Innovation in Road Maintenance
- A comparative study into Dutch and Queensland current practice -
We can learn from experience if we are ready to adapt that experience to changed conditions.

- J.C. Masterman, 1972 -
Innovation in Road Maintenance
- A comparative study into Dutch and Queensland current practice -

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Words of Gratitude

This report is the product of a research on innovation in performance contracts for road maintenance. It marks the final stage of the MSc Construction Management and Engineering at the Delft University of Technology. The research is carried out in cooperation with two governmental organizations, being Rijkswaterstaat and Transport and Main Roads. Many people were involved with this research and I can honestly say that in one way or another, all made an essential contribution to the coming about of the report now lying in front of you.

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Executive Summary

**Motive**
Around the world, a transition is taking place from input-driven to output-driven maintenance contracts. As such, the Dutch government is changing its road maintenance strategy as well. Contractual demands are to change from being specific and technical (the RAW-contract) to general and functional (the performance-contract). The performance-contract allows the principal to control the way the infrastructure is controlled from a distance. The contractor is responsible for ensuring the infrastructure suffices to a functionally level of quality, the latter being defined by the principal. Planning and design are left to the account of the contractor. Naturally, this change of responsibilities has a huge impact on the way principal and contractor (inter)act.
The environment of infrastructure constantly changes. Innovation plays an important role in adapting to such changes, as it can improve efficiency and effectiveness of both maintenance and the product. In the new situation, innovation is to be contractor-led. The idea behind it is to use market creativity and adaptability, while the principal decides which innovations are put into practice. It raises the question of how contractor driven innovation is best stimulated and made use of.
Quality of road maintenance directly influences user safety and perception. What's more, yearly almost a billion is spent on road maintenance, which comes down to 37% of the budget available for state controlled roads. The change of contract currently being implemented, now it is of great importance to assess if strategies work out as intended. And to explore possibilities for improving current practices.

**Set-up**
The goal of his research is to create insight into the possibilities for facilitating, stimulating and making use of innovation in road maintenance during the contract period. Use is made of two stepping-stones: the Living Building Concept and Queensland current practice. The Living Building Concept prescribes and defines contractor-led innovation. From this a research framework and assessment criteria are derived. It forms the theoretical basis of this research. In order to search for possibilities to improve, Dutch current practice is compared to Queensland current practice. In Queensland over 15 years of experience with road maintenance performance-contracts exists. Taking on a qualitative approach, by means of desk study and interviews respectively, contracts and current practices are investigated. In total, six cases are reviewed, of which three in The Netherlands and three in Queensland.
First, coherence between vision, contract and current practice is assessed. Hereafter both strategies are compared to each other. Making use of the criteria, strengths and weaknesses are pointed out. Subsequently, these are used as input for drawing up conclusions and recommendations.

**The Living Building Concept**
The LBC prescribes a shift from traditional demand-based and one-off project development towards market-based product innovation: the contractor designs and creates its own offer
and tries to realize profit by innovating. The principal is to take on a governing role and select the desired solution, the contractor advises the principal on matters at hand. For a contractor to be able to take on this responsibility, the principal should formulate demands functionally, thereby defining a solution space. With functional demands focused on the public value, created benefit is for the account of the end-user. The freedom provided will stimulate a contractor to come up with fit-to-purpose solutions. Driven by profit, the contractor will develop R&D facilities and will try to conquer the market by designing and developing innovative families of products.

In order for the turn-around to take effect, parties should collaborate strategically instead of operationally working apart together. Forming the basis of strategic collaboration is the joint quest for joint goals. Joint goals are to be established by communication and the provision of trust and equality.

**The Netherlands**

As demanded by the contract, innovation is contractor-led in The Netherlands. The use of functional demands provides a contractor freedom is to be creative. Most important incentives to innovate are the demand stated in the contract, the possibility to make profit and contract extension. Unavailability of budget, aspect demands and general regulations limit possibilities to innovate. Also, innovations are hampered by the fixed process, which can cause procedures to be unnecessarily lengthy.

The contract is primary in the way parties act towards each other, whereby sometimes old habits surface. However, where focus is put on collaborating, parties cooperatively work towards joint benefit. Those involved regard it to facilitate innovation.

**Queensland**

In Queensland, the focus is not on innovation. Still, innovation does take place and is contractor-led. The contractor is regarded to have best knowledge of the network. As a result, innovations proposed are seldom declined.

The stewardship role prescribes the contractor to take up responsibility for the network and to act as if being the owner. A natural longing to innovate is the result.

Most important incentive recognized is commitment. With performance in the stewardship role as criterion in past-performance and performance-measurement, this incentive is boosted by the prospect of being granted continuity. This is the second major incentive.

The contract defines a solution for each problem that can be encountered. A solution space is only provided by flexibility of these demands. Contractors also feel restrained by fact that no dedicated budget for innovations exists, as no initial investments can be made.

Collaboration is intense: the partnership is primary to the contract. This allows for processes and demands to be flexible, which facilitates innovation. Supported by partnering workshops, openness allows the sharing of core values. This is used to establish joint goals, which are safeguarded by the provision of trust and equality.

**Conclusions**

Innovation takes place, albeit more intense in The Netherlands due to the demand for innovation stated in the contract. Still, in both The Netherlands and Queensland, the end-user benefits as innovations improve efficiency and effectiveness of both maintenance and product.

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A flexible process has proven to facilitate innovation, as does collaborating strategically: establishing core values & joint goals and working on the basis of trust, equality and openness. Also, for a contractor to be able to search for and develop innovations, the provision of a solution space is required. Stating the demands functionally has proven to provide such freedom. Currently, what is value with regard to innovations in not defined by the principal, making it difficult for a contractor to autonomously steer innovations towards public benefit. As a result, the principal has become involved in the process.

Stimulating innovation are ‘making profit’ (The Netherlands), ‘commitment’ (Queensland), ‘continuity’ (both) and to a lesser extent ‘market position (both). Performance-measurement and past-performance efficiently support a demand for innovation.

The principals endeavour to make full use of innovations, but are not aware of market supply due to the fact that innovations are not registered and scored in a database.

*Recommendations*

To facilitate innovations, both The Netherlands and Queensland are to define value operationally, attuned to the end user. This will enable the contractor to design fit-for-purpose solutions, steered towards public benefit. At the same time, it will increase desirability of innovations. This allows the principal to further step away from the process, thereby providing trust. Value defined operationally safeguards freedom to be creative. To support this freedom, in Queensland functional demands should replace the current solutions stated. In The Netherlands the aspect demands should be converted into functional demands. To further facilitate innovations, in The Netherlands mandates should be provided on operational level. This will bring about a dynamic process, adaptable to the innovation proposed instead of the other way around.

Having proven to facilitate innovations, in The Netherlands the PSU should create a strategic collaboration. Parties should be made aware of the benefits and a partnering-agreement should underline the intent. Making collaboration a criterion in past-performance and performance-measurement should create another incentive to collaborate strategically. The total will result in a partnership coming into existence.

To stimulate development of innovations, in Queensland the focus should be put on innovation. The demand for innovation should be communicated and underlined by stating the demand in the contract. In The Netherlands the stewardship role should be taken up in the contract to try and create a natural longing to innovate with contractors. Also, in both The Netherlands and Queensland the submittal of innovations should be made a criterion in performance-measurement and past-performance. As a result, contractors will actively search for innovations, whereby the amount of innovation proposed will increase.

In order to make full use of innovations, the principal should store and score innovations in a database. This will enable organization-wide knowledge of market supply, allowing the principal to make an informed decision. At the same time, benefit can be transposed as it allows the implementation of innovations in other, similar projects.
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1 Introduction

Roads were created as from the moment first animals set ‘foot’ on earth and have been of importance ever since: roads allow the movement of animals, people and products. Adam Smith, a moral philosopher on political economy in the 18th century, agrees: ‘infrastructure is of the greatest importance for the economical development of a country, because trading and inhabitants require accessibility, as do the armed forces’ [Smith, 1776, p.120-130]. Proof of the first man-made Dutch road dates back to 4500 BC [Beliën & Van Hoogstraten, 1998, p.10]. Still, it would take until the arrival of the Romans in 57 BC, before the advent of paved and maintained roads in Europe was a fact [Caesar, 50 - 40 BC]. The Romans building the first roads, with the collapse of the Roman Empire came the total decay of the Middle Ages. It was bad news for the road system, of which quality declined significantly. It would take until the end of the Dark Ages before roads had again the same quality they once had [Beliën & Van Hoogstraten, 1998, p.20]. Since the Dark Ages, intensity of use has increased somewhat. First data exists from at around 1850, when the total of paved roads in The Netherlands measured a mere 2.500 kilometres. Last calculations show the current length to be exceeding 136.827 kilometres. [CBS, 2009]

Like a car or house, roads are to be maintained in order to preserve their quality. In most countries the government, being the owner of the roads and caretaker of public value, is responsible for arranging maintenance. Embroidering on Smiths’ argumentation, the state should ensure that public value is provided and public initiative can blossom, for the least economical burden. Thus, the quality cost ratio of infrastructure is to be optimized through market initiatives, while the government assures quality is attuned to the end user. The Dutch government is currently changing its strategy. In the past, the government held strict control over design and planning of maintenance activities: by means of strict specifications a certain quality of the roads was to be preserved. The new strategy is to only define performance using functional demands. The contractor is to suffice to these functional demands and thereby preserve quality while the government controls from a distance, similar to the set-up prescribed by Smith. Hereby, planning and design are left to a contractor. An entirely new contract and set-up for control are to safeguard this transition.

As explained, the quality of the road is preserved through maintenance. So what happens when circumstances change and new methods are required or perhaps the road needs a small adaptation? It is at these moments that innovation plays an important role. Innovation, by definition, is such a change, intended to improve the current situation. With the current responsibility shift, also the responsibility towards innovation changes. All of a sudden, contractor steered innovation is demanded. Thereby, one wonders how contractor driven innovation is best stimulated and made use of. What are the incentives for a contractor to innovate? How is it best arranged that innovations benefit the user? And how does the relationship between the principal and contractor influence innovation?

The Netherlands being in a process of change, these questions need to be answered. What better way to do so then by making a comparison with the land of promise: Australia? In The Netherlands, often Australia is regarded as one of the leading countries in asset management.
Thus, in order to get a better view of practice overseas and to search for techniques from which innovation in both countries can benefit, this research compares Dutch current practice to established Anglo-Saxon or, more specific, Queensland experience.

The Living Building Concept lies at the basis of this comparison. The Living Building Concept in The Netherlands played an important part in the above-mentioned shift in The Netherlands in the construction industry from being top down responsive to bottom-up pro-active. Starting from the idea that the environment is in a constant motion, it describes a conceptual system for anticipating and capitalizing these changes. By those means, it provides a theoretical basis for making use of innovation.

Thereby, the goal of this explorative research, titled *Innovation in road maintenance*, is to create insight in the current possibilities for making use of innovation during the road maintenance performance-contract period, by comparing Dutch and Queensland current practice, using the Living Building Concept as theoretical framework.
2 Research Design

This chapter provides an in-depth view on motive, research problem and the strategy used to solve this problem. Boundaries of this research are noted down, together with reliability and validity of the research. After reading this chapter, it should be clear to the reader how innovations play a role in road maintenance, why research into this subject is of importance and how this research can assist in improving current practice.

Paragraph 2.1 describes the motive for taking up the research, followed by a problem description and definition in 2.2. In paragraph 2.3, stepping-stones are explained, followed by the stated research goal in 2.4. Scope is defined in paragraph 2.5 and research questions are laid down in 2.6. Paragraph 2.7 explains research strategy and 2.8 describes validity and reliability of the research. Paragraph 2.9 finalizes by providing a reading guide for this report.

2.1 Motive

In The Netherlands in 2010 almost 1 billion is spend on Routine Maintenance of Main Roads: over 10% of the total budget of Rijkswaterstaat (RWS) and over 37% of the budget available for dry infrastructure. Still, Routine Maintenance works are small-scale; it is through the high quantity of maintenance that costs add up. Its enormous financial dimension is in proportion to the extent to which Routine Maintenance is discussed in media. Politicians as well seem to rather talk about new constructions. This is remarkable, as Routine Maintenance directly influences the user: should the quality of maintenance lack, the user will see, feel and experience it first hand. Quality of maintenance thereby directly influences user safety and satisfaction, showing why Routine Maintenance deserves a closer look.

Worldwide there is an observable trend towards outsourced highway management services [Porter, 2001, p.8]. According to Porter, as agencies recognize the benefits of moving their activities into a competitive environment, their documents tend to evolve and begin to seek to define the outputs they require the contractor to provide. The focus of the procurement documents is on specifying intervention criteria and defining performance standards.

Figure 1 shows the transition from input-driven to output-driven contracts. ‘Input driven contracts are characterized by a detailed method-based specification and payment is for each input. In recent years a number of road authorities (e.g. Main Roads, Queensland, Australia) have developed specifications that move further across the value chain and only specify the desired outcomes and required Levels of Service’ [Porter, 2001, p.6]. In the Netherlands, the first concrete notion of change originates from 2003, when the parliament of The Netherlands released the ‘Programma Andere Overheid’ (English: Program Different Government). It prescribes a control-mechanism based on the ‘market unless’ principle [I&M, 2005, p.1]. RWS currently stands by this principle. [RWS, Jun-2008, p.7]. It has huge impact on the way principal and contractor (inter)act. In accordance with the change of vision, RWS developed
the performance-contract. In The Netherlands, two types of routine road maintenance contracts currently exist: the RAW (*rationalization and automation in construction*) contract and the performance-contract. The RAW contracts are best characterized as ‘work activity’ type of contracts, while the performance-contract is a ‘key success factors’ type of contract.

With the RAW-contract, the principal-contractor relationship is one of high hierarchy: the contract describes in detail how the works are to be performed and RWS holds a position of high control. Typical for the RAW contract was the constant battle about supplemental work between principal and contractor. Not being in line with the vision, in road maintenance the change was made to the performance-contract [RWS, Feb-14-2006, p.54]. With this contract, the government dissociates oneself from designing the works to be done: ‘it defines scope and general demands for the project, thereby creating a solution space. The contractor is responsible for controlling the quality of the product’ [RWS, Feb-2007, p.2-4].

Figure 2 shows the new set-up. RWS as principal monitors and safeguards the performance of the Network, being: quality of the assets and coherence between the assets, network and surroundings. In order to control the quality of the assets, performance is specified in a contract, using demands and specifications. The contractor is responsible for monitoring and safeguarding defined performance and to do so is provided freedom in planning, design and execution of the works. This will instigate the market to provide innovative and affordable solutions and to increase efficiency [RWS, Jun-2008, p.8]; the basic of the ‘Market Unless...’ principle. To provide freedom, the way demands and quality are defined in the contracts is to change from being specific and technical (RAW) to general and functional (performance-contract).

