that initially can be regarded as an event with a negative impact, might be changed into an opportunity. These search process are therefore aimed 'inwards' with people from the own organization or project team.

The first question that is often asked after an unexpected event or risk has turned into an opportunity is: *why did we not see this before?* The answer to this question is different for every opportunity. Still, the interviews showed three mechanisms that are of importance for converting seemingly negative situations into opportunities.

- Stimulation of out-of-the-box thinking.
- Challenge assumptions that were made earlier in the project.
- Looking at the event, occurred risk or problem from the perspective of various stakeholders.

If these three mechanisms are not stimulated, it is very difficult to discover opportunities.

Social network

In addition also a cross-check was made between the sources of change and opportunity identification. As could be expected, source 2[4] gives rise to opportunities that are identified in the social network. The best way to identify a discrepancy in the current method of working and the desired method of working is by talking to the stakeholders. In this sense this is different from search processes, because it is more aimed 'outwards'.

In addition, these opportunities identified from the social network can be divided into two groups. The first group includes opportunities whereby a project stakeholder approached the project team with an opportunity. In the second group, the project team had to be pro-active in engaging the stakeholders and possibly identifying opportunities. In both occasions, providing information to the stakeholders in an adequate and timely manner is of the outmost importance. Without information they are never able to identify opportunities that can be a win-win situation for both themselves, as well as the project.

Life experiences

For life experience the most important aspect is the background of the project manager. For a project manager that has worked for several years at the contractor side of infrastructure projects, it is possible to look at problems from the perspective of the contractor. As stated in the discussion on search process, looking from the perspective of other stakeholders is invaluable for creating win-win situations.

Conclusion

From the limited numbers of opportunities, search process was the most common way to identify opportunities. However, drawing strong conclusions is not possible and will require more extensive research.

Validation

Next to discussing the manners of opportunity identification, the fact 'if' project managers look on a structured basis to identify opportunities was discussed. Although this was the case for endogenous opportunities, the exogenous opportunities were not identified in a structured manner.

It should be noted that there is a difference in search processes as defined in this hypothesis and an opportunity management session/ workshop. Search processes can entail every form of search for opportunities, an opportunity management session/ workshop is therefore an example of a search process, but not the only possibility.

The project managers expressed the need for more information on how to search for opportunities. This would be necessary in order to change from re-active to pro-active opportunity management. This remark is important for this research, because it basically expresses the need for the research. For opportunity searching, one project manager gave the example of stakeholder management. With stakeholder management an extensive analysis of the various stakeholders in the project is made and a ranking in Power and Interest is given to every stakeholder. This can be very helpful in mapping the project environment. However, to turn this information in the identification of opportunities is a step that has not yet been made. Opportunity management could be very helpful in taking this extra step.

[4] A discrepancy between the product or current method of working and the one desired by the project stakeholders.

In addition several other important conditions for performing opportunity management were recognized by the project managers

- The project managers indicated that opportunities are often found on the boundaries of the project and under 'pressure'. Challenging these boundaries is regarded as important for the identification.
- They stressed the need for involvement of external people in the sessions. Those people are not restricted by the 'history' of the project and external people can link the project to their own network and thereby identify new opportunities.
- Perhaps the most important point stressed by the project managers was about knowledge on what the client values. Only when the project manager knows what is of value for the client, he is able to 'score' on this point.

Hypothesis 3b: Decision making on the exploitation of project opportunities in infrastructure projects is done in an explicit manner.

Internal clients

In projects, the various interests are represented by people that have a more direct (internal) client role, the supervisors of the project manager. One project manager described these internal supervisors as guarding one or more of the three project objectives: time, quality and cost (see Figure 4-9 and Table 6). For most opportunities, the project manager needs to discuss the different trade-offs with these internal supervisors. Because an opportunity for one internal supervisor can be a risk for another internal supervisor, the discussion inevitably result into explicit decision making.

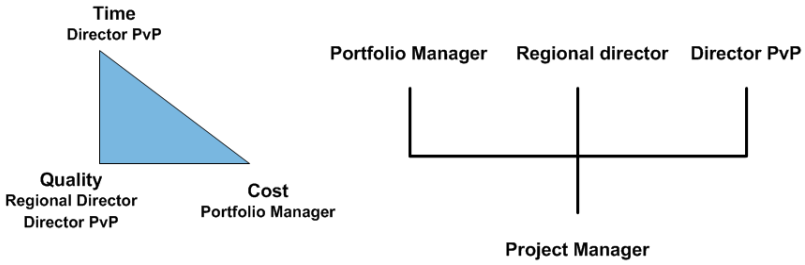

Figure 4-9: Internal supervisor

Table 6: Internal supervisor

Internal supervisor	Interest/ responsibility	Project objective
Portfolio manager	Budget	Cost
Regional director	Traffic flow	Quality / Scope
Director PvP	Decision of plan studies	Time / Quality

Conclusion

Information from the interviews suggest that hypothesis 3b can be verified.

Validation

The project managers during the validation session all agreed that opportunities require an explicit manner of decision making. The accountability they have towards the internal clients is a driver for this explicit decision making. However, the project managers indicated that the 'smaller' the perceived impact of the opportunity, the less explicit the decision making needs to be. Because the internal client will focus only on the opportunities with a high impact, decision making for smaller (endogenous) opportunities might be less explicit. This difference between exogenous and endogenous opportunities will be discussed more in detail in hypothesis 3d.

The project managers also indicated that a well-considered decision can be of importance for the result of the opportunity.

Hypothesis 3c: Decision making on the exploitation of project opportunities in infrastructure projects is done only after using explicit strategies for eliminating uncertainty surrounding the opportunity.

Figure 4-10 shows the various strategies and the frequency that these strategies were used for the identified opportunities. The total number in this case is 20, because for 3 opportunities no information was given in the interviews on uncertainty reduction. Figure 4-10 clearly shows that a wide variety of strategies are used for uncertainty reduction. Only strategy 4 (flexibility and adaptability) was not witnessed in the opportunities identified for this research. In addition to the seven strategies derived from the literature, practice showed one other strategy: testing of the opportunity. By first testing the opportunity on a smaller scale, uncertainty can be lowered before actual exploitation. This can be very useful for new working method (see Figure 4-3).

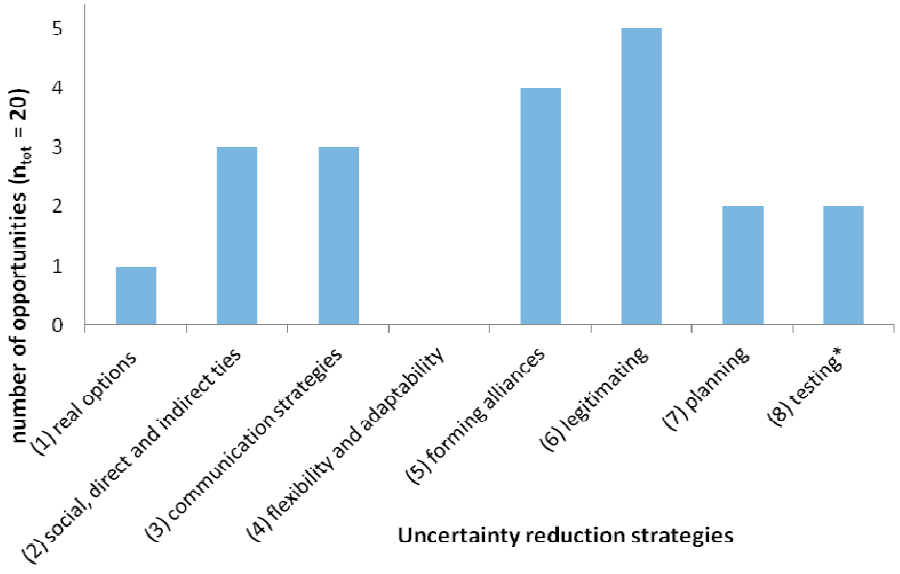

Figure 4-10: Hypothesis 3c – Uncertainty reduction strategies

In section 3.1 we have seen that uncertainty can be divided in two types: aleatory and epistemic uncertainty. *"Aleatorical uncertainty arises because of natural, unpredictable variation in the performance of the system under study"* (Daneskhah, 2004, p. 2). *"Epistemic uncertainty is due to the lack of knowledge about the behavior*

of the system that is conceptually resolvable" (Daneskhah, 2004, p. 2). Aleatorical uncertainty is always present, because it is impossible to remove. However, epistemic uncertainty can be reduced by using the various strategies explained in section 3.3.5. The interviews showed that the project managers used the various strategies, before deciding whether or not to exploit the opportunity. This was done to minimize the potential negative side-effects of the opportunity and to further investigate the result of the opportunity. In line with hypothesis 3b, this contributed to explicit decision making.

Conclusion

Uncertainty reduction could be categorized in almost all cases, this gives the strong suggestion that hypothesis 3c can be verified. What probably contributes to this is the fact that most of the opportunities have a big impact. This means that the decision making involved is not a quick and easy process, but needs careful consideration (as was seen in hypothesis 3b) and thus involves the reduction of uncertainty. However, doing a prediction on which reduction strategies are most frequently used is impossible due to the low statistical basis of 20 opportunities.

Validation

Due to time constraints, it was not possible to discuss this hypothesis during the validation workshop. Luckily, the discussion on hypothesis 3b also gave some hints on how project managers would have answered with regards to this hypothesis.

The project managers were unanimous in mentioning the importance of contracts in the case of opportunities. They stated that the first idea for an opportunity often is unclear and full of uncertainty and that uncertainty reduction with regards to the outcome of the opportunity is of the utmost importance. Practically, this would result in a contract with the stakeholders involved in the opportunity and this contract would serve as a sort of safety net for the project manager.

Hypothesis 3d: Decision making on the exploitation of project opportunities in infrastructure projects is done by the project manager in case of endogenous opportunities and by the client in case of exogenous opportunities.

Table 7 shows whether or not the decision making on the opportunity was made by the project manager in case of endogenous and exogenous opportunities. This in order to see if it is necessary for the project manager to have permission from the client before making changes to the scope. From 7 opportunities no information was received on who made the decision on exploiting the opportunity, the total number is therefore 16 opportunities.

Table 7: Hypothesis 3d – Decision making (n_{tot}=16)

Opportunities	**Endogenous**		**Exogenous**	
Decision maker	Project Manager	Higher authority	Project Manager	Higher authority
Number	4	7	0	5
Percentage	**25%**	**44%**	**0%**	**31%**

Mandate

Table 7 shows that the project manager in almost all the cases, both endogenous as exogenous, needs to go to a higher authority for the approval of the opportunity. This can be explained because the mandate of the project manager is often limited, depending on the size of the project between 50.000 euro to 200.000 euro at Rijkswaterstaat. The project manager needs permission for decisions that are beyond his mandate.

Even though the decision making of exogenous opportunities is not the responsibility of the project managers, the project manager is responsible for the 'content' of the opportunity. For example, the analysis of the technical safety is part of the project managers work. This can be summarized in the following table.

Table 8: Responsibilities for content and decision making of opportunities

Opportunities Responsibility	Endogenous	Exogenous
Content	Project Manager	Project Manager
Decision making	Project Manager/ Higher authority	Higher authority

Conclusion

Table 8 shows that hypothesis 3d can be partly nullified. Even for most of the endogenous opportunities, a higher authority had the final decision making responsibility on whether or not to exploit the opportunity.

Validation

Although this hypothesis was not directly discussed during the validation workshop, the subject was touched upon by the project managers in the discussion of hypothesis 3b. They all agreed that they needed permission from a higher authority for exogenous opportunities. For endogenous opportunities they indicated the importance of the mandate and the fact that the decision making on small endogenous opportunities is part of everyday project management work. If the opportunity was outside the mandate, permission from a higher authority was necessary.

Hypothesis 3e: Integrated contracts make it more difficult for the client to exploit opportunities.

Most of the project managers did not regard contracts of vital importance for the decision making on opportunities. The differences are more likely to be in the identification. There are basically three time frames for opportunity identification, see Figure 4-11. (1) The planning phase, before signing of the contract with the contractor. (2) Tendering phase in which the client is looking for a contractor that will realize the work. (3) Realization phase after signing of the contract with the contractor. The exact boundaries of these three time frames are different for every contract.

With more integrated contracts the contractor is involved in an earlier stage, which means that the planning phase for the client is shorter. One project manager described this by saying: "Opportunity management from the client becomes less, the opportunities will have to be identified in an earlier stage".