The shift of responsibility and attitude seems to be quite a change for an industry usually regarded as being conservative and inflexible. Therefore, while being in a process of change, it is of interest to evaluate to what extend the theory behind this change and the strategy for implementing it works out as intended. This intent is underlined by one of the main goals of RWS: ‘to ensure efficiency and effectiveness in current practices’ [RWS, Nov-2008, p.11], showing how evaluation of current practice is required.

2.2 Problem Description

‘In the construction industry, function and circumstances of built services change faster that the building itself. This is in full contrast to current practice, which is based on a static approach to performance.’ [De Ridder and Vrijhoef, 2005, p.2]

Figure 3 shows the relationship; both the network and its assets should suffice to the performance standards. The network, its assets and performance all change over time. Should the network not suffice
to the level of performance, intervention (maintenance, in other words) is required. Innovation is a change of intervention, further defined in paragraph 2.2.2. Figure 4 shows how innovation can improve performance through improving the product, process or resources. Keeping in mind that performance is related to both the network as well as the assets it is composed of, innovation can relate to both.

As became apparent in the previous paragraph, the contractor is to increase efficiency by developing innovative and affordable solutions. ‘The contractor is, within the set demands, allowed to submit improvement-propositions in order to efficiently improve the (maintenance) functionality of the product’ [RWS, Feb-23-2010, p.6].

If the contractor is to be stimulated to innovate, insight in and understanding of what drives a contractor in (or refrains from) developing innovations, together with the extent to which they are currently made use of is required.

2.2.1 Problem Definition

Taking the above into account, the problem definition for this research therefore is as follows:

The change of maintenance contract, combined with the desire and need for contractor-led innovations, requires insight in the way innovation is facilitated, stimulated and made use of.

2.2.2 Innovation Defined

No general definition of the concept of innovation exists. Therefore, a definition applicable to this research is here drawn up. Different interpretations of innovation currently exist:

“Innovation is the process through which firms seek to acquire and build upon their distinctive technological competence, understood as the set of resources a firm possesses and the way in which these are transformed by innovative capabilities” [Dodgson, M. & Bessant, J.R., 1996, p.38].

“Innovation means the application of new knowledge to industry, and includes new products, new processes, and social and organizational change” [Firth, L. & Mellor, D., 1999, p.1].

“Technological product innovation is the implementation/commercialization of a product with improved characteristics such as to deliver objectively new or improved services to the customer. A technological process innovation is the implementation/adoption of new and or significantly improved production or delivery methods. It may involve changes in equipment, human resources, working methods or a combination of these” [OECD/Eurostat, 1997, p.9].

The similarity between these definitions is that something new is created, a product or a process, then put to use [Tidd et al., 2001, p.28]. However, the definitions do not state that it has to be new for everyone; it suffices to be new for the organization or process adopting it. Innovation is basically change; either it is change in the things delivered (product innovations) or change in the way they are produced or delivered (process innovations) [Tidd et al., 2001, p.28].
It becomes clear that innovation can improve the input/output ratio, but it could also change quality of the output. Efficiency being the ratio of input to the output of any system [wordnet.princeton.edu], whereby efficiency can be improved by increasing amount of output (product of maintenance) or decreasing amount of input (costs of maintenance). Effectiveness, on the other hand, is the measure of being successful in producing a desired or intended result [oxforddictionaries.com]. Or, if actual output meets desired output. It is to be increased by improving the quality of output (product of maintenance).

Holding the preceding against the research problem defined and ensuring a sufficiently wide scope, the following definition of improvement is used in this report:

*An innovation is a change to the product, process or resources, new to the project and intended to improve efficiency of maintenance or effectiveness of product*

The relation shown in figure 5, coherence exists with definitions used by TMR and RWS: ‘to deliver and maintain the road network in an efficient manner, Main Roads must continually introduce new processes, products, materials or combinations of these in a way not previously used’ [TMR, 2010¹, p.1], and ‘innovation is understood to be employing a renewal or improvement of a product, service process or system’ [RWS, 2008, p.11].

The process is understood to be the maintenance process, performed by the contractor. Innovations regarding the product concern the physical product or its components. Resource related innovation either regards maintenance materials or equipment used.

### 2.3 Stepping-Stones

To tackle the research problem stated, use is made of two stepping-stones: the Living Building Concept and Queensland experience. The why and how of doing so are here explained.

**The Living Building Concept**

The LBC foresaw and played a part in the instigation of the shift from traditional demand-based and one-off project development, towards market-based product innovation, which is still taking place [De Ridder, Okt-2006, p.17]. Taking departure from the idea that the environment, society and technology are in a constant motion, the LBC states that ‘constant adaption to this motion is required. Therefore, more innovations are to be introduced, aimed on added value for the user and society’ [De Ridder, Okt-2007, p.1]. The LBC reverses the current chain in the construction industry from being top-down responsive to bottom-up proactive [De Ridder, Okt-2006, p.17]. That is, the contractor designs and creates its own offer and tries to realize profit and continuity by innovating, while the
principal selects the desired solution. The LBC describes the consequences of this relational change. The compatibility to the problem description is obvious and the main motive for using the LBC as stepping stone.

The LBC is designed to serve as a guideline for the construction sector in bringing about a desired situation and to prime the related processes [De Ridder, Okt-2006, p.18], setting apart a framework of conceptual views for doing so. Its concepts desire elaboration and possibly additional research [De Ridder, Okt-2006, p.19], thereby elucidating how the LBC does not strive to deliver a fixed solution but rather is a 'living building concept' in itself.

The LBC is originally set up for construction project but its validity for maintenance has been proven by the Hansweert-Krammersluizen research. Even though regarding wet-infrastructure, it states that 'the Living Building Concept is developed into a practical applicable framework and growth model for RWS' [PSIBouw, Jan-2009, p.75].

From its concepts and guidelines, a framework and research criteria are drawn up, used to analyze, assess and compare Dutch and Queensland current practice. The LBC not being definite, reflection upon the theory is performed during the synthetic phase of this research.

Queensland Experience

Australia started its first Road Maintenance Performance Contract in 1995 [Frost, M. & Lithgow, C., Dec-17-1996, p.2]. This twelve-year experience is valuable, especially with The Netherlands currently implementing the performance-contract. The most significant potential benefit of a performance-contract is increased value for money [Austroads, 2003, p.325]. Albeit a logical approach, it underlines the coherence between both countries’ line-of-approach. Queensland, one of the states of Australia, developed this principle ten years ago already, going out from the idea that 'price is not the sole indicator of value' [QPW, July-2000, p.3]. The similarity to Dutch current practice is obvious.

With the instigation of the Dutch performance-contract, a change of attitude towards an explicit cooperation between principal and contractor is of the essence [RWS, Sept-21-2009, p.4], whereby insight into the relational aspects is required. Research shows that partnering is used extensively on road projects in Australia [Manley, 2002, p.17]. On top of that, a preview into the current Queensland performance-contract showed great signs of close cooperation principal and contractor, while maintaining a clear distinction between roles. This led to the assumption that ideas for stimulating a contractor without restricting the freedom of design, are expected to be found. The current vision of the Department of Transport and Main Roads (TMR) the Queensland equivalent of RWS, validates: one of its main objectives is to 'pursue enhanced leadership and stakeholder relationships and the improvement of transport outcomes for Queensland. In order to do so, partnerships, alliances, networks and knowledge-sharing with government, industry and the community are to be realized'. [TMR, May-2010, p.12] Not only does this show the importance of working together with parties: it is closely related to improvement, which is, by definition, closely related to innovation. Knowledge-sharing being a sub-goal designed to safeguard this improvement seems to oppose Dutch current practice, which should benefit the usability of the comparison.
2.4 Research Goal

Taking the previous paragraphs into account, the goal of this research becomes:

To create insight into the current possibilities for facilitating, stimulating and making use of innovation during the road maintenance performance-contract period, by comparing Dutch and Queensland current practice, using the Living Building Concept as theoretical framework.

Herewith, the external goal is to produce insight into the current situation. This knowledge can then be used to improve, assess or further evaluate current practice. The internal goal (with which the external goal is to be reached) is to compare both current practices using the LBC. Thereby, the research is categorized as being practice-based qualitative research.

2.5 Research Scope

Subject of research is the performance-contract, used for the procurement of Routine Maintenance of main roads. The research focuses on the extent to which innovations are stimulated, facilitated and implemented within these contracts. In doing so, the contracts are analysed in exploration for interfaces with innovation, which in turn are studied in depth. Accordingly, the scope is aimed towards innovation taking place during the contract time span. Likewise and by the definition of innovation drawn up, the research is limited to innovations that improve the efficiency of the network or the maintenance thereof. Thereby, optimizations of organizational and business related processes that do not have a first order effect on innovation as defined are not part of the research scope.

Also, two physical borders bound the scope, being those of the country of Holland and the state of Queensland. Whereas global research performed on innovation and performance-contracts is taken into account, practical matters are limited to the two geographical areas.

With the principal having commissioned this research, the emphasis is on exploring opportunities for actions to be taken by the principal. The LBC, being used to examine current practice, is held against the light of applicability for innovation in road maintenance as well.

2.6 Research Questions

Following from the context of the research and the objective, the following questions need to be answered in order to accomplish the research goal.

1 What is current practice in road maintenance in both The Netherlands and Queensland?
   i. Which parties are involved and what are their goals?
   ii. Which works are performed under the performance-contracts?
   iii. Which differences between both societies should be taken into account?

2 How can the conceptual views of the LBC provide guidance in stimulating and facilitating and making use of innovations in road maintenance?
   i. What is the vision of LBC with regard to innovations?
   ii. How do its conceptual views describe innovation in road maintenance?
iii. Which criteria to assess the facilitation, stimulating and making use of innovations can be deduced from these conceptual views?

3 What is current practice on innovations in The Netherlands and Queensland?
   i. What are the principals’ visions for making use of innovations during the contract period in both countries?
   ii. How does this translate into the contracts and current practices?
   iii. Do current practices reflect the principals’ strategy?

4 How can the LBC, Dutch and Queensland approaches learn from each other?
   i. What are the strengths and weaknesses of the three approaches?
   ii. How can these approaches best complement each other?

5 Which recommendations can be made and which conclusions can be drawn?
   i. Which conclusions can be drawn from the research?
   ii. Which recommendation can be put forward?

2.7 Research Strategy

2.7.1 Research Model

Below, the set-up of the research is visualized in figure 6 and explained per research phase.

![Research Model Diagram]

**Theory**
By definition, the strategy of an organization determines how goals are pursued. Therefore, the strategies envisioned by the LBC, RWS and TMR for making use of innovations during the contract period are leading in this research. First, the conceptual views and strategies of the LBC are used to form a framework of practical matters that are subject to this research.

**Current practice**
Current practice is assessed using the framework drawn up. In order to do so, the contract documents are investigated. In both societies, three cases in which the performance-contract is currently applied are researched. This will provide insight into practical implications of these documents. Interviews held with those involved form the basis herein.

**Analysis**
The analysis of Dutch and Queensland current practice is a qualitative one. On the basis of the framework, current practice is analysed. All information deduced from the contracts and interviews is categorized and neatly arranged, whereby found (dis)similarities are leading.

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Goals and visions are compared to current practices in order to assess whether strategies work out as intended. Next, Dutch and Queensland practice are compared and analysed using the LBC criteria, resulting in the determination of problem and success areas. Conclusions will be drawn up, together with recommendations for the future.

2.7.2 Strategy

For this research, an exploratory approach is taken on. Exploratory research is a type of research conducted for a problem that has not been clearly defined, whereby the subject of study is done justice and left intact by taking up an open approach from within, interpreting with eye for context [Denzin, Norman & Lincoln, 2005, p.3]. With research on the subject still being in its infancy, exploratory research is used here to provide insight into the ins and outs and to draw up preliminary conclusions. The nature of the phenomena, the way the subject manifests its quality and the different viewpoints one can attend towards the subject are explored. An adaptive and dynamic attitude is taken up. ‘With exploratory research other characteristics are excluded, especially magnitude and frequency of the phenomena. Regarding the latter, quantitative research is more suited.’ [Philipsen & Vernooij-Dassen, 2004]. Thus, here a qualitative approach best suits the research goal. Preliminary conclusions drawn up in this research are could best be verified making use of quantitative research.

A phenomenological standpoint is taken up: during the research new insights will be gained. Therefore, a continuous reassessment of research goal, questions and strategy is requisite.

2.7.3 Research Locations

The research is executed at two different locations, being The Netherlands and Queensland, Australia. In The Netherlands, at Rijkswaterstaat, Dutch current practice is assessed. Contract documents, stakeholder interpretation and interests, together with the practical effects thereof are assessed.

The research is then continued in Queensland, at the Department of Transport and Main Roads in Brisbane. At TMR, the same aspects of current practice are studies and analysed.

2.7.4 Materials

The material needed to answer the research questions are listed below:

- Literature on performance measurement, contracting and cooperation.
- Literature on the Living Building Concept.
- Dutch and Queensland performance-contracts and contract management guidelines.
- Interviews with principal' and contractor’ project managers and experts.

The required literature is available through databases, libraries, coursework and lecturers, supervisors and PhDs at the TU-Delft, QUT, RWS and the TMR.

2.8 Reliability and Validity

When reading a scientific report, one needs to know if the results are trustworthy. In other words: is the research objective and does it provide a true-to-life view of the aspect researched? This does not imply that all research is to be performed objectively. With qualitative research, personal qualities as observing, communicating and interpreting are not
shut down but rather put to use with a certain aim. Striving for objectivity in qualitative research is striving to do the subject of research justice: to let the subject of research be heard while preventing a biased picture of the subject to be drawn [Maso & Smaling, 1998, p.2]. This paragraph explains the consistency of the research (reliability) and to what extent it is comparable to current practices (validity).

### 2.8.1 Reliability

Reliability is the absence of accidental misrepresentations [Maso & Smaling, p.2], to be safeguarded by a reliable execution of the research.

**Internal reliability**

The contract and accompanying control documents form the basis for the comparison made in this research. A factual document, no personal interpretations are made. Also, vision and goals are drawn up on the basis of the latest official statements made by both governments. The comparison is completed by the interviews. No use is made of software to give a code to the interviews. Case specific interpretation is done on the basis of information provided by both contractor and principal. When in doubt on correctness of information, or in the case of ambiguity on a certain subject interviewees were contacted a second time in a quest for conformation or clarification. To diminish interpretations being faulty, counterexamples of drawn up theories were explicitly sought for.

**External reliability**

All primary research material is made available. The Queensland performance-contracts are publicly available, as are the contract control documents of both TMR and RWS. Vision documents can be found on the websites of both governments. Not publicly available are the (case specific) Dutch performance-contract documents. The interviews are summarized and enclosed in appendix E, by which insight into questions and answers is provided. Hereby, possibilities for replication of the research are maximized.

### 2.8.2 Validity

Validity is the absence of systematic misrepresentations [Maso & Smaling, p.2], which are diminished by a reliable set-up of the research.

**Internal validity**

In both societies three cases are researched. Per case, both contractor and principal are interviewed and where possible multiple persons per party are contacted. That way, both parties are represented. Those interviewed all are key figures of the project.

The line of approach taken on in this research is to explore the current situation by letting those involved freely talk about their experiences; the questions asked in the interviews are open of nature. When summarized, the interviewees reviewed the interviews to reduce interpretation errors. Key-employees of RWS and TMR checked the goals and visions stated.

The cases researched all are currently underway. Thereby, parties might be retained in their expression of discontents as this could hamper their relationship. On the other hand, those involved are in the middle of the action and therefore have a clear view of the ins and outs. Reflecting on projects completed can be coloured by memory.
External validity

In The Netherlands, the three cases researched are currently the only cases making use of the Dutch performance-contract, whereby a total overview of the current situation is gained. This increases external validity. In Queensland, many more performance-contracts are active. However, the only two Open Competition contracts are active in Queensland, (which best resemble the Dutch set-up), is limited to two. Time and distances prevented the other Open Competition contract from being included in the research. However, the other contract is governed by the same contractor, which supports the validity of this research.

Another important aspect that should be noted is that Sole Invitee contractors are public authorities, which have a limit profit motive. With a private contractors’ core value being to make profit, incentives differ. The reader should take this into account when assessing validity of results.

Furthermore, each contractor is different, as are the parties acting as principal. As not all contractors and districts/regions are represented, one should be careful in generalizing attitudes reflected in this research.

In Australia, vision, strategy and regulations are set per state individually. Therefore, Queensland practice cannot be generalized and transposed on Australian practice in general without further research into interstate differences and similarities. Also, the inter-applicability of Queensland and Dutch practice is bounded to limitations; aspects of influence on the comparison are noted down in paragraph 3.4.

2.9 Reading Guide

With the 1st chapter providing an introduction and the 2nd laying down the preparatory and organizational aspects of the research, chapter 3 is the first chapter to structurally set apart the content of current practice in road maintenance in both societies. An outline of magnitude and set-up of road maintenance is provided, succeeded by a stakeholder analysis. Generalities of the contracts are discussed and the chapter concludes with stating the essential differences and similarities for comparison.

In chapter 4 the LBC theory used is explained.. A shortlist of the ground rules of the LBC is noted down, from which a research framework and criteria are distilled in the last paragraph. Chapter 5 and 6 together form the empirical part of the report. Chapter 5 provides an overview of the Dutch current situation, commencing with principal’ vision and goals. Next, an overview of contractual and formal arrangements is provided for. Complementing, current practice is described. Using the framework for describing both, the reader gains insight into the level of coherence and consistency between formal and practical arrangements.

Chapter 6 describes the Queensland solution and stands by the same set-up used in chapter 5 to maximize overview. The reader is stimulated to make a first comparison for oneself.

In chapter 7 current practices are reflected upon. First, Dutch vision, contract and current practice are compared. This brings to light strengths, weaknesses and (in)consistencies. Logically, this is succeeded by a similar reflection of Queensland current practice. With strengths and weaknesses from both current practices are then compared to each other on the basis of the criteria deduced from theory. Finalizing the chapter is a reflection upon both theory and current practices.

In chapter 8, conclusions and recommendations noted down.
3 Road Maintenance in The Netherlands and Queensland

In this chapter, general context of road maintenance in The Netherlands and Queensland is discussed. Practicalities of road maintenance works are explained and stakeholders are analyzed. By addressing the similarities and differences, a bird’s-eye view of current practice in both countries is provided.

Paragraph 3.1 provides an overview on facts and figures with regard to Road Maintenance. Succeeding is a description of the actors involved in 3.2, followed by a description of the generalities of the performance-contract whereby both contracts are discussed in 3.3. Paragraph 3.4 concludes the chapter, describing the differences between both societies to be taken into account when interpreting the findings of this research.

3.1 Facts & Figures

The Netherlands

In The Netherlands, the Ministry of Infrastructure and Environment is responsible for policy on the subject. RWS is the executing organization of the ministry and responsible for the stewardship over most highways and a number of motorways [www.rijkswaterstaat.nl]. In The Netherlands, next to several other national offices, 10 regional offices of RWS exist. Within the regional offices, one or more road districts can exist, adding up 20 in total. The total length of roads comes down to 137.347 km, of which 5.109 is state controlled [cbs.nl]. RWS in 2010 will spend € 973 million on Routine Maintenance [I&M, Sept-2009, table 5.1]; a total of € 190.518 per kilometre.

Queensland, Australia

The commonwealth of Australia is a federal constitutional monarchy under a parliamentary democracy, consisting of seven states. Each Australian state and territory has its own Parliament. While regulations, strategies and contracts are fairly similar throughout Australia, interstate differences in set-up, contract content and contract period exist [Ranatunga, D.N., (i) Jul-27-2010]. Queensland consists of 12 different regions. Per region, one or more regional offices can exist, adding up to a total of 73. It is these regional offices that manage the contracts, of which in total 79 exist. A map of this division can be found in appendix A.

In Queensland 180.500 km of public road network exists, of which 33.337 km is state controlled. The Department of Transport and Main Roads (DTRM) is responsible for the planning, management and deliverance of Queensland transport environment [tmr.qld.gov.au]. The TMR program budget for 2010 was 3.655 million AUS dollars, of which Routine Maintenance takes on 27%, the largest percentage and coming down to 986 million AUS dollars [TMR, Sept-8-2010, p.17]. With a state controlled network of 33.337 km, 29.602 AUS dollars is spent per kilometre. With an average Euro versus AUS Dollar exchange rate of 1,442 over 2010 [ecb.int], this comes down to 20.528 Euro per kilometre.

It shows how in The Netherlands over 9 times as much is spent on maintenance per kilometre. An interesting figure, albeit it should be taken into account that intention of use is greater in The Netherlands, with ‘a population of 16.6 million on 33.758 km²’ [cbs.nl1] versus 4.5 million [abs.gov.au] on 1.733.800 km² [abs.gov.au1]. An average of 2.6 inhabitants/km² in Queensland

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versus 491.7 inhabitants/km² in The Netherlands: 189 times as many. As a result, the average number of lanes is higher in The Netherlands. Also, one might bring up for discussion the difference in quality of the roads in both countries, making it difficult to put the figure in the proper perspective. Still, the difference is significant. Table 1 below provides an overview of the facts and figures.

<table>
<thead>
<tr>
<th></th>
<th>The Netherlands</th>
<th>Queensland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total length of network</td>
<td>137.347 km</td>
<td>180.500 km</td>
</tr>
<tr>
<td>Owned by RWS/TMR</td>
<td>5.109 km</td>
<td>33.337 km</td>
</tr>
<tr>
<td>Euros spend in total</td>
<td>973 million</td>
<td>684 million</td>
</tr>
<tr>
<td>Euros spend per kilometre</td>
<td>190.518</td>
<td>20.528</td>
</tr>
</tbody>
</table>

Table 1 - Facts & Figures

3.2 Actors

3.2.1 Multiple Actors on the Scene

Here, the involved actors are discussed. An actor is defined as any person or organization that can be positively or negatively impacted by or cause an impact on the project.

3.2.2 Stakeholder Analysis

Attention to stakeholders is important throughout the strategic management process because ‘success’ for public organizations – and certainly survival – depends on satisfying key stakeholders according to their definition of what is valuable [Bryson, 1995, p.2].

In appendix B, a stakeholder analysis can be found explaining the impact of their interests and the impact of actions on their interest. The stakeholder analysis is performed through the eyes of the principal. It shows how the contractor and the ministry are main stakeholders. The principal being the executory organ of the ministry justifies the choice to solely discuss the relation with the contractor. This is not to say the relation between principal and other stakeholders is insignificant. Focus here is on the crucial stakeholders.

3.3 Performance-contracts

3.3.1 What’s in a Name?

As explained in chapter two, the Dutch contract is named the Dutch performance-contract and the Queensland state of Australia has named its contract the Road Maintenance Performance Contract. In this report, the performance-contracts are simply referred to as ‘contract’. The Queensland contract is divided into two types of contract: Sole Invitee and Open Competition. These contracts are to be considered similar unless stated otherwise and the term contract refers to both types of contract.

3.3.2 The Works

It is of interest to understand which activities are performed under the different contracts. Here, a description of the works is provided.
The Netherlands

In the Netherlands, the works performed under the performance-contract are described as fixed and small variable maintenance. With the Dutch contract, the works are divided into Tasks, Services and Activities:

Tasks exist of fixed and routine maintenance works, of which nature and planning for the largest part can be determined in advance. The contractor is to determine at its own discretion which tasks are to be performed in order to suffice to the minimum set quality level’ [RWS, Feb-18-2010, p.11].

Services concern process related and supporting services that are not directly related to the maintenance, but concern relieving the workload of RWS [RWS, Feb-18-2010, p.12]. Arranging, monitoring and the upkeep of data concerning the product, together with taking care of calamities are the most important aspects laid down under Services [RWS, Feb-18-2010\textsuperscript{1}, p.20].

Activities concern object or route related, non-routine actions necessary to correct recorded shortcomings to the desired quality level [RWS, Feb-18-2010, p.13]. Four different kinds of activities are distinguished: *prescribed activities, reimbursable activities, to be specified activities* and *Improvement Propositions*. *Prescribed activities* are not cyclical and therefore cannot be paid for at regular intervals, but carry such little risk that they are considered routine maintenance. These tasks are defined at the start of the contract and are therefore incorporated in the tender price [RWS, Feb-18-2010, p.13]. *Reimbursable activities* are related to activities for which, due to the unpredictability of decay in the future, uncertainty on necessity of execution exist. *To be specified activities* are not yet defined [RWS, Feb-18-2010, p.13], as is their remuneration. It is up to the principal to demand from the contractor to specify, price and perform the activity [RWS, Feb-18-2010\textsuperscript{1}, p.25]. *Improvement propositions* are those activities that are executed on the basis of improvement-propositions proposed by the contractor during the contract time span [RWS, Feb-18-2010, p.13]. The goal of these investment propositions should be to improve the (maintenance) functionality of (objects and systems, being part of) the total of highway infrastructure [RWS, Feb-23-2010, p.6].

Queensland

The Queensland performance-contract predominantly is an arrangement for carrying out routine maintenance to the network [TMR, Jul-12-2010, p.20]. With the Queensland contract the works are executed when defects reach a predetermined intervention level. Response times set the time within to address the defect while activity standards prescribe how to address the defect.

Discretionary Changes

A major aspect of the contract administration revolves about discretionary changes: changes made to the quantity of an activity or network schedules to reflect the needs of the product [TMR, Jul-12-2010, p.28]. Thus, where necessary, adaptations may be made to the planning of the activities and the budget can be reallocated accordingly. But, ‘changing the quantity of activities is bounded to a certain percentage, set by the principal. Also, the network schedule totals are not to be exceeded’ [TMR, Jun-12-2010, p16]. When no scope for discretionary changes remains in order to satisfy the intervention levels or response rimes within this percentage, the contractor must give notice to the principal’ [TMR, Jun-12-2010, p.82].
A distinction must be made between adaptations resulting from discretionary changes and innovations. Discretionary changes influence quantities of activities, intervention levels or response times in order to adapt to various influences during the contract period. No changes are made to the methods, materials or the product. Where discretionary changes are limited to altering quantities, innovation relates to alteration of the product, process or resources.

**Remarks**

It should be clear that, although both countries apply different names, the works performed under the contracts are similar. Deducted from both contracts, the works are defined here as ‘the between principal and contractor agreed design and execution activities, set by the contract and to be performed by the contractor’. Examples are pothole patching, inspecting the product, sealing cracks, cleaning of guidance rail and waterways and replacing light bulbs. It should be noted that ‘large maintenance’, (named ‘rehabilitation work’ in Queensland) is not part of the contract scopes. Such activities comprise the construction of new roads, large-scale reconstructions or renovations. With such works, higher costs and risks are involved.

### 3.3.3 The Dutch Performance-contract

**Roles & Responsibilities**

**Rijkswaterstaat**

The role of the principal is to ‘determine the performance demands (with which the contractor is to comply), so that a desired result can be reached’ [RWS, Jun-24-2009, p.3]. The principals’ role is to shift from director to supervisor.

Within the districts, project teams control the contract using System Directed Contract Governing (SCB). An overview of the organizational structure of RWS can be found in appendix C. With SCB, control is risk based [RWS, Jun-24-2009, p.4]. ‘On the basis of the contractors’ quality-system and resulting registrations, a check-document (Dutch: Toetsplan) is set-up. This document is continuously updated during the contract period, letting changing circumstances and risks, new insights or shortcomings play a leading role.’ [RWS, Feb-2007, p.14] Three kinds of checks are performed: system, process and product checks, but the focus is on system and process checks [RWS, Feb-2007, p.17]. The idea being that a good process will result in a good product, it should benefit RWS’ strategy of taking a step backwards. RWS remains in a position of control, with remuneration being dependent on the checks performed. Another option for control is by being the party to determine contract extension, dependent on performance measurement [RWS, Feb-23-2010, p.14]. Still, a set procedure for determining performance measurement is yet to be developed.

**Contractor**

The way the contractor manages the project is to a certain extent regulated by the contract, as it is required of the contractor to have obtained a quality certificate on the basis of the ISO 9001:2008 norms [RWS, Feb-18-2010, p.38]. These requirements lay down demands for the quality-system, which as explained above facilitates the use of SCB and thereby RWS’ strategy for steering from a distance. This system is partly based on the Deming Cycle and used for managing each

![Figure 7 - Deming Cycle](RWS, Feb-2007 p.13)
operational process [RWS, Feb-2007, p.13]. As shown in figure 7, the set-up is to compare measured results to the output desired. In case of discrepancies, actions are to be taken to improve the results. The circle is repetitive and its the goal is to continuously improve the results and safeguards both quality and quality improvement [RWS, Feb-2007, p.13]. Clearly, this is one way (and the only way regulated by the contract) through which innovation can be developed.

Preparation and execution has always been part of the contractors' responsibility. Now, also 'the determination of aberrations, together with the taking of measures where necessary, lies with the contractor' [RWS, Feb-18-2010, p.38]. This implies that inspection of the product, identification, prioritization and planning of the works, together with the preparation and execution of the works are all part of the contractors responsibility. Thus, on top of being responsible for the delivered quality, the contractor is responsible for detecting and anticipating incompliance of the product with the set quality. Thereby, the contractor is encouraged to be pro-active, offering opportunities for developing innovations towards future needs. Still, all works to be performed are to be classified in work packages, which are to be approved of by the principal [RWS, Feb-18-2010, p.9].

Another essential basic is that 'the contractor is responsible unless, instead of if. Multiple reasons for the unless can exists. Most important are that (1) only transferable risks (i.e. risks which the contractor can estimate with fair judgement) can be transmitted to the contractor, (2) not exceeding the determined budget and (3) cohesion with other works’ [RWS, Feb-18-2010, p.7]. Thereby, with the Dutch contract a shift in legal responsibilities is aligned with the shift in the works.

**Set-up**

The Dutch contract, in its current and supposedly final form, exists of two main parts, being the *Basic Agreement* and the *Query Specification*, shown in figure 8 below.