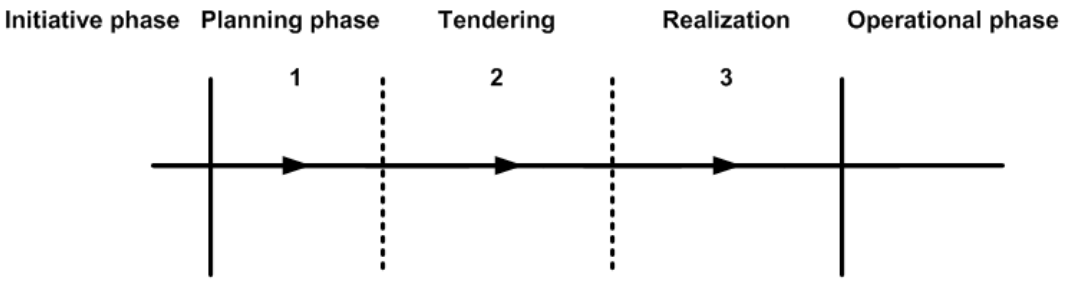

Figure 4-11: Three time frames for opportunity identification

Earlier hypotheses have already focused on opportunity identification and the steps that are taken towards the decision on whether or not to exploit the opportunity. This was all done from the perspective of the client. However, the interviews also showed that the contractor can identify opportunities that have *value* for the client. To stimulate the contractor in identifying those opportunities during the tendering phase (2), the interviewed project managers used EMVI[5] criteria in the tendering procedure.

From the examples 2 & 4 (Figure 4-3 & Figure 4-6), it can be seen that the Strategic Alliance contract can be very interesting for the client. The opportunities discussed in those examples were identified after signing of the contract and the cost reduction would usually be for the contractor. However, the strategic alliance allows for sharing of the profit between the contractor and client after signing of the contract. It therefore stimulates both parties to look for and exploit opportunities.

Conclusion

The interviews suggest that the hypothesis can be nullified.

Validation

During the validation workshop, there was initial disagreement between the project managers on the hypothesis. Several indicated instant approval with the hypothesis, in contrast to others that were strongly against this hypothesis. In the end, the project managers agreed on two important notions with regards to contracts and opportunities:

1. Opportunities bring change in a project that might have contractual impact. If the project manager takes this as a fundamental principle in projects, it is possible to set up contractual guidelines on how to deal with these opportunities. These guidelines are more important than the type of contract. This was illustrated by the quote: "Anticipate dynamics."

   In fact this is what the new integrated contracts try to achieve. By transferring more responsibilities to the contractor, they are stimulated to positively respond to uncertainty and dynamics in the project. Contracts that do not take into account these dynamics, might limit the opportunity space for the client.

   One additional point concerning integrated contracts was made. The price of scope changes for integrated contracts might be higher than for more traditional contracts.

2. The key issue in contracts is to stimulate the contractor in finding opportunities that have value for the client. Three criteria are invaluable: (1) Knowledge of the client about what has *value* for him. (2) Possibility of defining value in a *SMART*[6] manner so it becomes comparable. (3) Existence of a good *relationship* between the client and contractor.

[5] EMVI = Economisch Meest Voordelige Inschrijving, Most Economically Advantageous Tender
EMVI criteria are used by the client in the tendering procedure in order to be able to evaluate tenders not solely on the lowest bid, but also on quality (Rijkswaterstaat, 2011)

[6] Specific, Measurable, Attainable, Relevant, Timely

5. Implications for science and practice

What typologies of opportunities can be derived when looking at the information from the theory and practice and how can those opportunities be managed?

Chapter 4 analyzed the information from the interviews. This chapter will use this information to create a framework for the management of opportunities in infrastructure projects. It will therefore provide practical tips on how to perform opportunity management. The *how question* is therefore at the core of this chapter.

Just as in the previous chapters, the process of opportunity management is used as a guideline through this chapter. This process is shown in Figure 5-1 and for this chapter it is divided into three main sections. First, recommendations will be given on how to recognize situations that contain opportunities by pointing at the sources for opportunities (section 5.1). Second, the different methods for identifying opportunities in those situations will be explained in section 5.2. Third, information regarding decision making and the exploitation of the identified opportunities is given (section 5.3). The three typologies for opportunities that were derived from theory and practice are: (1) created and discovered opportunities, (2) endogenous and exogenous opportunities and (3) sources of opportunities.

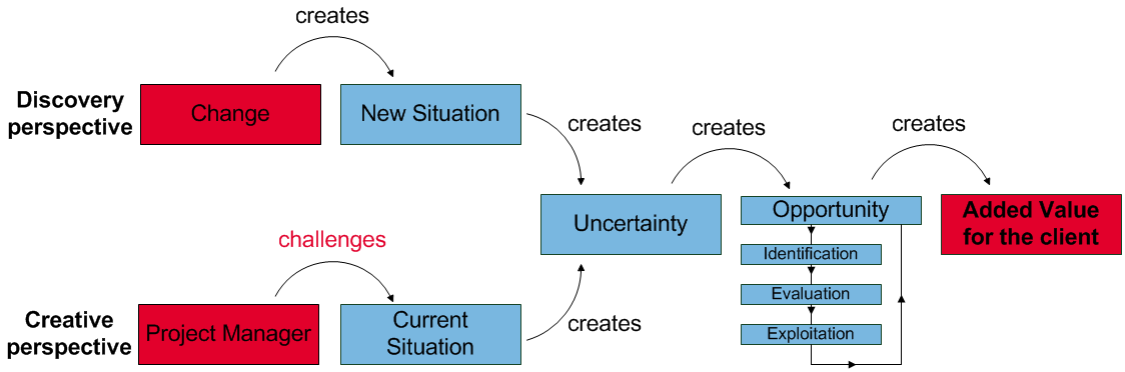

Figure 5-1: Opportunity Management Process

5.1 Sources of opportunities

Before being able to identify an opportunity, it is important to know which situations or circumstances have the possibility to contain opportunities. In these situations it is advised to the project manager and the project team to be in a higher state of alertness for the identification of opportunities. The sources presented in this section are a combination of the information from the literature, interviews and validation workshop. Those can be found in section 3.4 and section 4.1.

- Political pressure

  Infrastructure projects under political pressure often contain opportunities in the area of cooperation with external stakeholders. Political pressure can create a 'momentum' in which the ex-

ternal stakeholders that are 'lower' in the hierarchy are more inclined to actively cooperate, for example in issuing permits.

- Sense of urgency on project objectives

  If one or more project objectives are under pressure, this is often a good trigger for identifying opportunities. People tend to become both focused and creative and a project manager can use such a situation to identify project opportunities.
- Change in priority of project objectives

  Next to pressure on project objectives, it is also plausible that the priority in the project objectives changes during the project, because of a change in the perception of value by the client. Such a change in priority can be a source of opportunities.
- Stakeholders

  Project stakeholders are often regarded as a negative force in projects. However, this does not need to be the case and they can be a major source of opportunities when combining the interests of the project with the interests of stakeholders.
- Unexpected events and occurred risks

  Just like stakeholders, unexpected events and occurred risks are often only regarded negatively. This research showed that they can be a source of opportunities and therefore it is advised to be alert for opportunities that rest within unexpected events or occurred risks.

5.2 Identification of opportunities

Now we know when to be alert for identifying opportunities, this section will explain the proposed method for identifying those opportunities. In the first part of the section we will look at the *opportunity identification session* that a project manager can perform with its team. The second part of the section will deal with how to identify opportunities with *external stakeholders*. This section is based on the information from the interviews and the validation workshop, because entrepreneurial literature did not elaborated in depth on this topic.

Opportunity identification session

In an opportunity identification session, there are many important aspects that need to be considered: (1) work in groups, (2) build trust, (3) Involve people from outside the project team in the session, (4) challenge project constraints, (5) timing and frequency.

1. Work in groups

Although identifying an opportunity is a cognitive act and therefore an individual act, it is recommended to work in groups for the identification of opportunities. Groups have some strong advantages in comparison to working individually. First, if the entire group is involved in identifying opportunities it creates a sense of ownership in the group and people are more likely to commit themselves to the opportunities. Second, 'rough' ideas can be transformed into opportunities more quickly, because various disciplines are present that bring in knowledge on various parts of the opportunities. The evaluation on the feasibility of the opportunity can therefore be made much quicker. Third, by provoking each other to think outside the usual boundaries, people can inspire each other.

2. Build trust

Identified opportunities do not always lead to success. It is crucial that people can be completely open during an opportunity management session. They should not hold back information or ideas because they fear to be judged on their comments later on. Even though ideas or information might not lead directly to opportunities, other people can use it to further shape their ideas.

3. Involve people from outside the project team in the sessions

Adding several people from outside the project team in an opportunity identification session can have advantages because of two reasons. (1) External people bring fresh ideas, they are not restricted by earlier choices and 'invisible' boundaries surrounding the project. (2) External people bring in their own 'network' into the session and thereby find new synergies between other interests in the environment of the project.

4. Challenge project constraints

We have seen that opportunity thinking requires a large amount of creativity, because people need to use existing information for the creation of new ideas that can become feasible opportunities. In addition, it can be difficult sometimes to let go of assumptions and boundaries that 'rule' the project, but work restricting when searching for opportunities. As mentioned in point 3, involving people from outside the project might help to overcome this problem.

There are also other methods that stimulate creativity and 'out of the box thinking'. Appendix XIII gives a theoretical explanation for stimulating such creativity. In addition, a list of questions is given that can be used during an opportunity management session. Also, Appendix XII lists some questions that can be used for opportunity identification, however those are specifically aimed at integrating and coordinating work with other projects. The short description of the opportunities in Appendix IX can provide the project team with inspiring examples of opportunities.

5. Timing and frequency

Another important aspect is the timing of an opportunity management session. Although project managers are inclined to organize sessions around big milestones in the project, such occasions are not the only useful moments for identifying opportunities. In the discussion on discovered and created opportunities it was shown that it is also possible to identify opportunities without some form of change. An opportunity management session between milestones can therefore also result in the identification of opportunities.

In section 5.1 the situations that are sources for opportunities have been listed and those situations call for opportunity management sessions. However, from the interviews two important points were derived with regards to the frequency of opportunity management sessions:

- 'Out of the box thinking' is important for opportunity identification. Performing opportunity management sessions too frequently reduces this ability and therefore makes them less effective. This frequency will differ from project to project, depending on the project characteristics.
- Opportunities take more time to asses and exploit than risks. Identifying but not exploiting opportunities creates a negative impact on the motivation for people to identify opportunities.

Opportunity identification with external stakeholders

Besides identifying opportunities with the project team, it is also possible to identify opportunities by engaging external stakeholders. This can be done in two ways. The stakeholder can be approached by the project team in search of opportunities or the stakeholder can approach the project team with ideas for opportunities. As with the identification of opportunities in a session, some important aspects were derived from practice.

- Access to information
  Providing project information to the stakeholders in an adequate and timely manner is of the utmost importance. Without information they are never able to identify opportunities that can be a win-win situation for both themselves, as well as the project.
- Open communication of risks
  Opportunities inherently contain uncertainty and risks. Open communication on the risks towards stakeholders is important in order to build trust between the project and its stakeholders. Especially with stakeholders with whom the project has a long term relationship, because risks that materialize during exploitation of the opportunity might also have effect on the stakeholders.
- Sharing project ambitions and goals
  Especially relevant for the identification of opportunities with and by the contractor is sharing the project's ambitions and goals. Only when the contractor knows what has *value* for the client, it is possible for him to identify opportunities that can be a win-win situation for both parties.
- Non-financial opportunities
  Opportunities do not always need to result in monetary gain. Opportunities that improve stakeholder perception towards the project can also be of value for the client. The opportunities listed in Appendix IX can be used as a source of inspiration.

5.3 Evaluation and exploitation

After identification of the opportunity, an evaluation is done before exploiting the opportunity. Although regarded as two separate steps in the literature, this section treats them simultaneously, because practice showed that uncertainty reduction is both part of evaluation and exploitation of the opportunity. Practice also showed some important aspects in this decision making process.

- Windows of opportunity
  One of the problems with opportunities is finding the window of opportunity. Especially for opportunities in infrastructure projects that are related to other spatial developments in the area, for example by integrating work of the infrastructure project and real estate development. When going into the planning and realization phase, infrastructure projects are given strict milestones for finishing the project. Because funding from the government is secured at a certain point, it is almost certain that the project will be realized. For private real estate development the situation is different. The necessary funds have to be secured in a much more unstable envi-

ronment and decisions are influenced by the economic development. The decision making processes are therefore very uncertain and delays happen frequently. The window of opportunity for integrating parts of those projects into the infrastructure project might be missed because of these delays in the decision making process.

- Explicit decision making

  Explicit decision making on opportunities is of importance, because it lowers the possibility that opportunities turn out to be less than expected. Additionally it can be used as prove towards internal clients on the trade-offs the project manager made for exploiting the opportunity.

- Uncertainty reduction

  Decision making on opportunities is often not a quick and easy process. To limit the possibility of exploiting opportunities that turn out to have negative consequences, it is advised to reduce uncertainty before decision making, although this can conflict with the 'window of opportunity'.

  For opportunities with a relatively large impact it is also advised to formalize the opportunity in the form of a contract. This contract would serve as a sort of safety net for the project manager.

- Opportunity friendly contracts

  In order not to 'lose' opportunities in the evaluation because of contractual issues, two important requirements when setting up contracts are mentioned. First, opportunities are always linked to change in projects. This change is inevitable and it is therefore advised to make reservations in the contract that deal with possible opportunities that might arise from the changing environment. Thus, taking into consideration *dynamics* in the contract.