The *Basic Agreement* discusses basic and general contractual arrangements: juridical nature, use of the UAV-GC 2005, contract duration, applicable contract documents and other generalities are stated.

The *Query Specification* exists of three documents and annexes and appendices. The *General Query Specification* describes the set-up and scope of the contract documents.

*The Query Specification: Demands*, states the technical demands that are to be met during the contract period [RWS, Jan-25-2010, p.7]. This is done as much as possible on the basis of functional demands: to define the desired quality of the product rather then detailing what the contractor is to do [RWS, Jun-24-2009, p.18]. Specific demands, named aspect-demands, are related to a specific part and/or location of the product [RWS, Jan-25-2010, p8]. Demands are stated using a top-down structure and systems engineering approach.

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**Query Specification: Process** specifies guidelines and minimum requirements for the different processes. Only when necessary, demands are specified (into detail) [RWS, Jan-25-2010, p.8]. The **Annexes** consist of approximately 15 different documents, differing from performance measurement and assessment plans to guidelines and product data.

**Improvement-propositions as innovation**

From the contract scope, one might get the impression that innovation is possible through other ways as well, with the existence of other variable Activities. But the contractor is only to divert from existing maintenance strategies if an improvement-proposition is accepted by the principal [RWS, Feb-18-2010, p.5] The main differences, demonstrated in paragraph 3.3.2, are that (1) with improvement-propositions the activity itself is not yet recognized and put down in the contract during the allocation of the contract and (2) improvement-propositions are to be proposed by the contractor instead of being appointed by the principal. By definition of this research, these other activities are not recognized as being innovations. Therefore, with the Dutch contract, improvement-propositions are here regarded as the part supporting innovation during the contract period.

**Contract Period**

The standard contract period is three years. ‘This period can be extended twice by a year. The decision on extension of the contract is done on the basis of a performance measurement.’ [RWS, Feb-23-2010, p.7]

### 3.3.4 The Queensland Performance-contract

**Roles & Responsibilities**

**Transport and Main Roads**

TMR is responsible for defining the requirements of the product or services to be delivered [TMR, Apr-3-2009]. In other words, TMR is responsible for specifying quality and performance standards. As explained before, regional offices control the Queensland contract and appoint a project manager to govern the contract. Usually the project manager is responsible for multiple contracts, assisted by several engineers. An overview of the organizational set-up of TMR can be found in appendix C.

According to the contract, ‘the principal fulfills only one role: being owner of the network. In doing so, four responsibilities are recognized: (1) administrating the contract, (2) assessing progress claims and authorizing payment, (3) cooperating with the contractor in its network-stewardship role and (4) assessing the contractors’ performance.’ [TMR, Jul-12-2010, p.11]

Similar to the Dutch contract, ‘the principal may audit the quality-system of the contractor at any time. This is done either by checking coherence between the quality-system and performed procedures, or by independent testing of completed activities’ [TMR, Jul-12-2010¹, p.93]. Together with these checks the principal is to ensure accordance with the conditions stipulated in the contract. Also, in assessing the progress claims, the principal is to seek validation of the payment [TMR, Jul-12-2010¹, p.84]. Thus, as with the Dutch contract, the principal is to check whether payment is justified.

Also similar to the Dutch contract is the principal determining contract extension, dependant on performance-measurement. Opposed to Dutch arrangements, the Queensland contract...
other sector performance

the Department realizes its objective to achieve maximum

contractors are excluded.

Tender procedure is used. This contract is used for

E

- Set

- Volume 1: Sole Invitee
- Volume 2: Open Competition
- Volume 3: Guidelines for Undertaking Routine Maintenance

Either of the first two volumes can be used as basis of the contract. With Sole Invitee, no tender procedure is used. This contract is used for contracting out the works to a local government or a Departmental service delivery unit [TMR, Jul-12-2010\textsuperscript{1}, p.5]. Hereby, private contractors are excluded. Open Competition does make use of a tender procedure. Herewith, the Department realizes its objective to achieve maximum efficiency in the delivery of maintenance services [TMR, Jul-12-2010\textsuperscript{1}, p.7]. By benchmarking these agreements against other sector performance [the Sole Invitee contracts], the Department is assured of obtaining ‘best value’ for its maintenance dollar [TMR, Jul-12-2010, p.5]. So if best (financial) value is achieved with Open Competition, why is Sole Invitee used? The contract states it is ‘to protect the viability of rural communities’ [TMR, Jul-12-2010, p.1]. With a public organization

Contractor

The contractor under the Queensland contract fulfils three roles, all carrying with different responsibilities:

(1) Network-steward: the contractor must act professionally in the Department’s interest. In doing so, the contractor must ensure that: funds are wisely invested and the product is maintained in the best interest of the Department. Concerns are primarily dealt with at contractor level and advice is timely and of high standard, provided where necessary.

(2) Maintenance manager and supervisor: the contractor must plan and manage maintenance efficiently. The contractor is to ensure a systematic approach to maintenance, accuracy of records, adequacy of the quality system and sound financial and contractual management.

(3) Operations contractor: the contractor is responsible for undertaking Maintenance efficiently and in accordance with quality procedures.’ [TMR, Jul-12-2010, p11-12]

Comparable to the Dutch contract, the Queensland contract prescribes that in the basis the contractor carries responsibility. Also in line with the above and similar to the Dutch contract, the contract prescribes the necessity being ISO 9000:2008 certified and thereby use of a quality-system.

All of the above is distinctively set apart in the Queensland contract, making a clear distinction on generic roles and responsibilities. Albeit names differ, it should be clear that the division of roles, and responsibilities is similar to the set-up used with the Dutch contract.

Set-up

The Queensland contract exists of three different volumes.

- Volume 1: Sole Invitee
- Volume 2: Open Competition
- Volume 3: Guidelines for Undertaking Routine Maintenance

does define the performance-measurement. Currently, TMR is in a transition between two procedures. Both can be found in appendix D.

The objective is to provide a basis to assess overall contract performance and establish benchmarks to ensure more efficient practices and systems are adopted [TMR, Jul-12-2010\textsuperscript{II}, p.1]. Thus, it is believed to be a tool with which the contractor can be benchmarked, creating an incentive for the contractor to improve its performance. Ultimately, less than satisfactory reports may lead to contract modification or determination [TMR, Jul-12-2010\textsuperscript{I}, p.29].

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performing the works, local employment can be safeguarded, 'which assists in sustainment of small communities' [Austroad, 2003, p.35].

Some differences exist between Sole Invitee and Open Competition:
- With Sole Invitee, ‘contract negotiations of unit prices shall be on an open book basis’ [TMR, Jul-12-2010, p.7], leaving room for profit margins.
- In order to assure ‘best value’, for Sole Invitee contractors’ productivity targets are set with each contract period [TMR, Jul-12-2010, p.6]. Contract extension is dependent on the achievement of these targets [TMR, Jul-12-2010, p.16].

The purpose of Volume 3: Guidelines for Undertaking Routine Maintenance is to develop the operational procedures by setting guidelines, procedures, requirements and standards for performing and managing the works [TMR, Jul-12-2010\textsuperscript{1}, p.5]. It exists of 222 pages, stating a detailed solution for each defect that could occur, including planning, design and execution.

**Contract Period**

**Sole Invitee**
The Sole Invitee basic contract period is 1 year, with a guaranteed extension period of four years, to be extended each year with another year [TMR, Jul-12-2010, p.17]. Should the contractor perform dissatisfactory, this period is reduced by 1 year [TMR, Jul-12-2010, p.18].

**Open Competition**
The basic contract period of Open Competition is either 1 or 2 years. Contract extension is possible: ‘should the contractor perform satisfactorily, the contract can be extended by a year once or twice’ [TMR, Jun-12-2010\textsuperscript{1}, p.19], resulting in a maximum contract period of 4 years.

3.4 **Considerations for Comparison**

**Payment**
The remuneration of the works differs. With the Dutch contract, a fixed budget is determined, which is paid for lump sum. Thereby, profit is maximized by preserving the predetermined minimum quality for the least cost; a contractor would be stimulated to increase efficiency of both planning and quality/cost ratio of activities.

With the Queensland contract, a fixed budget is determined. Remuneration is on the basis of unit prices. Thereby, maximizing the price/cost ratio of the portfolio of activities increases profit; a contractor would be stimulated to decrease costs of activities. A contractor would not be stimulated in first instance to increase quality, unless price increases equally.

**Climate**

Following the Köppen-system, The Netherlands has a mild, humid oceanic (Köppen-grade Cfb) climate. The average of the coldest month is above -3 degrees Celsius, the average of the warmest month above 10 degrees Celsius but lower then 22 degrees Celsius. Rainfall is spread out evenly across the year and no dry season is present. [vwkweb.nl]. Due to its size, in The Netherlands local differences are relatively small.

Holding on to the Köppen system, in Queensland 15 different climates-grades can be distinguished [bom.gov.au\textsuperscript{1}]. Therefore, it is no surprise that weather averages differ greatly throughout the state. The region of the three cases (Brisbane region) has a humid, subtropical
(Köppen-grade Cfa) climate, characterized by hot and humid summers and cool winters [Geerts & Linacre, 1997, p.379]. The average of the coldest month is, as in The Netherlands, above -3 degrees Celsius but below 18 degrees Celsius. The average of the warmest month is above 22 degrees Celsius, much warmer than The Netherlands.

<table>
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<tr>
<th></th>
<th>The Netherlands</th>
<th>Queensland</th>
<th>Brisbane</th>
</tr>
</thead>
<tbody>
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<td>Average Annual Rainfall</td>
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<td>1141.6 mm</td>
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<td>Local Annual Record</td>
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<td>12461.0 mm</td>
<td>-</td>
</tr>
<tr>
<td>Wetttest Day (24h)</td>
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<td>465.0 mm</td>
</tr>
<tr>
<td>Average annual number of frost days</td>
<td>58</td>
<td>unknown</td>
<td>0</td>
</tr>
<tr>
<td>Hottest &amp; Coldest Mean Temperature</td>
<td>11.7 °C vs. 8.7 °C</td>
<td>28.6 °C vs. 13.3 °C</td>
<td>26.5 °C vs. 16.2 °C</td>
</tr>
<tr>
<td>Hottest &amp; Coldest Temperature Measured</td>
<td>38.6 °C vs. 27.4 °C</td>
<td>49.5 °C vs. -10.6 °C</td>
<td>43.2 vs. -0.1 °C</td>
</tr>
</tbody>
</table>

Table 2 - Weather data The Netherlands, Queensland and Brisbane

Table 2 shows the difference between The Netherlands and Queensland. In The Netherlands, frost days are more frequent, and with ‘frost-rain cycles being especially harmful to asphalt layers’ [VBW, 2005, p.11], maintenance cost resulting from due frost damage will be higher in The Netherlands. In Queensland heat is more intense and in period of drought, water might flow away from under the foundations resulting in subsidence [VBW, 2005, p.15]. Moreover, in Queensland flooding, tornados, earthquakes take place yearly, while in The Netherlands such damage causing aspects hardly take place. With such aspects increasing uncertainty, should repairs thereof be included in a lump-sum contract, prices would rise significantly as the contractor needs to take such uncertainties into account.

Magnitude and Intensity of Loads

In Queensland, the genetic critical mass for a vehicle is 125,2 tons [TMR, Mar-29-2010, p.4]. The maximum load allowed on highways in The Netherlands is 60 tons for special machinery and 50 tons for trailer trucks: not half of what is allowed in Queensland. It should be taken into account that with an increase of loads, in general the numbers of axis will increase as well, whereby loads are spread out more evenly. Still, with maximum load having a great impact on the life span of roads, this difference could have a significant impact.

In The Netherlands, currently in total 10.396.476 vehicles are registered [statline.cbs.nl]. Of these vehicles, 171.059 are trucks. In total, in The Netherlands 650,5 million tons have been transported with these trucks, over in total 7.137,9 million kilometres. In Queensland, the total of vehicles registered in 1999 was 2.242.300 and the number of trucks registered was 85.500 [ABS, 2007, p.4]. In total, 525 million tonnes is transported annually on Queensland roads [TMR, Mar-24-2010, p.1]. With the average truck travelling 93.200 kilometres in 2008 [ABS, 2007, p.4], the total of kilometres over which the load is travelled is estimated at 7987,2 million kilometres.

<table>
<thead>
<tr>
<th></th>
<th>The Netherlands</th>
<th>Queensland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of registered vehicles</td>
<td>10.396.476</td>
<td>2.242.300</td>
</tr>
<tr>
<td>Number of registered trucks</td>
<td>171.059</td>
<td>85.500</td>
</tr>
<tr>
<td>Freight weight transported</td>
<td>650,5 million ton</td>
<td>525 million ton</td>
</tr>
<tr>
<td>Freight kilometres</td>
<td>7137,9 million km</td>
<td>7987,2 million km</td>
</tr>
</tbody>
</table>

Table 3 - Traffic in The Netherlands and Queensland

Table 3 shows how weight transported and the numbers of kilometres over which freight is travelled is similar. But the number of trucks is twice as high in The Netherlands, by which intensity of a single load on average is twice as high in Queensland.

Maarten Lindenbergh
Culture

Australia is publicly known to be an Anglo-Saxon country, while The Netherlands belongs to Rhine-capitalist culture (together with Germany, Switzerland, Austria, Denmark and Sweden). While various books have been written about both cultures, one book in particular compares both in terms of management and organizations. The book is titled *Anglo-Saxons versus Rhine-capitalists*, written by J.J. Brouwer and P. Moerman. The elaboration noted down below is on the basis of this book. Quotations are put between apostrophes.

‘Anglo-Saxon culture is based on contracts. The legal system is based on case-law, whereby no system exists for defining general statements. With lawsuits, judgements are made on the basis of comparable judgements from the past. With codification lacking, legislation is extremely specific by nature.’ Therefore, watertight contracts are required, specifying all different aspects of the collaboration. It shows how the basis of the collaboration is one of mistrust instead of trust. ‘In Roman law, basic principles exist to which individual cases are tested’. Hereby the specific details so common in Anglo-Saxon contracts can be excluded.

‘The Rhine capitalist model is more resilient as for a large part it is left to the employees how set goals are reached. In the Anglo-Saxon model, employees are provided a blueprint of how to behave, specified into the littlest detail. ‘Hereby, much time and energy is spent on looking ahead fruitlessly to a hypothesized truth. Fruitless, as reality is stochastic, dynamic and complex,’ indicating that the Rhineland-culture thereby should be better able to adapt to changing circumstances in the environment.

Geert and Gert Jan Hofstede provide a cross reference to the above elaboration. In their book *Culture and Organizations* Hofstede and Hofstede discuss five key cultural dimensions, used for the analysis laid down below. Again, quotations are put between apostrophes.

‘The cross-cultural research is conducted in 70 countries for more than 30 years’. Both The Netherlands and Australia are represented, whereby data now is specifically attuned.

The book shows how the first dimension ‘power-distance’ is relatively low in both countries (The Netherlands 38, Australia 26, on a scale of 0-104). This implies that in both countries ‘hierarchy is low and organizations are horizontal rather than vertical’.

The second dimension is ‘individualism-collectivism’. Both countries score high (The Netherlands 80 vs. Australia 90 on a scale of 0-91), implying that in both societies ‘one is expected to look after oneself. The contractor-employee relationship is a contract between parties on a labour market and tasks prevail over relationships’.

The third dimension is ‘masculinity-femininity’. The Netherlands score low, Australia scores high (The Netherlands 14 vs. Australia 61 on a scale of 0-110). This indicates that in The Netherlands, ‘conflicts are resolved by compromise and humanization of work takes place by contact and cooperation’. In Australia ‘the strongest wins conflict and humanization of work takes place by the enrichment of job content’.

The fourth dimension is ‘uncertainty avoidance’. The scores of both countries are similar and lie in the middle (The Netherlands 53 vs. Australia 51 on a scale of 0-112). Thereby, ‘desire for strict laws, rules and regulations’ is tempered, but the societies cannot be said to be ‘risk aversive’ either.

The fifth and last dimension is long-term orientation. The Netherlands score medium, Australia scores low (The Netherlands 44 vs. Australia 31 on a scale of 0-118). Thereby, the latter is expected to have ‘a stronger focus on short-term gains rather than long-term with importance being on this years’ profit rather then profits in 10 years time’.

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*Innovation in Road Maintenance*
4 The Living Building Concept

This chapter focuses on the Living Building Concept (LBC), developed by Professor H.A.J. De Ridder. The theory is valued internationally for its innovative ideas for reforming the construction industry. Readers are invited to let themselves be inspired by the conceptual views and the depicted lines of reasoning. They are set down in such a way that a clear framework of essentials for improving innovation is provided, followed by the depiction of assessment criteria.

Paragraph 4.1 explains the vision of the LBC concept. Paragraph 4.2 sets out the basics of the LBC, describing how both parties can have something to gain from innovations. Paragraph 4.3 shows the conceptual views for working towards this vision and in paragraph 4.4, criteria are distilled for assessing Dutch and Queensland current practice.

4.1 Innovate to Adapt, Adapt to Innovate

What is needed for the effective control of constructions is an aggregate and comprehensive model to dynamically and effectively control and adapt demand (principals’ value) and supply (contractors delivery) in an integrated manner through the entire process, and idealistically through the whole life cycle of built facilities [De Ridder & Vrijhoef, 2006, p.1-2]. In paragraph 2.3 it became clear how, as part of the solution, the LBC reverts the entire construction chain of the building industry from being top-down responsive to being bottom-up proactive. In the same paragraph the link to the current shift in RWS strategy was established.

In line with the strategy, the idea behind the LBC is that consumer markets focus on innovation and change, which enables them to swiftly anticipate, adept and play along with changing influences and demands, thereby providing a dynamic atmosphere. Corresponding, the LBC encourages a governing role for the principal, by which control is executed from a distance. A principal possessing technical knowledge should not be necessary anymore; it is up to the contractor to advise the principal on all matters [PSIBouw, 2008, p.8]. The principal currently is no real customer. [PSIBouw, Jan-2009, p.14] In order for the principal to become a real customer, the current creativity, inventiveness and originality that is expanded by the principal, is shifted to the responsibility of the contractor. [De Ridder, Okt-2006, p.17] For a contractor to be able to take on this responsibility, the principal should formulate the demands functionally [De Ridder, Nov-2008, p.8], thereby defining a solution space: a precondition for reversing the construction chain.

With the LBC, a fully dynamic chain is created, putting those that are innovative in direct contact with the end-user [De Ridder, Okt-2006, p.25]. Therefore, a precondition is that functional demands are focused on the end-user. Currently, the end-user is left out of the picture, while the key to a dynamic and innovative construction industry is putting the focus on the end user [De Ridder, Okt-2006, p.2].

The created level of abstract [by formulating a solution space] enables the contractor to come up with fit-to-purpose solutions, using creativity and innovation [PSIBouw, Jun-2009, p.6] A contractor strives to make profit, now and in the future. To be able to offer an efficient product for a good price, the contractor will design and develop its own products and will try to conquer the market by innovating [De Ridder, Okt-2006, p.2]. Contractors will develop R&D facilities, in order to come up with favorable, well-defined and innovative families of products built up of standard components [PSIBouw, 2008, p.11]. Specialization of and
thereby diversity between contractors is the result. With the families of products put out into the market, innovations become applicable throughout the sector. The only thing the principal then needs to do, is pick the favorable solution.

Summarizing, the LBC suggest a change to an adaptive, effective and client focused construction industry. Essential thereby is a principal functionally describing a solution space, tailored to the end-users requirements. This will enable and inspire contractors to create families of products that provide a solution to the specified problem.

4.2 Something to gain

The LBC supports contractor-led innovative solutions, while the principal selects the most optimal solutions available [De Ridder, Okt-2006, p.25]. Innovation should take place in order to increase customer value (effectiveness) or decrease costs (increase efficiency) for the customer [De Ridder, Nov-2008, p.5]. It describes a two-party system of consumers (principal) and producer (contractor). Consumers are provided value (benefit) in exchange for a price, and producers generate value while being paid a certain price (possibility to make profit) [De Ridder, Okt-2006, p.26]. That way, there is something to gain for both parties: benefit for the principal (and thereby the end-user), profit for the contractor. In this paragraph, the concept is further explained.

4.2.1 Value, Costs and Benefit

Let's first take a look at the term value of a construction. Value is defined by the Oxford English Dictionary as ‘the regard that something is held to deserve; the importance, worth, or usefulness of something’. Maintenance is defined by the Oxford English Dictionary as ‘the process as keeping something in good condition’. The word ‘good’ here determines the value of the condition. Thus, by performing extra maintenance attuned to value, the value of a product can be increased.

Increasing value is done at the expense of resources or, in the world of economics, costs. Benefit is the difference between the value created and the costs incorporated in doing so. Thereby, benefit is increased either by decreasing costs or by increasing value. At the same time negative value can exist (e.g. noise pollution), decreasing value. This can be diminished by an increase of costs (e.g. construction sound baffles) [De Ridder, Okt-2006, p.81]. This is visualized in figure 9 below.

Figure 9 shows how all variables are dependent on time. This is exactly why interventions are required: it enables one to increase value or decrease costs during the products life span. These interventions then, together with external changes, influence the costs for maintenance in time. With both value and costs variable over time, benefit is variable over time. In order to understand how value and costs are built up, the LB provides decomposition:
Figure 10 shows how the value of a structure is dependant on technical value, perceived value and functionality. Technical value defines the level of being ‘fit for purpose’ and ‘up to date’. Perceived value is measured by the degree to which the structure is appreciated e.g. in terms of aesthetics, transparency and visual destruction of landscape. Functionality is dependant on the degree to which the structure is serving its purpose. Source: [De Ridder, Okt-2006, p.49]

The figure also shows how costs of a structure are decomposed into building costs, maintenance costs and operational costs. Building costs are related to design, construction, and renovation. Maintenance costs are related to inspections, replacements, repairs and preservation. Operational costs are related to operational management, control and service provision. Source: [De Ridder, Okt-2006, p.53] Obviously, in maintenance contracts the maintenance costs take on the largest part.

### 4.2.2 Increasing Benefit

The dependency of benefit on value and costs is visualized in figure 11. It can be seen that benefit is reflected by tangent $\alpha$. Thus, increasing benefit is equal to increasing $\alpha$.

The product is regarded to have a certain value, as explained in the previous paragraph. At the start of the contact, a price is determined for maintaining this value. With both value and price set to the product, alpha can be determined. Innovation is aimed at increasing value for the principal and end-user and/or lowering the costs for the principal [De Ridder, Nov-2008, p.13]. Driven by continuity, as explained in paragraph 4.1, the contractor will strive for both. The scenarios are shown in figure 12.

The blue dot represents the value of the product and the costs for maintaining the value. Figure 12-(B) shows the first possibility for increasing benefit: by increasing the value of the product. The blue dot takes on a new position in the graph and alpha has increased. With an
increase of value a (small) increase of costs is often inevitable [PSIBouw, Jan-2009, p.15]. Figure 12-(C) shows how a decrease of costs can lead to an increase of benefit. Again, a decrease of costs often leads to a (small) decrease of value of the product. Thus, by innovating, the contractor is to develop solutions that increase benefit through increasing value or decreasing costs. One difficulty is defining value. Adding up the different components of value to calculate total value addition might prove difficult, as dimensions differ. But with value being relative, this can be very well possible [PSIBouw, Jan-2009, p.16]. Still, a set-up for objectively measuring and defining value is not provided for by the LBC. Adding up costs is fairly easy and is done by discounting all costs to one point in time: the point when the decision is made [PSIBouw, Jan-2009, p.16]. With value and costs determined, benefit can be calculated, requisite for determining which offered solutions are preferable.

4.3 Conceptual Views

4.3.1 Solution Space

Currently, mutual distrust between principal and contractor results in overly specified contracts in which no room for innovation is provided [De Ridder, Okt-2006¹, p.2]. This opposes the desired situation, in which freedom is provided to the contractor. As explained in paragraph 4.1, this is done stating functional demands, thereby creating a solution space. This is visualized in figure 13.

The solution space is bounded to limitations. The graph on the right shows the four boundary conditions. The first boundary condition is (1) minimum quality of the product, to be preserved by complying with the functional demands stated in the contract. The more (and more detailed) demands stated, the more freedom inhibited. The second boundary condition is (2) budget, needed for solutions that require an investment. As budget can only be used once, it limits quantity and magnitude of innovations. The third boundary condition is (3) minimum costs. As the search for lowest costs should not be limited, the boundary condition is placed on the Y-axis. The fourth and last boundary condition is (4) regulations: any improvement should be in conformance with general regulations, e.g. safety or environmental.

4.3.2 Interests

**Differences**

The difference between value and costs (or total benefit), is for all involved parties [De Ridder & Vrijhoef, 2007, p.4]. However, principal and contractor both have a different interest: the principal tries to maximize benefit while a contractors core business is making profit. This is where price comes into play,

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¹ De Ridder, Okt-2006: An extensive study on value and cost determination in the construction sector.
composed of costs and profit. Profit is for the account of the contractor [De Ridder, Okt-2006, p.85]. So while a contractor may try to maximize profit, for the principal it is important that the contractors’ profit is limited or somehow controlled, as it diminishes benefit. Figure 14 shows this relation. With both having something to gain, incentives for innovations exist. A joint goal is created: maximizing the difference between value and costs.

4.3.3 Collaboration

With the instigated change, the way parties collaborate is subject to change as well. The LBC prescribes total openness between principal and contractor, which requires cooperating on the basis of trust [PSIBouw, 2009, p.8]. This does not come into existence automatically. At the start of the project, contractor and client are to discuss intensively the demand [De Ridder, Nov-2008, p.15]. Only then parties can stick to their own role during the project, which in its turn should increase trust, as it implies parties acting autonomously. The trick is to come to a joint solution [PSIBouw, 2009], p.3] The joint goal according to the LBC is ‘maximization of difference between value and costs’ [De Ridder, Okt-2006, p.149]. Thus, according to the LBC, first a joint goals and feasible demand are to be established, whereby the end-goal becomes clear. Working towards this end-goal should be on the basis of trust, safeguarded by parties sticking to their own roles. Essential here is openness: to be maximized through extensive communication, especially with regard to the core values and critical demands.

4.3.4 Cluster

As discussed in paragraph 4.1, contractors should propose innovative solutions and the principal should select the most optimal solutions available. It implies the principal having knowledge of availability of innovations. The LBC prescribes steering using aspect-systems: ‘with the whole being larger than the sum of its parts, the preservation of the relation between the parts of the whole plays an important role in dynamically steering the process [PSIBouw, Jun-2009, p.5]. With the whole being the national road network and its parts being the different maintenance contracts, a database of proposed and executed improvements is a perfect example of such a system. It satisfies the implication by opting for registering proposed and executed innovations in a database: innovations as being a part within (a part of) the network. Only then an informed decision can be made.

4.4 Framework and Criteria

4.4.1 Framework

Dutch and Queensland strategies for executing road maintenance are assessed making use of the following framework, deduced from the previous three paragraphs.

Roles and responsibilities

Here, the roles of both the principal and contractor are discussed, together with their responsibilities. What is the best strategy for the principal to best control the contractor? Is the principal controlling from a distance or rather heavily involved in the process? If the principal is taking a step backwards, then how do innovations come about? And is the contractor willing and able to take on the responsibility for improving the quality the product? Are innovations proposed clustered so parties’ knowledge is improved?
Incentives
Here, the different stimuli for contractor-led innovation to take place are discussed. Which incentives to search for and develop innovations can be recognized? And what are the gains for the principal? Can recognized incentives and gains be increased?

Solution versus Solution space
This header groups all aspects that are related to the solution space drawn up by the LBC. The four boundary conditions and their influence on the freedom of the contractor to develop innovations are discussed. Are restrictions recognized by the LBC also recognized in practice? How do these influence innovations? Can boundaries be stretched?

Process
Here, processes for making use of innovations are discussed. What are the regulations for proposing innovations to the principal? On what criteria assesses the principal such an innovation? And, do these arrangements facilitate innovations?

Collaboration
This header groups all relational aspects that exist between principal and contractor. How do parties communicate? What arrangements are made? Is a partnership present, or is hierarchy leading? Which behaviours prevail and how is innovation influenced by the collaboration?

4.4.2 Criteria
The conceptual views are here translated into criteria to which Dutch and Queensland practice should suffice, used in chapter 7 to reflect on current practice.

Innovation should take place
Innovation should take place in order to increase customer value (effectiveness) or decrease costs (increase efficiency) for the customer. Therefore, in order to compare best practice in both countries and to pinpoint possibilities for improvement, first the current level of innovation is assessed through quantifying innovations.

Be informed
The principal is to be an informed buyer and the contractor an informed supplier. The contractor should act autonomously, supported by the provision of a solution space. The principal remains at distance. Responsibilities shift to the contractor who advises the principal on all matters. Thereby, the principal no longer is required to possess technical knowledge. The principal knows the products available and picks the favourable solution.

Both should have something to gain
Both parties should benefit from innovation in order for innovation to take place. The LBC prescribes the contractor should be able to make profit, while the principal is benefits from innovations providing value increase or costs decrease. In the end, both parties should have something to gain.

Parties should collaborate strategically
Parties should collaborate strategically, which implies that joint goals and a feasible demand are established and clear from the beginning. Parties should work on the basis of equality and trust, through sticking to their own roles. Openness is to be maximized through extensive communication, especially with regard to the core values and critical demands.
5 The Netherlands

This chapter is the first section of the empirical part of this report. It provides insight into the current situation in The Netherlands on the level of innovation in road maintenance. The reader is taken on a tour through vision documents, contracts used and finally three cases from practice. Hereby, an overview of Dutch current practice and a first view on interrelations are gained.