  Next to this, it is advised to explicitly state what is of *value* for the client in the contract in order for the contractor to identify opportunities that are in accordance with this value. By defining this value in a SMART manner it becomes possible for the contractor to compare different opportunities and present the most promising ones.

6. Discussion

In this chapter the criteria of quality and limitations of the research are discussed. This chapter focuses on the research method, which can be assessed by looking at the issues of: *reliability* and *validity* (Van Aken et al, 2007). In addition, the *substance* of this research is also commented.

Reliability

The reliability of empirical research methods describes the consistency of the measurements. As we used qualitative interviews, every interview was unique and followed its own course. To improve consistency, a standardized interview protocol was used for all interviews. This way the consistency of the research might be lowered but it should still be given. Furthermore, as all steps of this research were described thoroughly (the interview protocol and a list of the interviewees is included in Appendix III and Appendix VIII), replicability of the research is possible.

Validity

A research method is valid if its usage is adequate to give an answer to the research question. Three types of validity can be distinguished: *content*, *internal* and *external validity*.

- Content validity describes the extent to which the research method measures the construct in question. In order to achieve content validity, it is important to clearly communicate the various concepts of the research to the respondents.
  Due to the explorative nature of this research, an explanation of opportunity management was not given before the interviews. The interpretation of the concept of opportunity management by the project manager was an important part of the research.

  In addition two other mechanisms are important for the content validity. First, the interviewees might have had a selective memory for the opportunities they have described during the interviews. Such a selective memory can result in the discussion of examples in which the project manager played an important role to convey a positive image about himself. Although this would have a relatively low impact on discussing successful opportunities, it could be a restrictive factor in discussing missed and failed opportunities.
  Second, interviews often lead to socially desirable answers. Respondents might be more inclined to give answers which they think make a good impression and meet the expectations of the interviewer. We tried to prevent this by stressing the neutrality of the interviewer towards the subject. It was also stressed that the research was not undertaken in order to confirm the existence of opportunities.

- Internal validity is achieved when the results of the research are complete. The risk of working with hypotheses is to miss the miscellaneous information from the interviews. To prevent this, Appendix X specifically treats valuable information from the interviews that was not captured in the hypotheses.

- External validity refers to the degree to which results can be generalized. Because the number of 12 interviews and the resulting 23 opportunities is very low in order to make generalizing conclusions, a validation workshop was held. In this validation workshop, the results from the analysis were discussed and validated by 6 project managers that were also interviewed and 2 independent consultants (see chapter 4).

Substance

- It is very difficult to determine the added value of opportunity management in infrastructure projects. This has deliberately not been the primary purpose of this research. However, during the interviews and workshop the project managers showed great interest in the subject and expressed the need for more information, both on the scientific and practical side. This shows that they believe that opportunity management can have added value.
- Even after completion of this research, a strict definition of what can be regarded as an opportunity remains difficult and will be interpreted differently by every project manager. Therefore not all opportunities that were identified in the interviews might be regarded as opportunities by all project managers. Although the validation workshop intended to tackle this problem, not all opportunities were discussed during the workshop.
- In this research a lot of literature was taken from the entrepreneurial field of research. This literature was then transformed to fit to the context of project management in infrastructure projects. Although this was done with the greatest care, it still remains questionable that certain concepts from entrepreneurship are applicable for infrastructure projects in the planning and realization phase. If applicable in the industry, it would be more logical for the initiative phase, because that phase is aimed at combining different opportunities into a viable project.

7. Conclusions and recommendations

This research deals with opportunities in the planning and realization phase of infrastructure projects. It is expected that a better understanding of opportunities and the management of opportunities thereof can support project managers not only in achieving their project objectives, but also by exceeding them as well as creating short and long term added value for the client.

In this chapter conclusions and recommendations of this research are presented. Section 7.1 will present the conclusions by answering the three sub-questions and afterwards the main research question. In section 7.2 the recommendations are presented and opportunities for further research into the topic are suggested in section 7.3.

The main research question:

How can opportunities and the process of opportunity management in infrastructure projects be described?

To answer the main research question, three sub-questions were formulated. Those were answered by various research methods, a literature study, interviews and a validation workshop. The literature study was predominately done by using entrepreneurial literature. Due to the strong difference between entrepreneurship and project management in infrastructure projects, hypotheses were formed. The hypotheses were tested in the interviews and validation workshop. The interviews and validation workshop were conducted with experienced project managers from infrastructure projects.

7.1 Conclusions

The first sub-question is:

1. **How can the studied literature be used to provide information on the management of opportunities in infrastructure projects?**

Before answering this question on opportunity management, it is important to explore the concept of opportunities. An opportunity starts with some form of change that *creates* a new situation. This change can be found inside or outside the project environment. This new situation *creates* uncertainty about the future. The uncertainty can be used by project managers to *create* something new that has added value for the client. This is shown in Figure 7-1 and results in the following definition for project opportunities.

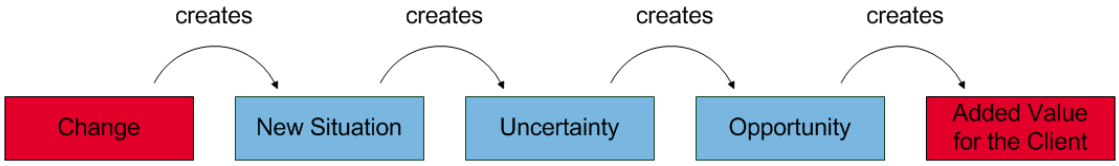

Figure 7-1: Decomposition of the opportunity

For the management of opportunities, two perspectives within the entrepreneurial literature were explained. Firstly, the *discovery perspective* that is related to a *causal view* in which opportunities are discovered (Eckhardt & Shane, 2003). Secondly, the creative view that is linked to *effectuation*, in which opportunities are considered to be the effects of the process. The main differences between the discovery and creative perspective for project managers is the fact that in the discovery perspective changes occur to which the project manager responds, whereas in the creative perspective the project manager induces the changes. The opportunity then needs to be identified, evaluated and exploited by the project team in order for it to be of value to the client. Figure 7-2 combines the information from the decomposition and the two perspectives on opportunities.

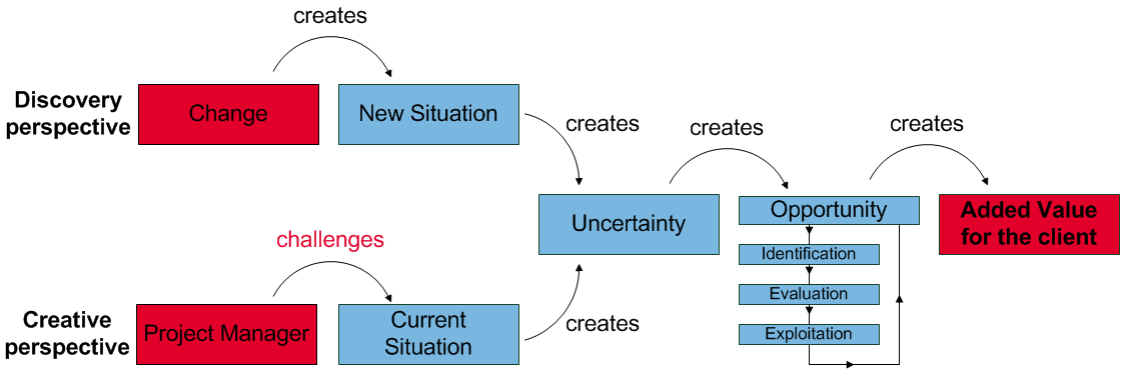

Figure 7-2: Opportunity management process

The second sub-question is:

2. How do project managers, manage opportunities in infrastructure projects?

To answer this question, eight hypotheses were formulated. The information from the interviews and validation workshop was used to test the hypotheses, resulting in the following answer to the question.

- Opportunities are more often discovered then created. This means that project managers are more inclined to identify opportunities when there is a specific change before the identification of the opportunity.
- Project managers are more inclined to identify endogenous opportunities than exogenous opportunities.
- Search processes are the most likely way of identifying opportunities, but they are only used after change occurs.
- Explicit decision making depends on the impact of the opportunity, the more impact an opportunity might have the more explicit the decision is made.
- Uncertainty reduction before exploiting the opportunity is regarded as pivotal in order to prevent possible risk associated with the opportunity to occur.
- The mandate of the project manager is important for decision making on endogenous opportunities. Exogenous opportunities always need approval from an higher authority.
- Integrated contracts such as D&C and DBFM are not considered limiting for opportunity management in comparison with traditional contracts.

The third sub-question is:

3. **What typologies of opportunities can be derived when looking at the information given by theory and practice and how can those opportunities be managed?**

Three different typologies of opportunities can be made by using information from theory and practice. For each of these three typologies a brief explanation of the effect in regard to the management of opportunities is given.

1. Endogenous and exogenous opportunities

The concept of endogenous and exogenous opportunities was derived from the theory. Practice showed that both opportunities exist in infrastructure projects, but that endogenous opportunities are more common in the planning and realization phase.

With regards to decision making some differences can be observed between endogenous and exogenous opportunities. For exogenous opportunities the project manager always needs to get permission from a higher authority before exploiting the opportunity. Even though project managers have a mandate for making decisions, a higher authority had the final decision making responsibility for endogenous opportunities.

2. Discovered and created opportunities

Theory made a distinction between discovered and created opportunities. This distinction could also be found in practice, it showed that most project managers are more likely to discover opportunities than to create them. For the management of opportunities this distinction is important, because it shows that project managers do not always have to wait for change to occur. By their own actions, or those of members of the project team, it is possible to create opportunities.

3. Sources of opportunities

Last typology divides the opportunities according to their source. Those are of importance in order to recognize the situations in which the project manager and his team can identify opportunities. By combining information from theory and practice five main sources of opportunities are derived.

1. Political pressure
2. Sense of urgency on project objectives
3. Change in priority of project objectives
4. Stakeholders
5. Unexpected events and occurred risks

This leads us back to the main research question:

How can opportunities and the process of opportunity management in infrastructure projects be described?

The process of opportunity management can thus be described as in Figure 7-2. Information from practice shows that opportunities are more likely to be discovered than created, because it is more common for project managers to respond to change in and outside the project for identifying opportunities. Identification can be done with *internal* and *external* stakeholders, whereby for both ways various aspects are of importance.

In the literature on opportunity management, identification of an opportunity is followed by an evaluation, whereby the added value is weighed against time and effort necessary for exploiting the opportunity. Although evaluation and exploitation are regarded as two separate steps in the literature, empirical information collected in this research suggest that both steps are in fact very interrelated. From practice several important aspects were identified for opportunity evaluation and exploitation: (1) windows of opportunity, (2) explicit decision making, (3) uncertainty reduction, and (4) opportunity friendly contracts. Whereby opportunity friendly contracts deal with *dynamics* in the project and *value* for the client.

In addition to the conclusions on opportunities and the way they can be managed, the following conclusions can be drawn.

- Very little literature is available on opportunity management for projects, especially for infrastructure projects.
- Within practice, different interpretations on opportunity management exist.
- Project managers are eager to learn more about opportunity management, but have very little tools and knowledge available.

7.2 Recommendations

In accordance with the conclusions, recommendations for project managers with regards to opportunity management can be made:

- A more pro-active approach towards opportunities can result in the identification of a larger number of opportunities.
- Understanding what is of value for the client and other stakeholders in the project can result in the identification of a number of opportunities. .
- During the tendering phase, evaluation of the contract from an opportunity management perspective can have a positive effect on opportunity identification, evaluation and exploiting in later stages of the project.

Additionally, a recommendation is made for opportunity management in organizations. In organizations such as Rijkswaterstaat or Prorail, a database can be set-up to describe identified opportunities in past projects. This can be used as an inspiration for other project managers when searching for opportunities.

To conclude, opportunity management is a part of project management that has always been done implicitly or not at all. This research aimed to provide an understanding of opportunity management by looking at both the theory and practice. It is the belief of the author that consciously applying opportunity management helps project managers in realizing added value for the client.

7.3 Opportunities for further research

This research provides several opportunities for further research. Several opportunities are mentioned in this section.

- Database of opportunities

The 12 interviews that were conducted for the research delivered 23 opportunities. This can be considered as a start for a project opportunity experience base from which project managers can draw upon. A more extensive research that is able to identify a far larger number of opportunities could be able to provide more examples for project managers that they can use in their daily work.

- Opportunities for whom?

This research solely focused on opportunities for the project manager who works for the client in infrastructure projects. Looking at opportunities in infrastructure projects from the perspective of other stakeholders might provide even more insight into the subject. For example the relationship between opportunities for the contractor and opportunities for the client.

In addition, it would be very interesting to interview the clients on opportunity management. Because project managers are expected to create additional value for the client, it is of importance to understand the perspective of the client.

- Opportunities in the initiative phase

By focusing on the planning and realization phase, this research left out another key part within the life cycle of an infrastructure project, the initiative phase. Because the initiative phase is aimed at creating the project with the financial means, it is basically a constant search for opportunities and opportunity management might be more suited for this phase than the planning and realization phase.