In Paragraph 5.1, the visions of both the ministry and RWS' are stated, from which thereupon goals towards innovation are deduced. For the sake of clarity, some of the intentions discussed in chapter 2 are here repeated. In paragraph 5.2, the contract content related to innovation is noted down, followed by the description of the three cases in paragraph 5.3. Paragraph 5.2 and 5.3 are noted down using the framework defined in paragraph 4.4.1.

5.1 Visions & Goals

5.1.1 Visions

Politics

The current Policy Intention 2008-2012 of the ministry states the need for the organization to be a 'more integral, compact, with better quality' [I&M, Jan-1-2008, p.8]. Translated to practice: quality is to be increased while the number of employees is to decrease. The same document states the strategy for doing so: 'RWS takes on the 'market, unless' principle: having faith in market parties and making optimal use of their creativity, while maintaining in control' [I&M, Jan-1-2008, p.8]. This is regarded to be essential, as ‘innovation is of vital importance to keep The Netherlands durable, accessible clean, safe and competitive’ [I&M, Sept-15-2009, p.1]. Thereby, the two goals are connected and the line-of-approach becomes clear: the political creed is to leave more to the market, thereby optimizing their innovative powers. The common ground between the vision and LBC strategy is evident.

At the same time, the ministries’ Director of Innovation states that ‘the different parts of the ministry itself, as well as the market parties should be knowledge based and driven towards innovation [...] which is to be developed in collaboration with the environment, so that in daily practice these can be used optimally” [RWS, 2008, p.5]. It shows how there is a demand for innovations developed by the 'Market', and the presence of 'Unless' on the subject. To be safeguarded by RWS, by using its knowledge as a government organization to develop innovation in cooperation with the market to ensure coherence with public needs.

Rijkswaterstaat

As the executing organization of the ministry, RWS develops and controls the national infrastructural networks, connoting that their visions are to create synergy. The vision of Rijkswaterstaat, ‘to be the trendsetting, publicly aimed en sustainable organization that executes the works for the government’ [RWS, Nov-2008, p.3], displays this connection.

‘To realize this vision, four pillars of change exist: (1) To be a publicly aimed network manager: which reflects public needs. (2) To be a trendsetting client: related to making use of the market. (3) To be a reliable and efficient partner: referring to the way RWS manages its relations. (4) To make people decisive: focuses on further increasing the efficiency of employees.’ [RWS, Nov-2008, p.3]


**Innovation**

Applied to the subject of innovation, being a trendsetting client stands out. RWS currently stands by and carries out the policy intention ‘Market Unless...’ principle [RWS, Jun-2008, p.7]. In doing so, the current focus is on increasing uniformity and efficiency and on further stimulating the market to deliver more creative and smarter products and services [RWS, Jun-2008, p.7]. ‘To do so, contractors are provided freedom in planning, design and execution, which instigates the market to provide innovative and affordable solutions and to increase efficiency [RWS, Jun-2008, p.7]. It (the contract) does so by defining only scope and general demands, thereby creating a solution space.’ [RWS, Nov-1 2008, p.44-45]

Ideally, market parties fully place themselves in the role of RWS and thereby support the publicly aimed network management [RWS, Jun-2008, p.19]. This entails knowledge of the contractor of role, goal and vision of RWS: another alteration to the previous situation.

Referring to the pillar of RWS being a reliable and efficient partner, collaboration is the key for implementing this change [Keijts, B., Jun-2008, p.1]. An important aspect of collaboration is the principle of equality: ‘RWS strives for a fair contract, in which respect for both parties’ interest and a well-balanced division of risks form the point of departure so that parties can determine and collaborate towards mutual interests’ [RWS, Okt-2008, p.20-21]. Putting the former into the light of innovation, no position of hierarchy should be created by RWS in developing or implementing innovation but rather an understanding and recognizing of both’ parties’ interests on the subject should be pursued according to RWS: by working on the basis of trust and by determining joint goals, innovation is to flourish.

The other aspect of being a reliable and efficient partner is clarity, or being transparent [RWS, Jun-2008, p.23]. ‘Being transparent requires processes, rules and procedures to be consistent, streamlined, simplified and centralized where necessary. Essential in this is a faster implementation of improvements where determined: the corporately ending of bad practices and corporate implementation of best practices. [RWS, Jun-2008, p. 24] The latter showing the apparent need of RWS’ current practices to corporately make use of innovations.

**5.1.2 Derived Goals**

From RWS’ vision, three goals towards innovation can be derived:

*Market Unless...*

As explained above, making use of the market is to diminish the amount of effort RWS needs to put in controlling demand and optimizing innovation. This is laid down into three interrelated goals: (1) steering from a distance, so that (2) the contractor is provided freedom, so that (3) market innovation is stimulated and made use of.

*Collaborating*

In being a reliable partner the focus is on collaborating with contractors. This leads to the following goals: (1) create equality and trust between parties, (2) collaborate to determine mutual interests and pursue joint goals and (3) provide unambiguous, and clear information.

*Optimize*

In being an efficient partner, the goal is to (1) centralize and (2) optimize processes, and to (3) ensure consistency in practices, while (4) working towards innovation.
5.2 The Dutch Performance-contract & Innovation

In this paragraph contractual aspects that relate to innovation are laid down, deduced from the contract (control) documents.

5.2.1 Roles and Responsibilities

All in all, the contract refrains from clearly linking responsibilities lying with RWS to innovation. If focuses on stating the responsibilities of a contractor: ‘the contractor is to maintain the product ‘with due diligence’ and to improve the product during the contract period and in doing so is aimed towards the public needs, by which availability and traffic flow are maximized’ [RWS, Feb-18-2010, p.6]. From this one sentence, four points of steering can be derived. (1) The contractor is to maintain the product in the best way possible. (2) The contractor is to improve the quality of the product, thereby formalizing the link to innovation. (3) Innovation is to be geared towards the public needs. (4) Public need is understood to be maximization of availability and traffic flow.

Considering the Market Unless... principle and putting it in relation to innovation, the requested submittal of improvement-propositions stands out in the Dutch contract. The Basic Agreement states that ‘the contractor is, within the set demands, allowed to submit improvement-propositions in order to efficiently improve the (maintenance) functionality of the product [RWS, Feb-23-2010, p.6]. It becomes apparent that improvements can be related to the process as well as the product. The contract further clarifies: ‘the goal of improvement-propositions is to implement qualitative improvements and/or to achieve economic advantage’ [RWS, Feb-18-2010, p.23]. Albeit the abstractness of the latter, from the statement it can be derived that improvement-propositions are to improve quality improvement or reduce costs. It is the role of the principal to assess the improvement-propositions in order to decide whether an improvement-proposition is to be accepted [Götz, M, (i), Aug-18-2010].

Summarizing, quality or cost reductive improvements of the product or the process are required, to be submitted via improvement-propositions by the contractor and assessed by the principal. These should be steered towards the need of the public, being maximizing availability and traffic flow.

5.2.2 Incentives

Making use of improvement-propositions is stimulated by RWS in three ways:

Demand for improvement-propositions by contract

In the basic agreement of the Dutch contract it is stated that a contractor should propose improvement-propositions. Secondly, by being one of the four activities stated improvement-propositions are part of the projects scope. Also, the contract states that the contractor is to maintain the product ‘with due diligence’, thereby indirectly stimulating innovation, with innovation being one of the possibilities to improve.

Making profit

Being remunerated for execution of improvement-propositions, the contractor can make profit doing so through ensuring costs do not exceed price. At the same time, executed improvement-propositions may result in cost savings for the contractor [RWS, Feb-18-2010, p.24]. This is possible when maintenance is optimized.
Continuity
Contract extension allows the contractor to continue performing the works. Already familiar with the works, profit is expected to be highest during this extension. Dependent on performance-measurement, the contractor is stimulated to perform according to criteria stated in the measurement.

5.2.3 Solution or Solution Space
Four boundary conditions exist:
(1) Minimum quality. Technical demands define minimum quality of the product as explained in paragraph 3.3.3. With ‘the contractor only to propose improvement-propositions that meet the requirements stated in the contract’ [RWS, Feb-23-2010, p.4], proposed improvement-propositions are not to decrease the value in such way that these demands are not met. Whereas the goal of RWS is to define the desired quality using only functional demands, the contract states aspect-demands prescribing into detail what the product is to suffice to and process related demands which limit a contractors freedom in executing maintenance.
(2) Budget. ‘In order to refrain the contractor from proposing undesired improvement-propositions, it is important to paint a picture of the principals’ financial possibilities. Therefore, yearly and by negotiation, a budget for improvement-propositions is to be determined.’ [RWS, Jun-24-2010, p.16] As money can only be spent once, this budget limits the volume and magnitude of improvement-propositions the contractor can propose.
(3) Minimum costs. Cost reduction being an improvement, no limit for decreasing costs exists.
(4) Regulations. Many regulations exist with respect to the works. All non-functional demands set by the contract can be considered regulations. Other regulations exceed the project, such as safety policies or environmental regulations.

5.2.4 Process
RWS is to decide whether the pros (i.e. an increase of value, decrease of costs) of an improvement-proposition weigh up against the cons (i.e. decrease of value, increase of costs). This paragraph discusses the process and format for submittal and criteria of assessment.

Process
Only the contract control documents prescribe a process for submittal of an improvement-proposition. In the first stage, improvement-propositions will be global and indicative: ‘only after acceptance of the proposition the contractor works out the improvement-proposition into detail’ [RWS, Jun-24-2009, p.16]. The working out of the improvement-proposition is the second stage. The costs for doing so are remunerated [RWS, Jun-24-2009, p.16]. Whenever the worked out improvement-proposition is accepted by RWS, the realization is laid down in writing and assigned to the contractor by means of a supplementary agreement [RWS, Jun-24-2009, p.14]. The total comes down to the three stages shown in figure 15 below.

Figure 15 - Three stages of improvement-propositions
The blue arrows represent the assessment procedures. The format of assessment performed in the first stage remains unclear. What is defined is that at some stage, ‘the improvement-proposition is handed over to the district, which decides on approval on the basis of district policy and goals’ [RWS, Feb-15-2010, p.26]. No other details are specified.

**Format**

‘Parties together determine the exact format of a worked out improvement-proposition. Still, an improvement-proposition is to contain at least (1) the foundations for the improvement, (2) a Life Cycle Costing (LCC) calculation, (3) advantages for both principal and contractor, (4) the strategy for execution, (5) the maintenance regime and additive maintenance demands, (6) a specified price calculation.’ [RWS, Feb-18-20101, p.25].

**Assessment**

Assessment criteria are specified by the contract: ‘an improvement-proposition can only be accepted if (1) it falls within contract scope, (2) improves product quality or yields financial savings, (3) is to be executed within the contract period and (4) in the eyes of the principal is an appropriate offer [RWS, Feb-18-2010, p.24]. Whenever accepted but deviating from the demands, the constraint is nullified [RWS, Jan-25-2010, p.10]. Thereby, it becomes important to assessing whether changes, to be instigated by the improvement-proposition, are in keeping with the functional demands. Thus, where the functional demands determine quality of the product, an accepted change now influences stated demands. Propositions thereby need to be assessed on possible influences on scope and demands, as shown in figure 16 below.

**Finance**

With regard to the financial assessment of an improvement-proposition, three scenarios can be recognized. These are be explained using figure 17 below.

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Whenever an improvement-proposition (IP) yields future cost savings (CS), this profit is to be used for the initial investment of the improvement-proposition [RWS, Jan-6-2010, p.1]. Thus, capital outlay (CO) is equal to the initial capital outlay (ICO) minus CS. Naturally, if CO is smaller than zero the costs of the improvement-proposition can be recovered during the contract period. It his case the district is to assess the improvement-proposition.

If an investment is required, this is to be paid by the principal, from the budget available for improvement-propositions. An LCC is then required. Approval by DVS is required if either CO is greater than 30.000 Euros, the total of CO exceed 150.000 Euros per annum or if the pay back period (PBP) is greater then seven years [RWS, Jan-6-2010, p.1]. It shows how economic character determines the body authorized to approve an improvement-proposition.

5.2.5 Collaboration

The way parties act towards each other is in many ways an informal aspect. However, this does not necessarily mean that aims and guidelines of collaboration cannot be formalized in a contract. This formalization is here set forth:

The Basic Agreement states that ‘equality between parties should exist’ [RWS, Feb-18-2010, p.6] and that ‘parties are to complement each other in cooperating to accomplish both parties’ set goals’ [RWS, Jun-24-2009, p.5]. Etiquette is thereby made clear: input is on the basis of joint effort while output is the achievement of joint goals, all the while working on the basis of equality but in doing so, parties are to stick to their own responsibilities.

As support to the envisioned etiquette, the Project Start Up (PSU) was called into existence. During the PSU the emphasis is on maximizing mutual trust and on pursuing a joint approach [RWS, Mar-15-2010, p.3-4]. Thereby the PSU and etiquette complement each other. Strikingly, the sub-goals of RWS (equality and trust, mutual interest and joint goals) are only very briefly mentioned in the contract. Not once further made explicit, little formal guidance is provided.

Next to a PSU, once each two months a project meeting and a contract meeting are to be arranged by the principal [RWS, Feb-18-2010¹, p.12]; another possibility to communicate informally the roles, goals and objectives in increasing the quality of the product.

Three times a year monitoring meetings are to be organized by the principal, during which the performance-measurement is discussed. Criteria for this measurement, which should reflect the spirit of contract to indirectly communicate expectations, lack.

5.3 Three Dutch Cases

This paragraph discusses three different cases in which the Dutch performance-contract is used. Unless stated otherwise, information is deduced from the interviews with those involved. Summaries of these interviews can be found in appendix E.

5.3.1 The Zeeland Case

The Zeeland Case was the first case to use the Dutch contract for road maintenance and is to be the precursor for the phase-in of the Dutch contract nationwide. Details are provided in table 4. It was adopted by the PIM project, which had commenced on the 30th of January 2006 in the province of Zeeland [projectpim.nl²]. Thereby, the focus of the contract is on collaboration between principal and contractor [Mencke & Verkade, 10-Dec.-2010, p.2]. To underline this intent, an intention of collaboration was signed by those involved. A copy of
this intention can be found in appendix F. All fixed and (small) variable maintenance is included in the contract, except for electrical equipment.

<table>
<thead>
<tr>
<th>Case</th>
<th>Contractor</th>
<th>Start</th>
<th>Duration</th>
<th>Length of network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zeeland</td>
<td>Private, Heijmans</td>
<td>2007</td>
<td>5+3 Years</td>
<td>176 km</td>
</tr>
</tbody>
</table>

Table 4 - Details of the Zeeland case

*Quantitative Consideration*

In the past two and a half years, the contractor has proposed 51 improvement-propositions. Of these, 24 have been approved of and 6 are currently being assessed. Appendix G shows the focus is on quality improvements that require initial investment.

*Incentives:*

The first incentive for the contractor to propose and execute improvement-propositions is being allowed to make profit from construction thereof. Profit percentages are fixed by agreement. Should execution result in cost savings, these savings are transferred back to RWS. Continuity is an important incentive for the contractor, as during contract extension extra profit can be made (the contractor by then is familiar with the network). Therefore, the contractor actively steers on contract extension, which is currently determined on the basis of a declaration of performance: if no contractual deficiencies exist, contract extension is granted. But it was only after RWS strongly communicated the desire to put the emphasis on innovation that Heijmans’ creativity was boosted. Therefore, the district is currently in search of a performance-measurement tool by which performance is assessed on measurable terms. Finally, market position is recognized as incentive; developing improvement-propositions requires research, resulting in new knowledge, useable in the future for other similar projects.

*Solution versus Solution Space*

In order to enable initial investment, a budget is made available. Extra budget can be provided by DVS for test or pilot projects that are of interest for the entire nation. In terms of value, improvement-propositions can be related to any part of the product or maintenance process. But quality or value is not further defined by the contract documents. The functional demands stated in the contract are strict. The technical or process related demands are more flexible and can be changed.

*Process*

Contrary to current policy, improvement-propositions were at first submitted by Heijmans in their definite form. However, most were rejected for not being in line with district policy and vision. It resulted in the change towards the procedure explained in paragraph 5.2.4 so that in a preliminary phase, feasibility could be discussed. The stage is a general outline of the idea, together with a general planning and estimate of the costs for working and executing the improvement-proposition. The worked out improvement-proposition provides more detail and an extensive calculation. Unit prices are not provided for, but to maximize openness and minimize mistrust insight into profit and risk percentages is. In order to further increase the amount of improvement-propositions executed, Heijmans organized a brainstorm session with RWS. This resulted in 14 to be worked out improvement-propositions. Due to lack of a centralized assessment procedure, the district assesses costs versus benefit using its own in-house developed assessment procedure. Risks are assessed and a
representative sum of money is attached to these risks. Chances of those risks firing are calculated. With transferring the pros and cons into computable risks, quantitative assessment is possible.

At the start of the project most management decisions were made ad hoc as no standard format, procedure and criteria existed. These have been set-up in a later stage, during the contract period, causing vagueness about the concept of improvement-propositions at the start of the project.

No clustering exists beyond district level. The contractor does: a relatively small department centrally keeps track of all improvement-propositions submitted and executed.

**Collaboration**

Both parties are devoted to collaborate and the intention to collaborate is widely recognized. This is partly due to the signing of partnering-agreement by those involved. Nailed up against the wall at both RWS’ and the contractors’ offices, it serves as reminder of the fact that the relation between principal and contractor in this project is very important. Both parties feel that the high level of collaboration in this project led to the fact that when limits are stretched or crossed, issues are more easily solved and diminishes the typical game played between principal and contractor.

Both parties get around the table on a regular basis to discuss future actions: RWS is closely involved in the development of improvement-propositions and is able to steer this process. This is regarded as being convenient by the contractor, as it becomes possible to narrow down improvement-propositions in an early stage. Otherwise, the contractor would be forced to keep a broad focus, resulting in a longer development time.

Not knowing the goals of RWS, the improvement-propositions proposed by the contractor in the beginning of the contract period were not favourable to RWS. Therefore, the district presented its goals and criteria for scoring improvement-propositions. It enabled the contractor to steer. Also, Heijmans could now make clear how in their proposal how these demands and goals were met, thereby simplifying the assessment. After these actions, the amount of improvement-propositions executed increased significantly. Still, the determination of benefit for the principal remains opaque, whereby according to the contractor attunement not yet is optimal.

Attention is paid to the fact that with core values differing, it is impossible for the contractor to fully put oneself in the position of principal. RWS tries to prevent this difference from having a negative influence on improvement-propositions by being involved in the generation thereof. Still, when a submitted or worked out improvement-proposition is refused, it is often not communicated on what terms, which frustrates the contractor, thereby hampering the collaboration (and knowledge of the principals’ goals).

At the start of the cooperation, parties had difficulties letting go of the old situation. RWS employees interfered with Heijmans’ methods of working [Ernst & Young, Jun-2008, p.22], which hampered cooperation. However, the cooperation underwent a growth process. During the contract period, the change towards a relation build on trust has been made, adding to the level in which cooperation takes place. Thereby, it adds to the level in which Heijmans is able to operate in a way that is focused on the end-user. [Ernst & Young, Jun-2008, p.4 & 22].
5.3.2 The Netherlands East Case

The Netherlands East Case is the second Dutch contract for road maintenance being executed in The Netherlands. Details are provided in table 5. The contractor is De Jong BV. The contract was instigated in order to replace multiple RAW contracts executed in three different road districts, being Arnhem Nijmegen, Zwolle & Achterhoek. The scope of the works is similar to the Zeeland case.

<table>
<thead>
<tr>
<th>Case</th>
<th>Contractor</th>
<th>Start</th>
<th>Duration</th>
<th>Length of network</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Netherlands East</td>
<td>Private, De Jong</td>
<td>Aug-9, 2008</td>
<td>3+2 Years</td>
<td>203 km</td>
</tr>
</tbody>
</table>

Table 5 - Details of the The Netherlands East case

Quantitative Consideration

In the first two years, 40 improvement-propositions were proposed, of which 26 have been approved. In total, 10 improvement-propositions have been rejected and 4 are in the process of being assessed. An overview can be found in appendix G, showing that the emphasis in this project is on conservative changes to the product and innovative maintenance techniques rather than on outside-the-box improvements to the product.

Incentives

The contractor is allowed to make fixed profit percentages from executing improvement-propositions. Also, cost savings are for the account of the contractor. As a result, development of improvement-propositions for a large part relies on optimizing the maintenance process. Contrary to current regulation drawing-up of an improvement-proposition is not remunerated separately. The contractor therefore includes these in the costs for execution. Contract extension is recognized as important incentive for the contractor to perform according to set demands. However, no set performance-measurement tool or criteria is used to assess the contractors’ performance. Rather, it is based on general impression and discussed informally during evaluation meetings, held at least once a year.

Solution versus Solution Space

Before allocation of the contract it was made clear three million Euros would be available for the initial investments of improvement-propositions, which increases the solution space provided. With halfway the contract half of the budget being spent, it is used in proportion to contract progress. The option for extra budget being provided by DVS is not recognized in this project. Regarding the other boundary conditions, the The Netherlands East-case is similar to the Zeeland-case.

Process

The principal can request from the contractor the working out of improvement-propositions, thought up by the principal. But, in line with the set-up the contract the strategy is to leave development of improvement-propositions to the contractor as much as possible. As with the Zeeland case, the procedure has changed. First, only two stages existed and much effort was put into working out the improvement-proposition, only to be declined when handed in. This resulted in high costs, and an extra stage was added. Costs are not mentioned in the first submittal, so that parties can talk freely about desired outcomes. The format for handing in improvement-propositions in the second phase follows the latest strategy set by RWS. As with the Zeeland Case, the addition of an LCC calculation is preferred.
The assessment criteria are similar to the procedure described in paragraph 5.2.4. Determination of appropriateness of the offer is dependent on a price comparison between the offer of the contractor and the price estimation executed by RWS. Dependant on type of improvement-proposition, standard percentages for overhead, profit and risks are incorporated. The sum proposed by the contractor should lie within a certain range of the costs estimated by RWS. The contractual assessment criteria were believed to lack detail, whereby a checklist was drawn up to provide clarity on the necessity, scope and qualitative and financial advantages.

The principal does not communicate improvement-propositions beyond district level. Also, by not remunerating the drawing up of an improvement-proposition, intellectual ownership stays with the contractor. This refrains RWS from stocking improvement-propositions beyond the contract period. The contractor does cluster improvement-propositions in a database, whereby those proposed and executed in the past can easily be looked up.

**Collaboration**

Parties have declared to be willing to change, as they understand that the new contract requires a different attitude. But, with old habits still surfacing, collaboration is not yet optimal.

Most important hurdle is communication. Communication of information is absent on two levels: the first information gap is the contractor being unaware of assessment criteria. This results in vagueness and uncertainty on goals and envisioned substance of improvement-propositions. Currently, the contractor becomes aware of what is preferred by RWS from learning on the job. This prevents the contractor from thinking from the principals’ view and developing improvement-propositions aimed towards a clear goal. The second information gap recognized is that the contractor is unaware of the assessment procedure of RWS. These procedures can be lengthy, especially in the case of an extensive improvement-proposition. Should it be communicated to the contractor why this is an extensive procedure, the understanding could resolve the current dissatisfaction. Next to this, the contractor currently remains unaware of what the status of an improvement-proposition until the final decision has been made, resulting in uncertainty.

The intention of cooperating on a high level is present. The principal tries to keep at distance. However, some find it hard to let go of the old situation (of having a hierarchical position over the contractor). It results in wrongful involvement, which inhibits mutual trust.

Also, it is required from the contractor to decompose into detail the financial sum of the improvement-proposition. Still, RWS recalculates the costs of all submitted improvement-propositions. With cost estimates of RWS and contractor sometimes differing, discussions about these differences sometimes result in friction. Again, this hampers mutual trust.

### 5.3.3 The IJsselmeer Area Case

The IJsselmeer Area is the third Dutch contract for road maintenance to executed in The Netherlands. Details are provided in table 6. The contract makes use of the UAV-GC 2005 and is controlled using SCB. All fixed and (small) variable maintenance is included in the contract.

<table>
<thead>
<tr>
<th>Case</th>
<th>Contractor</th>
<th>Start</th>
<th>Duration</th>
<th>Length of network</th>
</tr>
</thead>
<tbody>
<tr>
<td>IJsselmeer</td>
<td>Private, Krinkels</td>
<td>Jan-1, 2010</td>
<td>3+2 Years</td>
<td>176 km</td>
</tr>
</tbody>
</table>

*Table 6 - Details IJsselmeer case*
Quantitative Consideration

Only one improvement-proposition has been proposed so far, which has been declined.

Incentives

The contractor is allowed to make profit from executing improvement-propositions. Profit and risk percentages are fixed by agreement. Whenever cost savings of an improvement-proposition are greater than the initial investment, these savings are for the account of the contractor. Contrary to the contract documents, drawing-up of an improvement-proposition is not remunerated. The contractor charges these costs on in the calculation for execution. Continuity is regarded to be an important incentive. However, a clear performance score is absent, resulting in opaqueness on the subject. Should it be clear to the contractor how performance is measured, it would enable steering towards contract extension.

Solution versus Solution Space

Currently, no budget is available for improvement-propositions whereby no capital investment can be made by RWS. In figure 18 this is visualized by the lack of solutions space on the x-axis. Only improvement-propositions of which the investment is paid back within the contract period can be executed. This leaves only for increasing benefit through cost savings or cost neutral quality improvements. It is recognized that extra budget could become available through DVS. However, this goes only for leading, innovative and valuable improvement-propositions. Other restrictions are as with the Zeeland case, with the addition that the contractor regards safety as a strict regulation: not complying with current safety regulations will results in the denial of an improvement-proposition. According to the contractor, RWS is open to change of the functional or technical regulations as long as scope is maintained.

Process

In line with the Market Unless... principle, RWS refrains from taking the initiative. Innovations ideas could be discussed with the contractor in an informal way, but it remains up to the contractor to decide upon making it an improvement-proposition. Currently, the process consists of two stages. In order to prevent much effort and costs being put in undesirable improvement-propositions and to increase joint benefit, both parties would welcome the addition of an extra stage. In this stage, the principal should be able to steer improvement-propositions: indicate what is value so that the contractor is able to steer. Regarding the format, only those aspects defined in paragraph 5.2.4 are recognized. Contrary to the contract, the format for handing in improvement-propositions is not further defined, resulting in opaqueness. The assessment procedure is similar to the procedure stated in paragraph 5.2.4. Improvement-propositions are to be in line with district vision and policy and should have a good value/cost ratio on the long run. If an improvement-proposition concurs with both these boundary conditions, it is to be accepted. No specific criteria exist. RWS does not cluster improvement-propositions beyond district level. Also, the drawing up of improvement-propositions is not remunerated, whereby intellectual ownership stays with the
contractor, preventing RWS from making use of the improvement-propositions in other projects. The contractor does cluster improvement-propositions in its quality-system.

Collaboration
While its importance is recognized, the emphasis in this contract is not on collaboration. Both parties are still getting used to the new set-up of the contract. Again, communication and openness are insufficient.

The project related goal, vision and desires of RWS are unclear to the contractor. This prevents the contractor from fully being able to put oneself in the position of RWS, which in its turn hinders purposefully searching for desirable improvements.

Another problem is the unfamiliarity of the contractor with functional demands and the principals’ interpretation thereof. Thereby, the solution space is not clearly defined, whereby validity of a developed solution would be unclear. Also, the assessment procedure is opaque: criteria and roles and responsibilities of individuals are unclear.

Still, the distinction between principal and contractor responsibility is clear to both parties. In coherence, it is the intention of RWS is to provide as much freedom to the contractor as possible: the contractor is regarded by RWS as being a knowledgeable market party and more familiar with the product than RWS. The idea is that therefore, the contractor should be able to provide new insights in possible improvements. In order to preserve this line of approach RWS tries not to meddle in improvement-propositions: should preferred adaptations be recognized, these are not forced through or laid upon.
6 Queensland

This chapter uses the same outline as the previous chapter and concludes the empirical part of this report. Vision, derived goals, the contract and three cases from practice together provide insight in Queensland current practice. The reader is encouraged to take into account Dutch experience and to consider differences and the results thereof. This in preparation of the reflection that will follow in chapter 7.

In Paragraph 6.1, from the vision document, vision and goals or RWS towards innovation are deduced. In paragraph 6.2, the contract content related to innovation is explained, followed by the description of the three cases in 6.3. To ensure consistency and maximize clarity paragraphs 6.2 and 6.3 are noted down using the framework defined in paragraph 4.4.1.

6.1 Vision & Goals

6.1.1 Vision

This paragraph first discusses the general vision of TMR and Engineering and Technology department, which is the ‘TMR department responsible for Routine Maintenance. From this elaboration then the goals towards innovation are derived.

Department of Transport and Main Roads

The main vision of TMR is Connecting Queensland. In short, this implies planning, managing and overseeing the delivery of a safe, efficient and integrated transport system that supports sustainable economic, social and environmental outcomes in Queensland. [TMR, Jan-2010, p.1] One of the priorities in doing so stated by the Corporate Plan (and the only one related to innovation), is that ‘current and emerging technologies to improve the transport system and customer service should be embraced’ [TMR, 2010, p.1], implying a need to facilitate and implement innovation. The Operational Plan, describing the practical implications of the vision, states that the Department is to ‘lead transport technologies, improvement and innovation’ [TMR, May 2010, p.5]. It displays a need for TMR to take on a governing role on the subject.

Related to the previous is the priority to ‘create an organization and workforce that leads transportation into the future’ [TMR, 2010, p.1], again implying a leadership role for the Department, now in anticipating and reacting on future needs. In the light of this research, the statement indicates a need for leadership to foresee a need to change and subsequently steer innovations towards this change. The Operational Plan further clarifies by stating that ‘the main goals of enhanced leadership are to (1) lead and influence state and national transport-related policies and (2) to build partnerships, alliances, networks and knowledge sharing with the government, industry and community’ [TMR, May 2010, p.12-13]. By (1), the leadership role is to be interpreted to be on the governing level by stating the rules and guidelines for innovation. By (2), on the level of collaboration the vision is to create an equal relationship, high in communication and collaboration.