- Entrepreneurs vs. Project managers

This research showed that project management and opportunity management can be conflicting in certain cases, because project management means working within the scope of a project and opportunity management is often concerned with changing the scope. One of the questions that arose during the validation workshop was therefore: if we want project managers to work with opportunities, are we not selecting the wrong project managers? A research into competences of project managers with regards to opportunity management would therefore be highly interesting. Also testing to which extend project managers think and act effectually or causally can contribute to the knowledge on opportunity management.

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Appendix II. Definitions and abbreviations

Definitions

Complexity: The number of environmental elements, and the level of interdependence among these elements

Entrepreneurship: Entrepreneurship is an activity that involves the discovery, evaluation and exploitation of opportunities to introduce new goods and services, ways of organizing, markets, processes, and raw materials through organizing efforts that previously had not existed

Entrepreneurial opportunity: a situation in which a person can create a new means-ends framework for recombining resources that the entrepreneur believes will yield a profit

Project: a temporary endeavour undertaken to create a unique product or service

Project Management: the application of knowledge, skills, tools, and techniques to project activities to meet project requirements

Product scope: the features and functions that characterize a product or function

Project opportunity: An uncertain situation that can be exploited by the project team in order to create added value for the client

Project scope: the work that must be done to deliver a product with the specified features and functions

Risk: effect of uncertainty on objectives

Project Risk Management: the systematic process of identifying, analyzing, and responding to project risk

Project Opportunity Management: the systematic process of identifying, evaluating, and exploiting of project opportunities

Uncertainty: any deviation from the unachievable ideal of completely deterministic knowledge of the relevant system

Abbreviations

EMVI	Economisch Meest Voordelige Inschrijving Most Economically Advantageous Tender
ISO	International Standards Organization
MIRT	Meerjarenprogramma Infrastructuur, Ruimte en Transport
RWS	Rijkswaterstaat, Directorate General of I&M
PMBoK	Project Management Body of Knowledge
SMART	Specific, Measurable, Attainable, Relevant, Timely

Appendix III. List of Interviews

The interviews are divided into two broad categories. First are the explorative interviews in which the discussion was on a broad range of issues regarding the topic, see Table 9. An official transcript of those interviews has not been made and those will not be referred to in the report. Second are the official interviews of which the transcript has been approved by the interviewee, see Table 10. Those are used to test the hypotheses that were made in the second phase of the research.

Table 9: Explorative Interviews

Name	Function	Type	Date
Rudolf Rijkens	Senior Consultant	Explorative Interview	16/03/2011
Jeroen Versteegen	Senior Consultant	Explorative Interview	18/03/2011
Peter Pestoor	Risk Manager NZ Lijn	Explorative Interview	22/03/2011
Joost Beljon	Issue Manager NZ Lijn	Explorative Interview	22/03/2011
Joost van Blokland	Consultant	Explorative Interview	30/03/2011
Alex Miggelenbrink	Project Manager	Explorative Interview	08/04/2011
Werner Plekkenpol/ Caroline van der Kleij	Senior Consultant	Explorative Interview	04/05/2011
Mirjam Cauvern	Project Manager	Semi-structured Interview	09/05/2011
Jurgen van der Heijden	Senior Consultant	Semi-structured Interview	10/05/2011
Marieke Koopmans	Senior Consultant	Explorative Interview	24/05/2011
Ineke Meijer	Senior Consultant	Explorative Interview	12/08/2011

Table 10: Official Interviews for data-analysis in report

Jan-Pieter van Schaik	Project Manger	N23 Westfrisiaweg	31/05/2011
Duko Roeleven	Hoofd Risicomanagement	Noord Zuid Lijn	06/06/2011
Joost Beljon	Issue Manager	Noord Zuid Lijn	06/06/2011
Henk de Pater	Project Manager	Noord Zuid Lijn	08/06/2011
Marcel van Rosmalen	BA Quality Manager	Betuweroute	13/07/2011
Jan Bijkerk	Directeur Uitvoering	Noord Zuid Lijn	04/08/2011
Henk Meuldijk	Project Manager	A74 Venlo	22/08/2011
Frans de Kock	Project Manager	GOVer A27/A28	31/08/2011
Carel van Belois	Project Manager	A12 Lunetten - Veenendaal	31/08/2011
Alex Miggelenbrink	Project Manager	Bereikbaar Leeuwarden	02/09/2011
Peter van Wijk	Project Manager	N201	05/09/2011
Peter Korbee	Project Manager	N201	08/09/2011

Appendix IV. Conditions for Entrepreneurship

This Appendix reflects upon the conditions and non-necessary conditions for entrepreneurship as stated by Shane (2003, p.6).

Conditions for entrepreneurship (Shane, 2003, p. 6).

1. *Entrepreneurship requires the existence of opportunities, or situations in which people believe that they can use new means-ends frameworks to recombine resources to generate profit.*
   Just as entrepreneurship requires opportunities, so does the management of opportunities requires project opportunities. It is assumed that the planning and realization phase of infrastructure project contains opportunities for project managers.
2. *Entrepreneurship requires differences between people. Mainly in relation to the access to information and the manner in which people process this information differs greatly. In addition, entrepreneurship requires a decision to act upon an identified opportunity.*
   Project teams in infrastructure projects consist of a variety of people, each with their own tasks and responsibilities. Opportunities in infrastructure projects need to be acted upon before they can be exploited, to take this step some sort of decision process exists.
3. *Entrepreneurship requires risk bearing, because the exploitation of an opportunity is by definition uncertain. By going into the process of exploiting the opportunity, entrepreneurs therefore bear the risk that uncertainties will turn out negatively for them.*
   Exploiting opportunities in infrastructure projects also requires risk bearing. However a difference between entrepreneurs and project managers exist, because project managers do not individually bear project risks. In contrast with entrepreneurs who are personally impacted by the success or failure of the opportunity.
4. *Entrepreneurship requires organizing, for the exploitation of the opportunity needs the recombination of resources. This recombination needs to be organized in some way.*
   Infrastructure projects are complex undertakings that involve a multitude of stakeholders. The exploitation of project opportunities therefore also requires organizing, while the project manager is not able to do the opportunity exploitation by himself.
5. *Entrepreneurship involves innovation, because by recombining resources something new will be formed. Even the recombination of resources involves some innovative activity.*
   Shane (2003, p. 6) states that the recombination of resources is an innovative activity. According to Tidd, Bessant and Pavitt (2001, p. 28) innovation is change in the things delivered (product innovations) or change in the way they are produced or delivered (process innovations). Project opportunities in infrastructure projects also change the 'product' of the project or the 'process' (read construction method) of the project. In this framework, project opportunities therefore involve innovation.

Non-necessary conditions for Entrepreneurship (Shane, 2003, p. 8).

1. *Entrepreneurship does not require the creation of a new firm.*

   For the exploitation of opportunities in infrastructure projects a new project team might be set-up, however in most occasions it is expected that the opportunity is exploited by the current project team.

2. *Entrepreneurship does not need to be undertaken by a single person.*

   Already mentioned at point 4 of conditions for entrepreneurship, infrastructure projects are complex undertakings that involve a multitude of stakeholders. It is therefore unlikely that the management of the opportunity is done by a single person.

3. *Entrepreneurship does not require a successful outcome.*

   Project opportunities are exploited in order to add value to the project. However, due to uncertainty in the exploitation of opportunities, a successful outcome cannot be guaranteed on beforehand. In addition, perception on the outcome of opportunities might alter in time and will vary between different project stakeholders.

4. *In Entrepreneurship, the factors that explain one part of the entrepreneurial process do not have to explain other parts.*

   For entrepreneurs and project managers alike, individual factors with a positive impact on opportunity identification can have a negative impact on evaluation or exploitation.

Appendix V. Opportunity Exploitation – Information asymmetry and uncertainty

Information asymmetry

If an entrepreneur has extra information, he is enabled to see opportunities, but this might also cause some problems for entrepreneurial opportunities: First, there is a difficulty for an entrepreneur to disclose his information. This is not the case for project managers, because they usually need to disclose opportunities to their clients before exploiting them. Second, with the extra information the entrepreneur is able to act opportunistically towards potential investors. For project managers, acting opportunistically towards clients is not desirable for the long term relation. Third, excessive risk taking is encouraged because the entrepreneur does not work with his own resources. This is not true for project managers, because the negative consequences of failed opportunities will often have an impact on one or more project objectives. Fourth, adverse selection is not a problem for project managers. If they communicate all opportunities towards the client, they are able to prioritize to the highest importance and therefore mitigate the risks that the client picks out the wrong opportunity.

Uncertainty

The second characteristic of resource acquisition is uncertainty. First, uncertainty about opportunities makes it difficult for investors to evaluate them. For projects this means that it is impossible to exactly predict the value of the opportunity before it has been exploited. Therefore the client has to evaluate the opportunity with limited knowledge and the investment decision is based on this judgment. A second point is the misalignment in value perception between the entrepreneur and investor. Also for project managers this can cause issues, because he will need to bargain with the client on the value of the opportunity. Third, for entrepreneurial opportunities the investors would like to have collateral if the opportunities do not turn out to be profitable. Because project managers do not personally invest in projects, this is not applicable.

Figure 7-3 summarizes what has been discussed. The points that are applicable in a project management context are written in red.

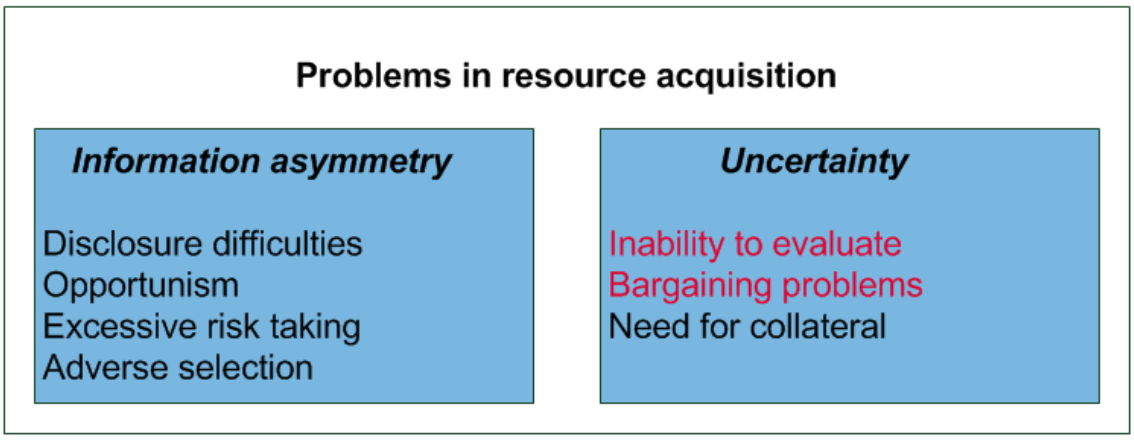


Figure 7-3: Problems in resource acquisition (Adopted from Shane, 2003, p. 165)

Appendix VI. Decision making principles

At each step of the process, expert entrepreneurs use the principles outlined below. Each principle inverts key decision making criteria in received theories and conventional management practices (Sarasvathy, 2008, p. 21).

- Non-predictive control

Effectuation argues that entrepreneurs use a logic of non-predictive control to transform means at hand into new outcomes that they themselves may not have initially envisaged (Dew et al, 2009). Non-predictive control is defined as avoiding predictive information in favor of what the decision maker and his stakeholders can actually control at any given point in time (Wiltbank et al., 2006). This is in contrast with the predictive (causal) logic where the decision maker chooses between alternative means based on forecasts about pre-selected favorable outcomes.

- The affordable loss principle

Calculations of expected return do not drive the choice of projects in an effectual view; instead, the choice of projects depends upon the decision makers' assessments about what they are willing to lose. One example of this is the entrepreneur who refuses to leave a well-paying job until he finds an opportunity that he predicts will pay more (causal) versus one who decides to invest a small portion of his savings and two years of his life on a project that he believes is worth that amount of time and money - irrespective of whether it will pay more than what he currently earns (effectual) (Dew et al., 2009).

- Commitment of stakeholders

This principle involves negotiating with any and all stakeholders who are willing to make actual commitments to the project, without worrying about opportunity costs, or carrying out elaborate competitive analyses. Furthermore, who comes on board determines the goals of the enterprise, not vice versa (Sarasvathy, 2008, p. 21).

- Leveraging as opposed to avoiding contingencies

Allowing one's means, acceptable levels of downside risk, and stakeholders to decide goals implies an ability to open oneself up to surprises of various sorts. In causal calculations, there is an explicit effort to avoid unpleasant surprises. The effectual entrepreneur, in contrast, has to stand ready to make do with what comes his way and to learn to transform both positive and negative contingencies into useful components of new opportunities (Dew et al., 2009).

- Humans as the prime drivers of opportunities

This principle urges relying on and working with human agency as the prime driver of opportunity rather than limiting entrepreneurial efforts to exploiting exogenous factors such as technological trajectories and socio-economic trends (Sarasvathy, 2008, p. 22).

Appendix VII. List of Hypotheses

Hypothesis 1a: Opportunities in the planning and realization phase of infrastructure projects are more likely to be discovered then created.

Hypothesis 1b: The most likely sources of discovered opportunities are:

1 The unexpected occurrence of a positive/ negative internal project event or external event.

3 Need for a project solution.

7 New insights from outside the project.

Hypothesis 2: endogenous opportunities are more inclined to be identified in the planning and execution phase of infrastructure projects than exogenous opportunities.

Hypothesis 3a: Search processes are most effective for identifying opportunities.

Hypothesis 3b: Decision making on the exploitation of project opportunities in infrastructure projects is done in an explicit manner.

Hypothesis 3c: Decision making on the exploitation of project opportunities in infrastructure projects is done only after using explicit strategies for eliminating uncertainty surrounding the opportunity.

Hypothesis 3d: Decision making on the exploitation of project opportunities in infrastructure projects is done by the project manager in case of endogenous opportunities and by the client in case of exogenous opportunities.

Hypothesis 3e: Integrated contracts make it more difficult for the client to exploit opportunities.

Appendix VIII. Interview Protocol

1. Achtergrond

Dit interview protocol is bestemd voor de interviews in het kader van het afstudeeronderzoek van Marcel van der Wal, Master student Construction Management and Engineering aan de faculteit Civiele Techniek aan de TU Delft. Het afstudeeronderzoek richt zich op opportunity management binnen infrastructuur projecten.

Dit protocol is geschikt om inzicht te krijgen in hoe projectmanagers omgaan met opportunities binnen projecten. Alle interviews worden afgenomen door de afstudeerder. Geïnterviewden worden tevoren geselecteerd op basis van enkele criteria. Hierbij spelen onder andere de ervaring als project manager, het veronderstelde kennisniveau, de huidige functie in het werkveld en de beschikbaarheid een rol.

2. Doel van het interview

De primaire doelstelling van het interview is het verzamelen van empirische data die bijdraagt aan het volledig beantwoorden van de in het kader van het afstudeeronderzoek gestelde onderzoeksvragen. Deze onderzoeksvragen richten zich op de manier waarop projectmanagers omgaan met opportunities binnen hun project. Daarbij staat de hoe-vraag centraal.

Door beantwoording van de onderzoeksvragen kunnen de interviews op de lange termijn bijdragen aan het verhogen van het algemene kennisniveau over het managen van infrastructuurprojecten.

3. Resultaat van het interview

Het interview levert informatie op over de beleving die geïnterviewde als professional heeft van:

- **Wat** opportunities zijn
- **Wat** de aanleidingen zijn voor het kijken naar opportunities
- **Hoe** opportunities gemanaged worden

De interviews worden verwerkt in het kader van het afstudeeronderzoek. De belangrijkste resultaten zullen in de hoofdtekst van het rapport zijn terug te vinden.

4. Werkwijze per interview

1 De te interviewen personen worden benaderd, al dan niet via een collega van AT Osborne of één van de begeleiders aan de universiteit, of zij bereid zijn mee te werken met het interview. Bij deze uitnodiging behoort ook een toelichting op de context van het interview. Als de benaderde persoon positief staat tegenover het interview, wordt er een afspraak gemaakt.

2 De omschrijving van de context voor het interview wordt van tevoren toegestuurd. Bij de afspraak worden een aantal belangrijke kenmerken van het interview gemeld:
   - Het gaat om een inventarisatie van persoonlijke visies en afwegingen en niet om formele standpunten van een organisatie.
   - Het gaat om het verkrijgen van informatie over ondernomen activiteiten en afwegingen die managers in een specifieke project context maken. Daarbij wordt er getracht te kijken naar één pro-

ject. Wanneer opportunities uit andere projecten besproken worden, dan zal dit duidelijk aangegeven moeten worden, zodat de context van de opportunity te allen tijde duidelijk is.

- Het interview zal, indien de geïnterviewde hier geen bezwaar tegen maakt, opgenomen wordt ten behoeve van de rapportage in het kader van het afstudeeronderzoek. Opnames en aantekeningen zullen niet in een andere context gebruikt worden.
- Een conceptuitwerking van het interview zal aan de geïnterviewde worden toegestuurd, waarop deze nog correcties kan aanbrengen.
- De geïnterviewde zal na afronding van het onderzoek een management samenvatting met belangrijkste resultaten opgestuurd krijgen.
- Uitgangspunt is dat het interview 1 uur in beslag neemt.
- Het interview zelf bestaat uit vier onderdelen:
  - Introductie interviewer. (+/- 5 minuten)
  - Introductie geïnterviewde en project (+/- 5 minuten)
  - Algemene visie op opportunities (+/- 10 minuten)
  - Bespreken specifieke opportunities in het te bespreken project (+/- 35 minuten)
  - Afsluiting interview (+/- 5 minuten)

3 Alle interviews worden opgenomen op geluidsdrager. Deze opnames worden naderhand uitgewerkt tot een interview verslag. Een concept van dit interview verslag wordt ter controle aan de geïnterviewde voorgelegd en deze krijgt een redelijke termijn om de tekst te corrigeren. Weergaven van het interview in het afstudeerrapport worden geanonimiseerd, met uitzondering van de aangegeven opportunities. Door de specifieke projectcontext waarin deze opportunities zich bevinden, zal daarin altijd een mate van herkenbaarheid blijven.

5. Introductie van interview

Belangrijk onderdeel van het interview is een goede introductie met wederzijdse kennismaking tussen interviewer en geïnterviewde. Waarbij voor de totale introductie 10 minuten genomen wordt. Een checklist met aspecten de aan de orde moeten komen tijdens introductie is:

- Voorstellen door de interviewer
- Waardering uitspreken voor medewerking en aangeven waarom dat voor de voltooiing van mijn onderzoek van belang is
- Achtergrond van het interview toelichten, checken of informatie bij afspraak ontvangen is en checken of context duidelijk is.
- Gang van zaken gedurende interview toelichten. Hierbij zal nog geen inhoudelijke informatie verstrekt worden, dit vanwege het open karakter van het interview.
- Check of locatie geschikt is voor interview (rust / tijdframe)
- Uitleggen hoe rapportage over interview plaatsvindt
- Geluidsopname uitleggen, toestemming checken.
- Vertrouwelijkheid benadrukken

Bij het voorstellen van geïnterviewde komende de volgende onderdelen aan bod. Het te behandelen project al afgerond is, zal de vraagstelling lichtelijk aangepast moeten worden.

- Achtergrond / opleiding en werkervaring, in het bijzonder enkele recente projecten
- Korte introductie project
- Vanaf welk moment bent u betrokken bij dit project? (Eventueel: Tot wanneer bent u betrokken geweest bij dit project?)
- Wat is uw rol in dit project?

6. Inhoudelijke vragenlijst interview

De vragenlijst bestaat uit twee onderdelen:
- Algemene visie op opportunities
- Beschrijving specifieke opportunities in het te bespreken project

Uitgangspunt bij het eerste onderdeel is dat de projectmanagers vrijuit kunnen vertellen over wat zij zien als opportunities. Door hier op een open manier naar te vragen, is het mogelijk om zonder sturend te zijn een indruk te krijgen wat de geïnterviewde verstaat onder opportunities. Deze aanpak heeft twee voordelen, ten eerste kan de interviewer een beeld krijgen van het kader waarin de geïnterviewde denkt. Dit maakt het makkelijker om de voorbeelden van het tweede gedeelte te plaatsen. Ten tweede is het een goede introductie voor de project manager.

Het tweede onderdeel van het interview wordt ingegaan op opportunities die een invloed gehad hebben binnen het project. De insteek is om de projectmanagers zelf aan het woord te laten over hun werk. De door hun vertelde ervaringen worden later door de interviewer gekoppeld aan zijn theoretische kader. Dit is het belangrijkste onderdeel van het interview.

Wel zal vooral al gevraagd worden of het mogelijk is om meerdere opportunities te benoemen. Afhankelijk van de tijdsduur en verloop van het gesprek zullen er vermoedelijk tussen de 2 en 4 opportunities besproken worden.

Aangezien het interview gericht is op het verzamelen van empirische informatie met betrekking tot de *hoe-vraag* is het van belang om ten allen tijden open vragen te stellen. Door de verschillende perspectieven die vanuit de literatuur gedefinieerd zijn zal het niet mogelijk zijn om alle vragen te beantwoorden. Deze zijn daarom vooral een handvat voor de interviewer. Zeker als het blijkt dat de stappen in het management van de opportunity niet zo helder blijken als beschreven in de literatuur, is het van belang om in zo'n situatie niet de stappen op te dwingen aan de project manager. Het is aan de interviewer om alle informatie in een later stadium te koppelen aan het theoretische kader.

Algemene visie op opportunities

De vragen behorend bij het eerste gedeelte staan hieronder vermeld.

1. *Wat is u visie op opportunities binnen infrastructurele projecten?*
   - *Wat verstaat u onder het begrip opportunity?*
   - *Waar komen volgens u opportunities vandaan?*
   - *Hoe gaat u om met opportunities?*
   - *Wie is er volgens u verantwoordelijk voor het managen van opportunities?*
   - *Wanneer zou u kijken naar opportunities?*
   - *Zijn er bepaalde gebieden waar u speciaal naar kijkt voor opportunities?*

Beschrijving specifieke opportunities

De vragen behorend bij het tweede gedeelte staan hieronder vermeld.

2. *Als we ons focussen op specifieke opportunities die zich voorgedaan hebben binnen het project. Kunt u enkele opportunities beschrijven die u tijdens u project heeft benut of gemist?*

Tijdens de beschrijving van de opportunity zal er sterk op gelet worden of de opportunity een endogene of exogene opportunity betreft. Wanneer mogelijk zal dit geverifieerd worden met de geïnterviewde.

Vervolgens wordt met (een deel) van onderstaande vragen doorgevraagd om alle gewenste informatie over de opportunity te verkrijgen. Dit is afhankelijk van de informatie die de geïnterviewde vanuit zichzelf zal geven.

Aanleiding

- *Was er een specifieke reden/aanleiding om te zoeken naar kansen?*
- *Zo ja, wat was deze reden/aanleiding? Wat gebeurde er vooraf zodat deze reden/aanleiding kon ontstaan?*

Opportunity

- *Identificatie*
  - *Hoe heeft u deze opportunity geïdentificeerd?*
  - *Wie heeft de opportunity geïdentificeerd? / Wie waren er betrokken bij de identificatie van de opportunity?*
  - *Wat was er van belang om deze opportunity te zien? Ervaring, contacten buiten het project of iets anders?*
  - *Zijn er bepaalde methodieken (interviews, brainstorming, etc) gebuikt bij het identificeren van de opportunity, zo ja, welke? Wat is van belang bij het gebruiken van de betreffende methodiek?*
  - *Zijn er bepaalde vragen gesteld die het identificeren van de opportunity getriggered hebben? Zo ja, welke?*
  - *Wanneer werd de opportunity geïdentificeerd en had na u mening de opportunity eerder geïdentificeerd kunnen worden?*
- *Evaluatie*
  - *Is er een bewuste afweging gemaakt om de kans al dan niet te benutten? Zijn daar bepaalde methodieken voor?*
  - *Wat waren hierin de overwegingen of criteria?*
  - *Moest er een investering gedaan worden voor het verzilveren van de kans? Zo ja, hoe heeft dit de afweging beïnvloed?*
  - *Wie bepaalt of de kans wordt genomen? Waren er andere partijen betrokken bij de afweging?*
  - *Zo ja, welke partijen werden er betrokken bij het beoordelen van de opportunity? Welke criteria waren van belang voor het betrekken van deze partijen? Wat was de invloed van deze partijen op de opportunity?*
  - *Wat was de contractuele situatie? Hoe heeft deze de afweging voor het nemen van de kans beïnvloed?*
- *Benutten*
  - *Hoe heeft u deze opportunity benut?*
  - *Hoe bent u omgegaan met de onzekerheid die het benutten van een opportunity met zich meebrengt?*
  - *Heeft u een bewuste strategie gekozen om de kans van slagen te maximaliseren, en zo ja, hoe heeft u dat gedaan?*

Resultaat & Reflectie

- *Wat was het resultaat van de opportunity?*
- *Wanneer u kijkt naar tijd, geld en moeite die het benutten van de opportunity heeft gekost? Bent u tevreden met dit resultaat?*
- *Waaraan meet u het resultaat van de opportunity af? Is dit nog veranderd over de tijd?*
- *Hoe schat u in dat de opportunity beoordeeld wordt door de belanghebbende in het project, bijv. opdrachtgever, omwonenden, of bestuurders?*
- *Zou u terugkijkend op dezelfde manier met de opportunity zijn omgegaan? Zo ja/nee, waarom wel/niet?*

Voor het laatste punt moet genoteerd worden dat er ook opportunities besproken kunnen worden die nog niet in zijn geheel zijn benut. Het resultaat zal daardoor nog niet geheel duidelijk zijn en ook de reflectie is op dat moment nog lastig om te maken.

Appendix IX. List of opportunities

The opportunities with the following numbers are exogenous opportunities: 7 - 10 - 15 - 20 - 22 and 23.The last column indicates if the opportunities were from the planning (P) or realization phase (R).

Table 11: List of opportunities

Nr.	Figure	Description of the opportunity / *Core of the opportunity*	P/R
1	Figure 4-6	Na het ter discussie stellen van de eisen van het hoogheemraadschap kon een tunnel hoger aangelegd worden en op de kosten bespaard worden. *(1) Ter discussie stellen van ontwerpeisen. (2) Alliantie overeenkomst zodat zowel OG als ON profiteren van de kostenbesparing.*	P
2		Door het ondergronds uitvoeren van installaties in een tunnelproject, kon extra overlast voor de omwonenden vermeden worden. De gecreëerde goodwill kon later gebruikt worden om de werktijden op te rekken. *Door tijdig omgeving in te schakelen kunnen nieuwe ideeën ontstaat. Implementatie van deze ideeën creëert goodwill die later weer gebruikt kan worden.*	R
3		Door tijdig betrekken van de aannemer bij extra werkzaamheden in het project, kon expertise van de aannemer gebruikt worden en tijde en geld bespaard worden. *Bij verwachte extra scope, maar gebruik van de expertise van de aannemer in een vroeg stadium.*	R
4		Het afdichten van een bouwput, zodat er ook 's nachts gewerkt kon worden. Dit resulteerde in tijd en dus ook geldbesparingen. *Door het luisteren naar klachten uit de omgeving en het zoeken van de 'echte' problemen, kunnen bepaalde randvoorwaarden aan de kaak gesteld worden.*	R
5		Door het gebruiken van een beheersmaatregel ivm de veiligheid kon een vastgelopen situatie toch weer toch weer aan de gang gekregen worden. *Bij het grijpen van kansen zelf de communicatie voeren en persoonlijk met alle betrokkenen praten is van belang om snelheid in het proces te houden.*	R
6		Het naar voren halen van bepaalde stukken werk, zodat de doorlooptijd van het project korter wordt. *Door het project vanuit het perspectief van de aannemer te bekijken, is het mogelijk op zoek te gaan naar win-win situaties. Dan is het niet nodig om extra kosten te maken bij het verkorten van de doorlooptijd.*	R
7		Het verstevigt uitvoeren van de bouwconstructie, zodat er in de toekomst nog de mogelijkheid bestaat om hier op te bouwen. Ook tijdsbesparing opgeleverd door ontwijken van besluitsvormingsproces. *Investeringen in het 'niet onmogelijk maken van' zaken in de toekomst, kan waarde in de toekomst generen en helpen om tijdverlies bij besluitvormingsprocessen te voorkomen.*	R
8	Figure 4-3	Alternatieve bouwmethode van een spoordijk bleek vele malen goedkoper te zijn. *Bij lange bouwdelen is de oplossing voor één deel niet altijd direct de beste oplossing voor een ander deel. Tijdtechnisch niet kritische delen kunnen vaak goedkoper gerealiseerd worden.*	R

9		Na afkeuring van een ontwerp van een viaduct vanwege veiligheid en esthetische redenen, werd het nieuwe ontwerp veel goedkoper en sneller. *Stel geregeld ontwerpen ter discussie en neem vergunning verlenende instanties mee in de besluitvorming om verrassingen achteraf te voorkomen.*	P
10		Door overmatige overlast van bouwverkeer door een dorp, moest er een werkweg aangelegd worden. Deze werkweg kan later weer gebruikt worden als basis van een ander deelproject (geluidsschermen op de plek van de bouwweg). *Kijk over de scope van je eigen deelproject heen en zoek naar mogelijkheden om tijdelijke voorzieningen te gebruiken tot permanente projectonderdelen.*	P
11		Door het veranderen van de bouwvolgorden kon grote tijdwinst worden geboekt. *Stel aannames en methodes van werken die al meerdere jaren vaststaan ter discussie om te komen tot nieuwe ideeën en opportunities.*	R
12		Het aanpassen van het ontwerp leverde waarde op voor de omwonenden. *Grote waardeafwegingen worden door de politiek gemaakt, daarbij kan je als projectteam alleen maar de alternatieven aandragen.*	R
13		Door nieuwe regelgeving moesten er maatregelen genomen worden voor de compensatie van uitstoot. Een creatieve oplossing zorgde dat dit mogelijk was zonder tijdverlies. *Betrekken van alle partijen bij het zoeken naar de oplossing.*	P
14		Door het behouden van een teamlid was het mogelijk om tijdverlies in de planningfase te vermijden. *Bij overdracht tussen teamleden, zorg dat deze in het project rollen op een rustig moment. Dan is het mogelijk om ze in te werken.*	P
15		Door het combineren van groot onderhoud en wegverbreding was het mogelijk om eerder te beginnen met de wegverbreding en tijdelijke rijstroken als permanente te gebruiken. *Het combineren van twee werkzaamheden maakt twee zaken mogelijk. (1) Bepaalde tijdrovende werkzaamheden voor project B kunnen al bij project A uitgevoerd worden. (2) Bepaalde tijdelijke voorzieningen voor project A kunnen voor project B ook gebruikt worden of zelfs permanent gemaakt worden (extra rijstroken ivm doorstroming tijdens onderhoud).*	P
16		Door de omgevingsvergunning op de knippen en los te halen van het WAB was het mogelijk om eerder contact te hebben met de omwonende en een netwerk te creëren. Dit had een positief effect op het project. *(1) Creatief zijn met de mogelijkheden stimuleer je door mensen te betrekken met een 'can-do' mentaliteit. Dit is vooral van belang bij beroepsgroepen waar dat normaal gesproken minder in de natuur zit (bv. juristen). (2) Vroegtijdig in gesprek met stakeholders maakt ze meer betrokken bij het werk.*	P
17		De aannemer kon de bouwtijd verkorten, maar zou dan wel in het korte tijdsbestek meer hinder veroorzaken. Dit was een kans om een deel van het project eerder op te leveren. *Duidelijk de ambities van het project doorcommuniceren naar de stakeholders (in dit geval aannemer). Daarmee stuur je hun in pakken van kansen (win-win situaties) voor het project.*	R
18	Figure	Door de planning aan te passen kon er rekening gehouden worden met een ver-	R

	4-5	koopmanifestatie die in de omgeving gehouden werd. *(1) Goede communicatie met omwonenden voor het identificeren van waarde voor hun. (2) Vroeg betrekken aannemer bij wensen vanuit de omgeving.*	
19		Opnemen van extra werk in het project om te verkomen dat dit niet gedaan zou worden door de verantwoordelijke partij. *Het pro-actief aanpakken van werk dat rondom het project gedaan wordt zorgt voor meer controle van het project.*	R
20	Figure 4-2	Door het grondwerk van een gedeelte van de weg bij een ander project onder te brengen dat al in de realisatie was, kon tijd ingewonnen worden. *Door het verplaatsen van werkzaamheden die veel tijd vergen in een ander project dat een fase voorloopt, kan veel tijd bespaard worden.*	P
21		Door grondsaneringswerk over te nemen van andere partijen, werd de afhankelijkheid van het besluitvormingstraject van die partijen weggenomen. *Door werk binnen te trekken van een ander project, haalt men de afhankelijkheid van het besluitvormingsproces van dat project weg.*	P
22	Figure 4-7	Binnentrekken van werk van een ander project, besparing op overhead kosten en een vermindering van het aantal interfaces tijdens de realisatie. *Samenvoegen van werk met ander projecten levert besparingen op in de overhead en vermindering van interfaces tijdens de bouw.*	P
23		Door de bouwkeet en bouwweg te plaatsen op een plek waar ook een toekomstige gemeenteweg aangelegd zal worden, is in de kosten bespaard. *Door tijdelijke voorzieningen slim te plaatsen/ in te richten, kunnen ze later door ander projecten gebruikt worden. Het huidige project behoeft ze dan ook niet te verwijderen.*	P

Appendix X. Additional information from the interviews

In addition to the information related to the hypotheses, other valuable information can be extracted from the interviews. This section discusses the additional information: The first part discusses some general remarks regarding opportunity management. The second part reflects on factors that have a positive or negative impact on opportunity management.

General remarks

Risk and opportunity management

In chapter 1 it was stated that project uncertainty management has two sides: project risk management and project opportunity management. Most of the interviewed project managers acknowledged this fact and also said that both risks as well as opportunities exist in the planning and realization phase of infrastructure projects.

However, the manner in which project managers perceived opportunities and risks was quite different, which is a problem when discussing the topic. This will therefore be shortly discussed.

This research marks the difference between risks and opportunities by looking at two characteristics. First, the opportunity should have a positive effect on project objectives, thus create value. This is graphically shown in Figure 7-4.

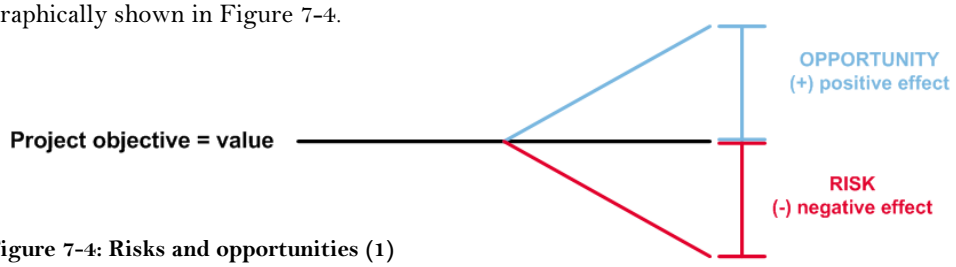


Figure 7-4: Risks and opportunities (1)

Secondly, opportunities need to be acted upon (i.e. exploited) before they have a positive effect. Risks are different, because they can have a negative effect if you act on them or not. This can be seen in Figure 7-5.

Figure 7-5: Risks and opportunities (2)

The interviews showed mixed perspective on risks and opportunities, and the management of them. Two project managers stated that they regard opportunities only as part of project risks. In their view, opportunities are equal to mitigation measures that are taken in response to project risks. Other project

managers insisted that opportunities are very different from risks and the mitigation measures developed to control risks.

This overlap between risk mitigation measures and opportunities emerged in almost every interview. Because it is such a personal choice to call it the one or the other, and therefore it proved to be difficult to find a strict boundary between the two.

Missed and failed opportunities

People are by nature more inclined to talk about their successes than about their failures. Project managers or other members of a project team are no exception to this rule. Discussing examples of missed or failed opportunities therefore proved to be more difficult during the interviews.

First a clear distinction between failed and missed opportunities should be made: Failed opportunities are opportunities that were pursued, but turned out to have a negative effect. Missed opportunities are opportunities that were identified after their 'window of opportunity' had gone by. The problem with missed opportunities is that one does not always know the opportunities that were missed. One project manager stated that fragmentation is the prime source for missing opportunities.

Factors that influence opportunity management

Inherent conflict opportunity thinking and project management thinking

One of the most important issues in project management is scope management. In essence scope is 'the identity' of the project - without it the project does not exist. Basic premise of project management thinking is therefore to guard the scope of the project as rigid. Scope changes, or changes in general, usually indicate extra work which causes the project to run over budget and time. When looking for exogenous opportunities, the project team deliberately searches for changes that can be made. In the interviews, two observations were made:

First the issue of extra scope: The interviewed project managers are on most occasions reluctant to add extra scope to the project. Only if the demand comes directly from the client and extra funds are provided the project manager might be willing to accept extra scope. However, some project managers said, they would still hesitate to accept the extra scope, because the process could be disturbed. Especially when the project is already running smoothly, extra scope might cause side-effects that cause delays or cost overruns.

Second the issue of less scope: Although with opportunities the focus is often on searching for things that add value for the client, it is also possible to relocate a certain scope into another project or not to realize a certain part of the scope. Such line of reasoning was accordingly to the interviewees not common in project management, because it usually raises the question: Why giving away part of your project?

Changes in priority between project objectives

It usually takes several years to plan and realize infrastructure projects. During this period of time the priority between the various project objectives can change. Such a change in the priority between the project objectives can cause opportunities that were not positively evaluated in an earlier stage, to become viable. An example is given in Figure 7-6.

Several years ago the minister of I&M[7] decided that road construction/renewal should be planned and executed more quickly. In his opinion, procedural delays needlessly delayed the projects and in order to solve the mobility problems the projects should be realized more swiftly. Value in these "Spoedwetprojecten" was therefore the time to delivery. From a project management perspective, the trade-off between cost and time shifted towards time. It can be assumed that opportunities that satisfied this value were identified and exploited in these "Spoedwetprojecten".

At this moment, the government is proposing budget cuts and it is highly probable that also Rijkswaterstaat will face budget cuts on the projects. This could mean that the trade-off between cost and time shifts back towards cost

This means that other opportunities in the project might become viable. Taking into account this possible change in trade-offs in the contract makes it easier for exploiting those opportunities in a later stage.

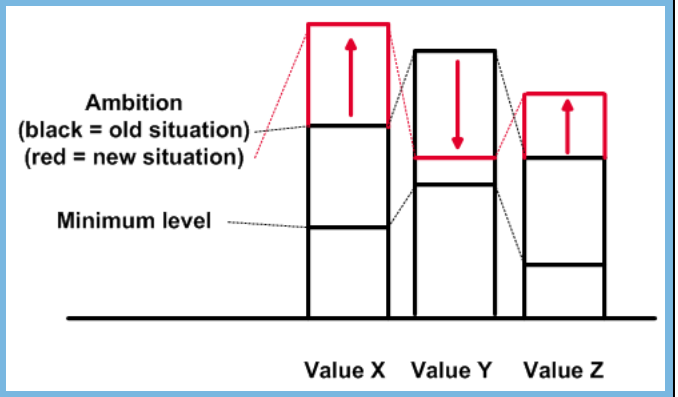


Figure 7-6: Shifting ambition levels

In the interviews in which the priority between the objectives was stable during the course of the project, the project managers appeared to be less convinced that their projects contained opportunities. In addition, it might also be conceivable that new objectives arise during the project, for example objectives with regard to sustainability. No indication of this could be found in the 12 interviews conducted for this research.

Political context

It takes years before infrastructure projects enter the planning and realization phase. The initiative phase of those projects is long because of the various interests in the area and the political sensibility of the project. Such long processes can result in solutions that are satisfactory for all stakeholders and in effect become Pareto-efficient. However, such solutions do not have to be socially desirable

The interviews showed that opportunities for improvement in later stages of the project were often not implemented due to the political context. Even if they might create added value for the major share of the stakeholders, the risk that they cause time delays due to the decision making process is often a great obstacle for opportunity exploitation.

[7] Ministerie van Infrastructuir and Milieu. Ministry of Infrastructure and Environment.

Appendix XI. Validation workshop

To illustrate how the validation workshop was done, several of the powerpoint sheets that were used are shown below. Because the discussion was to be held in Dutch, the hypotheses had been translated into Dutch as well. Theses translations are listed after the sheets.

Programma

AT OSBORNE

16:00 Ontvangst
Introductie deelnemers
Doel van vandaag

16:20 Presentatie onderzoek

16:30 Discussie hypothesen

17:30 Discussie stelling(en)

17:50 Wrap-up
Sluiting

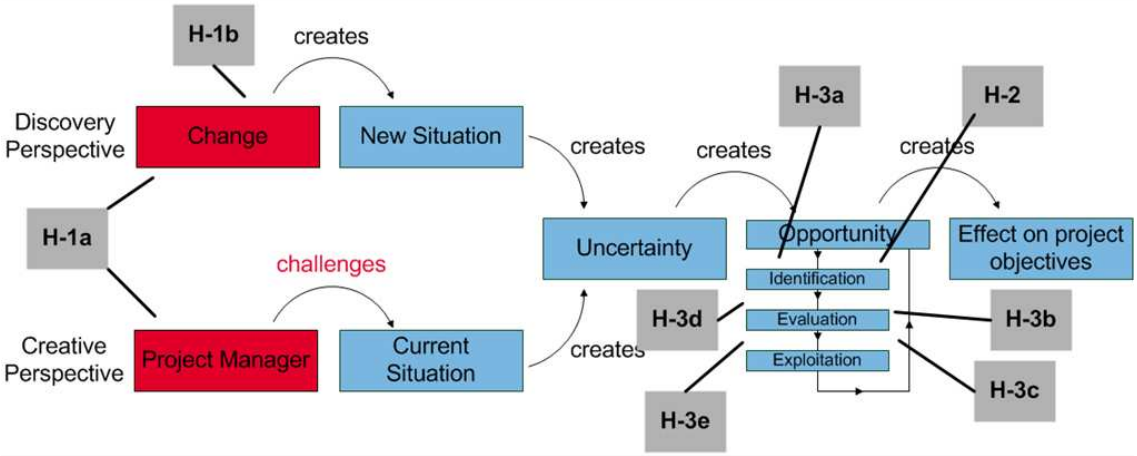
18:00 Borrel

3

3. Literatuur – 8 hypothesen

AT OSBORNE

Opportunity Proces



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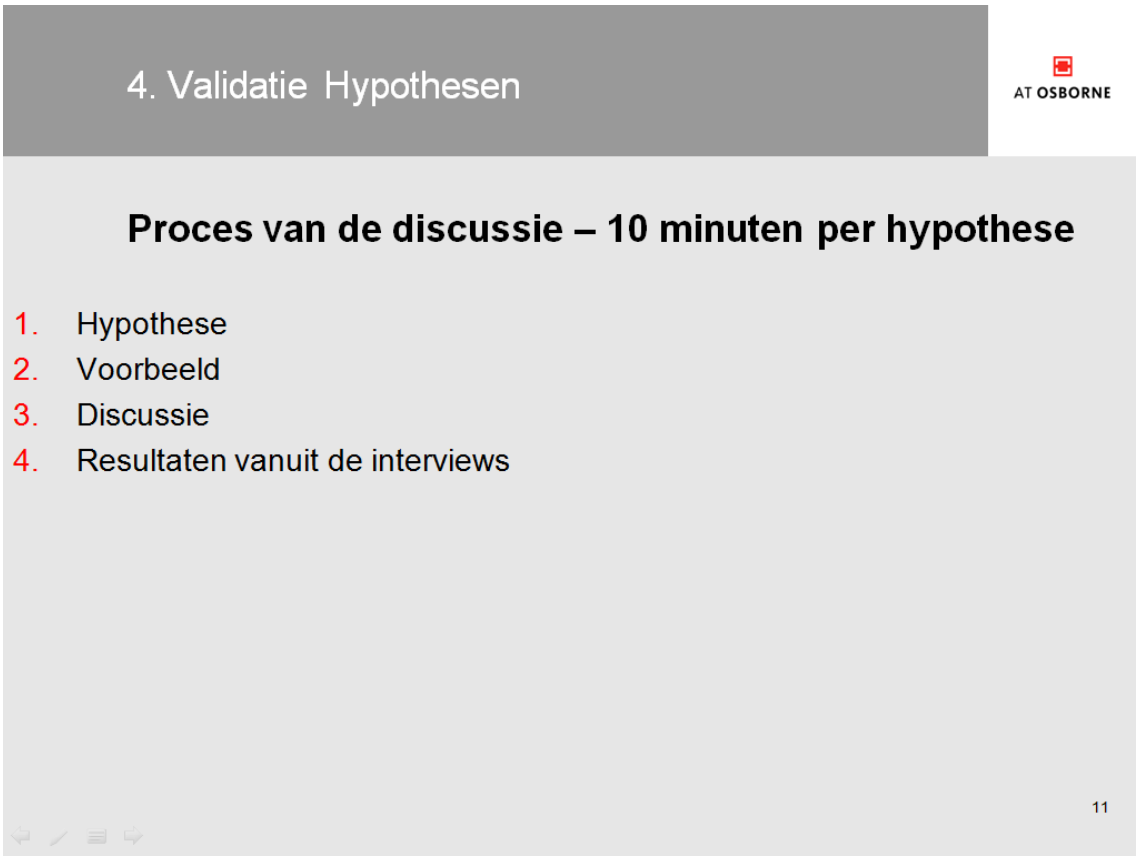

Dutch translations of hypothesis as used during the presentation.

Hypothesis 1a - Het is waarschijnlijker dat kansen geïdentificeerd worden als er een directe aanleiding voor is.

Hypothesis 1b - Kansen ontstaan voornamelijk bij…

Hypothesis 2 - In de praktijk worden vaker endogene kansen dan exogene kansen geïdentificeerd.

Hypothesis 3a - Het gestructureerd/ systematisch zoeken naar kansen wordt het meeste toegepast voor de identificatie van kansen.

Hypothesis 3b - Besluitvorming over de kans is gebaseerd op een expliciete analyse en afweging van de kans.

Hypothesis 3e - Geïntegreerde contracten verkleinen de kansenruimte voor de opdrachtgevende organisatie.

In case time would be left after discussing the hypotheses, several statements had been prepared. These were not necessary, because discussing all the hypotheses proved to be difficult in the limited amount of time.

Stelling 1 – Expliciet kansenmanagement heeft meerwaarde.

Stelling 2 - Kansenmanagement conflicteert met de filosofie van project matig werken.

Stelling 3 - Vanuit de staande organisatie worden er onvoldoende prikkels gegeven aan project managers om kansen te benutten.

Appendix XII. Identification of exogenous opportunities

The interviews gave 6 examples of exogenous opportunities that focused on integrating and coordinating work with other infrastructure projects that are executed or about to be executed in the same region. These 6 examples are briefly described in Appendix IX. More elaborate descriptions for opportunity 20 and 22 can be found in Figure 4-2 and Figure 4-7.

6 examples out of 12 interviews means that not all project managers came up with such opportunities. This observation might mean two things:

1. These opportunities are not present in every project. It therefore not necessary to have a structured search for opportunities.
2. These opportunities were present, but not identified by the other project manager or his team. In this case a structured manner of searching would have resulted in more opportunities to be identified.

The six examples can be categorized in three groups. The numbers written behind each category resemble the codes used in Appendix IX. Combinations with

1. projects that are in an earlier phase (opportunity 7 – 10 and 23);
2. projects that are in a similar phase (opportunity 15 and 22);
3. projects that are in an advanced/subsequent phase (opportunity 20).

In order to help project managers in identifying these opportunities, a list of questions is given in Table 12 to trigger the identification. As stated in section 5.3, these opportunities are more valuable in the planning than the realization phase of the project. This list is therefore set up from the perspective of the *planning phase.*

GROUP	*Question*	Effect possible opportunities		
		TIME	COST	QUALITY
Future projects (Which projects will be executed after our project?)				
Planned projects	*Are certain temporary provisions useful for future projects?*		X	
	Can our design assist future projects?		X	X
Similar phase projects (Which projects are also in our phase?)				
	Do we have similar activities? *1. Can we use economics of scale?* *2. Can we reduce overhead?*	X	X	
	Are certain temporary provisions useful for other projects?		X	
	Do we have mutual impact on the stakeholders?			X
	Is maintenance work scheduled in the projects?	X	X	
	Are my waste materials possible ground materials for other projects and vice versa? (especially when looking at sand)		X	
Advanced projects (Which projects are in an advanced phase?)				
	Can we transfer parts of our scope to other projects?	X		
	Which lessons learned can we take from their experience?	X	X	X

Table 12: Questions for identifying exogenous opportunities

Appendix XIII. Identification of opportunities - Lateral thinking

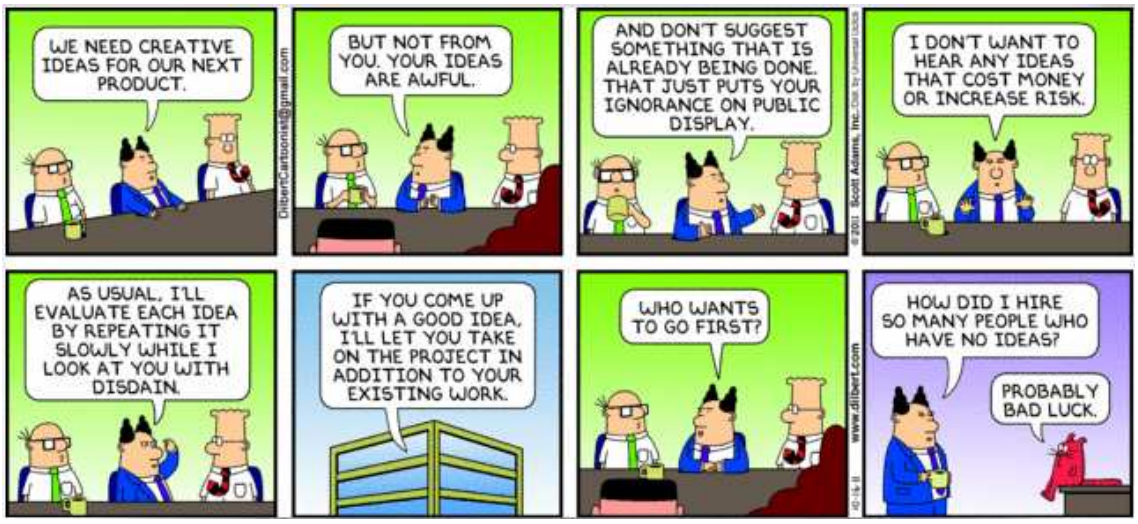

Figure 7-7: Creative meeting (Adams, 2011)

Introduction

Large amounts of literature are available on creativity and stimulating the identification of opportunities. For this research, the work of Edward de Bono is used. Edward de Bono is the leading authority on creative thinking worldwide for over 40 years. He has developed a theoretical model called "Lateral Thinking" to stimulate creativity. One of the techniques from literature on Lateral Thinking strongly resembles the method used to identify opportunities described in this report, "challenging project constrains".

Provocation

Many important new ideas come about through chance, accident, mistake, or "madness". These provide some kind of discontinuity which forces people to look outside the usual boundaries. Provocations are experiments of the mind that systematically produces these discontinuities. (de Bono, 1992, p. 145). Before we go deeper into this subject, first the logic behind perception is explained briefly.

Perception

Whenever we look at the world, we see the world in terms of existing patterns. Information that we receive is funneled through these patterns so we can make sense of the world around us (de Bono, 1992, p. 11). Figure 7-8 shows the formation of such a pattern.

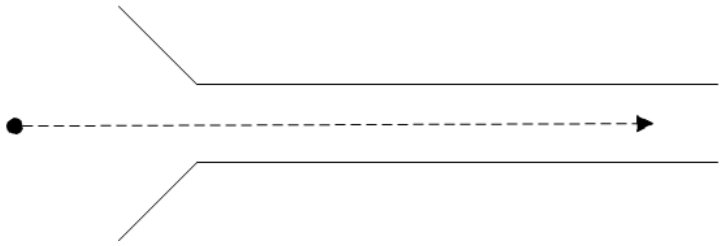

Figure 7-8: Single pattern (Adopted from de Bono, 1992, p. 11)

In time, thousand of these patterns are formed (see Figure 7-9). *Perception* is the process of setting up and then using these patterns.

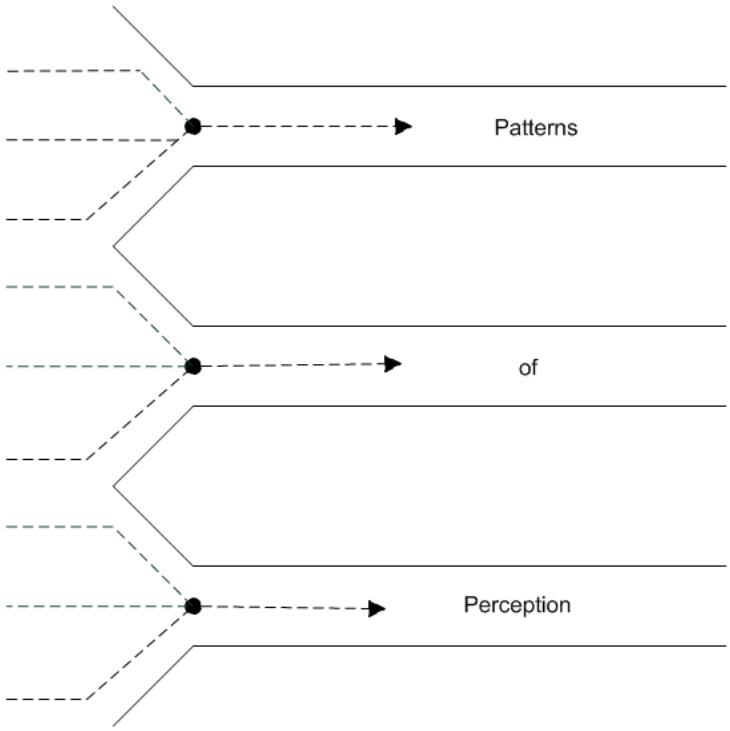

Figure 7-9: Patterns of Perception (Adopted from de Bono, 1992, p. 12)

Humor

What happens when we do not follow the neatly sequence as described above? Humor occurs when we are taken from the main track and deposited at the end of the side track (see Figure 7-10). From there we can see our way back to the starting point. Creativity occurs in exactly the same way. But how do we get across from the main track to the side-track? Therefore we need systematical provocation methods. (de Bono, 1992, p. 146).

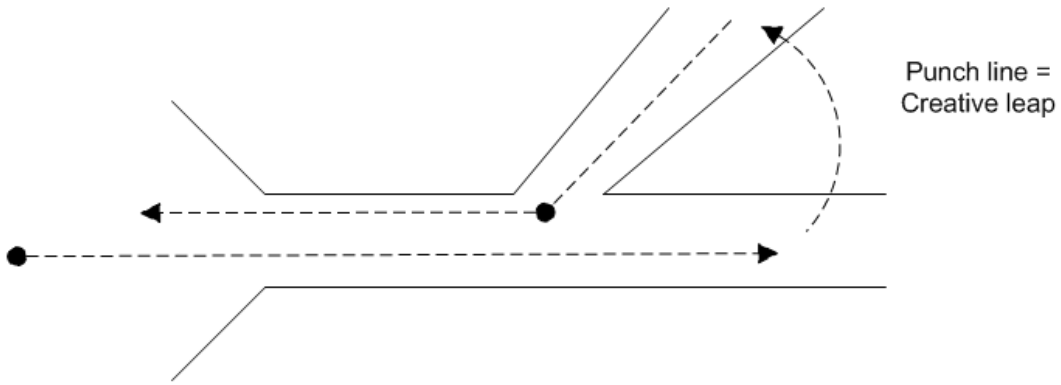

Figure 7-10: Patterns of Perception (Adopted from de Bono, 1992, p. 147)

Provocation

In provocation, we move from the starting point to an arbitrary provocation. Then we move on from the provocation to an opportunity (see Figure 7-11). The validity of the result cannot be justified by looking at the way we got to the opportunity. However, when looking back towards the starting point we may see that the new position has added value. If the new position has added value, this means that the opportunity might be viable.

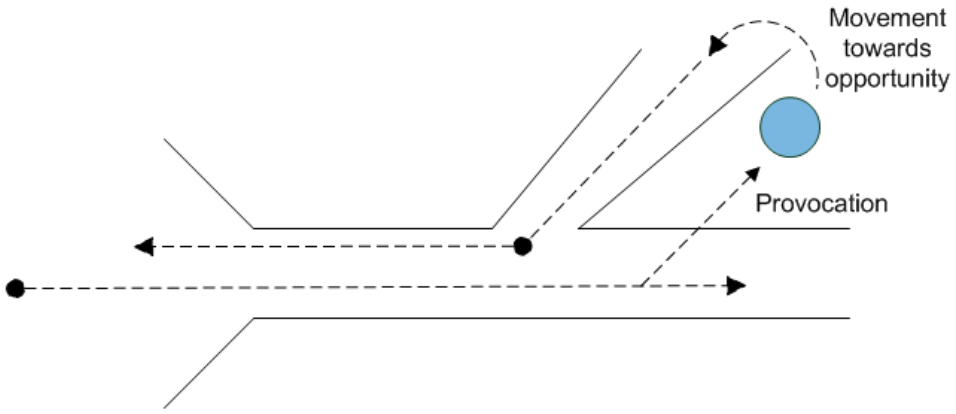

Figure 7-11: Provocation (Adopted from de Bono, 1992, p. 147)

Thus, provocation is used to get people out of the usual maintrack of thinking. From the provocation it is possible to identify opportunities that have a added value.

Setting up provocations

Thus, in order to systematically produce discontinuities that stimulate creative thinking we need provocations. These can be categorized in three ways: arising provocations, escape provocations and stepping-stone provocations (de Bono, 1992, p. 317). In addition, the research also provides a list of provocations that the reader can use during an opportunity management session.

First, provocations can *arise* from people even if they did not intend to think about provocations. An idea which is judged as being unsound or even ridiculous can nevertheless be used as provocation to move forward to ideas that are useful.

Second, *escape* provocations are deliberately set up. A certain point that is taken for granted or normal is used and turned around. Either by negating the point, cancelling the point, drooping the point or simply doing without it. This cannot be done when the point is a problem, complaint or difficulty.

Third, the *stepping-stone* provocations are also deliberate provocations. These should be set up boldly and without any though on how the provocations might be used. Four methods can be used to get these provocations: (1) Reversal, the normal approach is reversed to form the provocation. (2) Exaggeration, the normal dimensions (time, size, weight, number, etc.) are exaggerated beyond normal. (3) Distortion, the normal relationship between involved parties or the normal sequence of activities is distorted to create a provocation. (4) Wishful thinking, putting forward a fantasy that is not realistically expected to happen.

During the interviews conducted for this research, opportunities were discussed with the project managers (Appendix IX). The provocations that are at the basis for these opportunities are listed in Table 13. This list of provocations can be used in opportunity management sessions.

Table 13: List of provocations

Nr.	Provocations
1	What if we can change our design conditions?
2	What if we would be our own 'hoogheemraadschap'?
3	What if the environment decided where to install noise machines?
4	What if the contractor was part of our organization?
5	What if we didn't have limitations in the construction times?
6	What if all actions should lead to progress in the project?
7	What if we would execute the project to the wishes of the contractor?
8	What is of value for the contractor?
9	What if we were also responsible for future projects in the area?
10	What if we construct parts of the project differently from other projects?
11	What if we split up the design in several smaller parts?
12	What if we turn the construction method around?
13	What if we don't build a certain part of the project?
14	What if we would make the project exactly as the stakeholders want it?
15	What if we keep the same team members during the course of the project?
16	What if all permits should be filed by a separate procedure?
17	What if we could make as much nuisance as we wanted during construction?
18	What if we change our schedule?
19	What if all stakeholders would try to delay the project?
20	What if we could not use our own contractor to build the project?
21	What if we were responsible for all the work around the project?
22	What if you were program manager of all projects in the region?
23	What if all temporarily facilities should be used temporarily?

Movement

In order to get from the provocation towards the opportunity, we need some form of movement (see Figure 7-11). Also this can be systematically stimulated. De bono (1992, p. 318) suggest five ways of doing so (de Bono, 1992, p. 318).

(1) *Extract a principle*, concept, feature, or aspect from the provocation and ignore the rest. Work with that principle and build a new idea around it. (2) *Focus on the difference* between the provocation and the normal way of working. (3) Visualize the provocation being put into action from *moment to moment*. Analyze what happens and extract the useful parts. (4) Focus on the aspects that are directly regarded as positive. Build an opportunity around these positive aspects. (5) Investigate *under what circumstances* the provocation would offer added value. Then look if it is possible to move to such circumstances.

Appendix XIV. Nederlandse samenvatting

Dit onderzoek behandelt opportunities[8] in de planuitwerking- en realisatiefase van infrastructurele projecten. Opportunities zijn onzekere situaties die benut kunnen worden door het projectteam voor het creëren van waarde voor de opdrachtgever en opportunity management is het systematisch identificeren, evalueren en benutten van opportunities. Het is de verwachting dat een vergroting van de kennis op het gebied van opportunities en het managen van opportunities, project managers kan ondersteunen in het behalen en overtreffen van project doelstellingen door het creëren van waarde voor de opdrachtgever, zowel op de korte als lange termijn. Doel van het onderzoek is het vergaren van nieuwe kennis op het gebied van opportunities en opportunity management.

Om het boven geformuleerde doel te bereiken zijn er drie onderzoeksmethoden toegepast. (1) Een literatuurstudie van ondernemerschap en project management literatuur. (2) Empirische data is verzameld door middel van interviews met twaalf ervaren project managers van infrastructuur projecten. (3) Validatie van de gevonden antwoorden in een workshop met de geïnterviewde project managers en enkele andere project managers.

Op basis van de beschreven onderzoeksmethoden, heeft dit onderzoek aangetoond dat weinig literatuur beschikbaar is over het managen van opportunities in projecten, in het bijzonder voor infrastructuur projecten. Informatie uit de interviews met ervaren project managers toont ook aan dat opportunities vaker 'ontdekt' worden dan 'gecreëerd'. Dit betekent dat project managers meer geneigd zijn te reageren op veranderingen voor het identificeren van opportunities, dan pro-actief naar opportunities te zoeken zonder een directe aanleiding.

In de literatuur van opportunity management wordt de identificatie van de opportunity gevolgd door een evaluatie waarbij de toegevoegde waarde afgewogen wordt tegen de tijd en moeite die nodig is voor het benutten van de opportunity. Ofschoon het evalueren en benutten van de opportunity in de literatuur als twee aparte stappen in het proces gezien wordt, doet empirische informatie verkregen in dit onderzoek vermoeden dat beide stappen zeer verweven zijn. Uit de praktijk blijken verschillende aspecten van belang bij het evalueren en benutten van opportunities.

Naast bovengenoemde conclusies over opportunities en de manier waarop ze gemanaged worden, kunnen er twee andere conclusies getrokken worden op basis van de informatie uit de interviews en de validatieworkshop. (1) Er bestaan verschillende interpretaties van opportunities en opportunity management in de praktijk. (2) Project managers blijken een sterke behoefte te hebben om meer te leren over opportunity management, maar hebben weinig informatie beschikbaar om ze daarin te assisteren.

Concluderend, in de praktijk blijkt het proces van opportunity management voornamelijk impliciet te worden doorlopen. Dit onderzoek heeft geprobeerd om te doorgronden wat opportunity management inhoud door te kijken naar de theorie en de praktijk. Het is de overtuiging van de auteur dat het bewust

[8] In deze tekst wordt het woord opportunities gebruikt in plaats van kans om verwarring met de probabilistische betekenis van kans te voorkomen.

toepassen van opportunity management project managers kan helpen in het realiseren van extra waarde voor de klant.

Aanbevelingen voor het toepassen van opportunity management en mogelijkheden voor verder onderzoek staan beschreven in hoofdstuk 7 van dit rapport.