Engineering and Technology

The Engineering and Technology Department (E&T) is responsible for determining the strategy taken on with the performance-contract. E&T has its own vision statement:

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Expanding the Departments’ view, the main goal of E&T is to ‘be partners in technical performance’ [TMR, Jun-30-2010]. Therefore, ‘technical leadership and capability, together with clear consistent standards and guidelines needs to be developed and provided for’, while ‘knowledge is imported and shared, innovation is actively and responsibly embraced, TMR is tapped into the industry and works with partners, in order to seek out and apply best practices’ [TMR, Jun-30-2010]. Being in line with the Departments’ vision, it clearly states the leadership role in setting standards, while at the same time it expressed the need to stimulate and facilitate innovation in a partnership environment. These facts are underlined by E&T, distinguishing three strategies: (1) **Leadership**: develop a framework and policy on research, development and innovation (R&D&I) and continually improve the capability to innovate. (2) **Collaboration**: secure stakeholder support and commitment for R&D&I. (3) **Realizing Benefits**: maximize the benefits of R&D&I by sharing initiatives widely. [TMR, Sept-17-2010, p.1]

6.1.2 Derived Goals

From the above section two goals are derived: *Take the Lead* and *Be Working Together*:

**Take the Lead**

It is the goal of E&T to embrace innovations. (1) As a governing party, it is to set the rules and guidelines on innovation in such a way that (2) developing innovation is facilitated, stimulated and made use of. Thereby, (3) its capabilities on the level of innovation are to be increased.

**Be Working Together**

Innovation is to flourish by (1) actively creating partnerships so that (2) TMR is tapped into the industry and through which (3) knowledge is shared.

6.2 The Queensland Performance-contract & Innovation

In this paragraph contractual aspects that relate to innovation are laid down, deduces from the contract (control) documents.

6.2.1 Roles and Responsibilities

Similar to the Dutch contract, the contract states little in terms of the principals’ responsibilities towards innovation. Regarding the contractors responsibilities, two stimuli can be deduced from the contract: (1) efficiency improvements and (2) network stewardship:

On the level of efficiency improvements, a difference exists between **Sole Invitee** and **Open Competition**. With *Sole Invitee*, one is required to meet a fixed increase in productivity while **Open Competition** takes departure from the idea that efficiency improvements are achieved through the tender process [TMR, Jul-12-2010, p.16]. Productivity measures an output, which is gauged by actual dollars [TMR, Jul-12-2010, p.17]. Thus, the elemental difference is that after the contract is allocated, contractors under *Sole Invitee* need to improve in accordance with a fixed cost percentage, while under **Open Competition** contractors are not obliged to improve productivity during the contract time span. Safeguarded efficiency through the tender process should be ascribed to economical interests: all tenderers would like to be contracted out the contract. Thus, with the limited contract period of **Open Competition** (paragraph 3.3.4), productivity improvements come step-by-step rather than continually as
intended with Sole Invitee. Thereby, a clear incentive to innovate during the contact time span exists for Sole Invitees.

Secondly, the stewardship role (acting in the Departments best interest) demands from the contractor ‘to perform both an Owner/principal role and contractor role within a contractual arrangement. As explained in paragraph 3.3.4, it involves acting, thinking and making decisions, within the overall contact of funds available, that would be of benefit to the owner both in short and long term [MR, Jul-12-2010, p.107]. Thus, the contractor in its choices is to place oneself in the position of owner. The Departments is committed to continual improvement in the way it manages the road system’ [TMR, Jul-12-2010, p.7], and ‘there is a strong emphasis on planning for efficiency gains’ [TMR, Jun-12-2010, p.6] Thereby, the stewardship role indirectly requires the contractor to innovate.

On the basis of the contract, responsibility of the principal remains undefined. Two other aspects must be noted. First, only the efficiency gains and productivity targets are a direct driver to innovate, and even those are not linked to innovation by the Queensland contract. Secondly, it should be mentioned that several indirect drivers to innovate exist through the stewardship role, but can only be deduced from the total of rules and intentions set out throughout the contract. Thereby, the Queensland contract refrains from putting the emphasis on innovation.

6.2.2 Incentives

The development of innovation by the contractor is stimulated by the Queensland contract in three ways:

Demand by Contract
As explained above, the Queensland contract puts forward one generic driver to innovate: (1) the stewardship role. With Sole Invitees, a second drive exists: (2) efficiency improvements.

Making Profit
Contractors will be paid for actual work performed rather than what it actually costs the contractor [TMR, Jul-12-2010, p.6]. It explains how a contractor is allowed to make profit from activities (and thus from the executing innovations). Also, it shows how the contract is an arrangement on the basis of unit prices rather than on the basis of lump sum payment.

Continuity
As established, continuity is an important incentive for a private contractor. This translates in two ways. First, the contract extension, based on the performance assessment, is an incentive to innovate during the contract period with performance in the stewardship role being one of the criteria. Second, from the tender requirements it can be deduced that with a tender the principal takes into account a contractors’ past-performance [TMR, Dec-17-2008, p.5]. Thus, performance in one contract is of importance in order to acquire others as well. With Sole Invitee, continuity is considered an important incentive as it enables the contractor to guarantee community employment.

6.2.3 Solution versus Solution Space

(1) The first boundary condition to set the solution space is minimum quality, defined by Volume 3 as explained in paragraph 3.3.4. Thereby, for each defect a solution is already
provided for. These may be changed by agreement between TMR and the Contactor [TMR, Jul-12-2010\textsuperscript{[I]}, p.6]. The grey area in figure 19 visualizes this variability.

(2) Being insufficient for maintaining current set quality, the budget set for the contract will be spent regardless of how much efficiency gains take place. No further budget for innovation is provided for [Ranatunga, D.N., (0), Jul-27-2010], resulting in a lack of solution space.

(3) Regarding the third boundary condition, minimum costs, the Dutch and Queensland performance-contract are similar: cost reductions can be applied without restriction.

(4) Of all regulations safety is leading: ‘any proposed changes during the contract period will be held against the light of safety, as safety of the road used is one of the most important aspects of the contract’ [Mistry, M., (0), Aug-18-2010]. Secondary regulations concern the environment or surroundings.

6.2.4 Process

‘Non-routine maintenance activities are requests for work that has been identified as a network-need but is not a defect. These will generally be funded by an increase to current contract allocation if such funds are available’ [TMR, Mar-10-2009]. Thereby, should an innovation lead to a new activity or the adaptation of a present one, it should fall into this category. The same goes for adaptations to the product. For a non-routine maintenance activity to be approved of, a request is to be submitted using the variations request form. This extensive document is to include a detailed cost breakdown showing all day works, profits and overheads. No requirements are stated for the assessment of such a request and no other procedures for innovations are set by the contract (control) documents.

6.2.5 Collaboration

Even though innovation is not mentioned in the contract, the role of the contractor is determined formally, as shown in paragraphs 3.3.4 and 6.2.1. Most important is that the contractor is to act as a network steward. But acting in the interest of the principal implies being aware of its goals and needs. And apart from the goal to ‘maintain a safe road environment for road users and integrate environmental considerations with economic analysis when selecting maintenance activities’ [TMR, Jul-12-2010, p.6], no goals are stated in the contract. This makes it difficult to steer innovation solely on the basis of the contract.

Goals could become clear informally, for example through the meetings. Two types of meetings are organized: formal contract review meetings and progress meetings. Contract review meetings are to be convened by the Department twice (four times for Open Competition) for each year of the contract period [TMR, Jul-12-2010, p.17]. Every three months a progress report is handed in, which can be followed up by a progress meeting [TMR, Jul-12-2010, p.120]. With Open Competition, monthly progress meetings are obligatory [TMR, Jul-12-2010, p.79]. While these meetings could serve as a platform for communicating goals or substance of innovation, a written down obligation to do so lacks. At the same time, ‘it is the
role of the principal to co-operate with the contractor in its stewardship role’ [TMR, Jul-12-2010, p.11]. Combined, the line of reasoning stated in the contract can be interpret as the contractor taking up the main role, while the principal facilitating the boundary conditions for doing so. Thereby, one of the requirements for the principal is to communicate goals and needs related to innovation.

To underline the need to work together, the contract states the expectation of parties to adopt a relational approach to their operations, to be shaped by the Partnering-agreement [TMR, Jul-12-2010III, p.1] ‘The partnering principles is about parties developing solutions that meet the needs of everyone involved, and is based on transparency: parties should identify and communicate common goals and communicate and respect each other’s goals and values. [TMR, Jul-12-2010II, p.1] It explains how joint benefit is to be created by collaboration through openness.

The concept of partnering is visualized in figure 20. ‘Mutual objectives are determined at the start of the project and kept under review during. Problem resolution is about respecting equality of rights and searching for win-win solutions. With continuous improvement, parties should identify and aim for best practices’ [TMR, 2001, s.7-10]. The interrelation between innovation, communication and collaboration is obvious, as is the Departments’ strategy for tackling any opaqueness on the subject of roles and innovation: contractor and principal are to determine together what they regard to be value.

Partnering is formalized by a partnering-agreement, which reflects the joint goals and commitment. This document is to be signed by all parties’ key players and displayed at both offices [TMR, Jul-12-2010II, p.7].

6.3 Three Queensland Cases

As in chapter 5, here the three different cases are discussed. Different is that here one paragraph is dedicated to describing the principals’ strategy, as all cases are governed by the same project manager.

General information about the cases is provided, together with an explanation of the case specific aspects regarding innovation on the basis of the established LBC framework. Unless stated otherwise, information is deduced from interviews with persons involved, of which summaries can be found in appendix E.

6.3.1 The Principals’ Strategy

Project Management

The managerial set-up of the three cases is alike. Most substantial difference is the fact that with RoadTek, being part of the same government body, the partnership is most intense: machinery, materials and site are shared and even workforces are interchanged between both parties. As a controller, the principal with RoadTek is least strict: audits and checks are performed not to control the contractor but rather to assist in assessing network quality.
In all cases, the strategy is to step away from the process and strict regulations. Innovations are supposed to come from the contractors, having best knowledge of the network. The principal accepts proposed improvements unless there is a good reason not to. Not increasing benefit is one such reason. At the same time, TMR can inform a contractor about possible innovation informally. The decision to execute or trial remains with the contractors.

**Quantitative Consideration**

With no need of demand for innovation being communicated to the contractors, the focus of the contracts is not in innovation. Still, innovation does take place. Multiple examples exist, and from thought in total 10 examples can be recalled by the project manager, but as innovations are not recorded no exact number can be cited. Most innovations seem to come from the private contractor, Downer-EDI. Especially when it comes to asphalt Downer-EDI is considered an expert introducing pioneering innovations.

**Incentives**

No financial incentives to innovate are recognized. Savings made from innovations are put back into the project, a result of the contractor being paid on the basis of unit prices. The stewardship role functions as inventive: taking up the role of owner, the contractor should take pride in controlling network quality, creating a natural longing to improve. The contract extension is to be a stimulus to perform, as is the past-performance.

**Solution versus Solution Space**

The boundary conditions are as recognized in paragraph 6.2.3. The principal would welcome an increase of budget, so that a change can be made from reactive to pro-active work and to allow for innovations requiring an initial investment. Regarding the regulations, the solutions stated by Volume 3 are regarded an advice rather then anything else.

**Process**

The process is dependant on the type of innovation and determined ad-hoc. While preferably the innovation is developed and designed as much as possible by the contractor, the principal serves as a sounding board; the contractor usually informally sounds the principal out on viability of the proposal. Duration of the process varies between instant implementation and two years, all depending on the estimated risks. Innovations are assessed on network improvement, value/costs ratio, safety and risk of adverse effects. With the contract, safety is priority number one. Therefore, in the eyes of the principal innovations are to be steered towards increasing safety.

As explained above, the principal does not record proposed innovations in a database. TMR experts have knowledge of innovations that have taken place in their knowledge field. But, as experts only are involved when required, most innovations are known only to those directly involved. Knowledge is shared to some extent through knowledge meetings and innovation magazines. However, innovations often concern minor changes. As a result, parties are not always aware of the fact that innovations are being put into practice. No list of possible improvements is provided to the contractors involved.
Collaboration

All three contractors are willing to collaborate. They are regarded to take pride in what they do and to succeed in the stewardship role. The principal allows the contractors to work autonomously and does not get involved as long as the contractor is doing the right thing. The relationships are regarded mature and comfortable, as problems can be solved without looking at regulations. The contract only serves as a back up, but so far no legal conflict has arisen. This contrasts with the previous situation, in which a bad relationship with a private contractor resulted in a contract-based collaboration and eventually in the determination of the contract period. This is partly accredited to the fact that the previous project manager stood by a hierarchical managerial approach, which prevented equality between parties.

General goals of the contract are communicated during pre-start meeting of the contracts, but innovation is not one of these goals. Partnering workshops support the understanding of parties’ values. The principal feels to be working towards joint benefit, which is considered to be the result of the stewardship role.

6.3.2 The Metro-Downer EDI Case

The Metro Downer EDI-Case is one of the two Open Competition contracts in Queensland and the only one in the Metro Region. Details are provided in table 7.

<table>
<thead>
<tr>
<th>Case</th>
<th>Contractor</th>
<th>Start</th>
<th>Duration</th>
<th>Length of network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro-Downer</td>
<td>Private, Downer-EDI</td>
<td>Jan-2009</td>
<td>2+2 Years</td>
<td>+/- 300 km</td>
</tr>
</tbody>
</table>

Table 7 - Details Metro-Downer case

Quantitative Consideration

Various innovations have been introduced. As innovations are not registered into a database per project, no exact number can be quoted. But various examples exist: a litter picker (safety improvement), use of a GPS device for recording maintenance (efficiency improvement) and several asphalt improvements (quality improvements and cost reductions).

Downer EDI is a multinational organization with a workforce of more than 21,000 people located across more than 40 countries. With over 30 asphalt and bitumen plants and over a 100 years of experience in road maintenance, it can be considered an expert on the level of pavement (materials). This is reflected in the type of innovations proposed and innovations introduced in other projects.

Incentives

In line with the intentions of the principal, the stewardship role results in a strong incentive to innovate. The contractor puts oneself in the position of owner, which results in a high level of commitment. The contractor focuses on what is best for the network. A constant quest for providing value for money, or the highest quality/cost ratio is the result, creating a natural longing to improve the product or maintenance process.

Being a private company, making profit is the core business of Downer-EDI. However, if an innovation results in a reduction of costs, these costs are used again for other maintenance activities. The execution of extra activities allows the contractor to make some extra profit, but this is not substantial enough to be regarded an incentive. Downer EDI producing its own asphalt, money can be made from introducing new asphalt mixtures. Extra profit can be made when these mixtures are then used in other road projects as well.
In order to be a leader in the field the contractor is constantly in search of innovations. Also, innovation is regarded to influence reputation. Two other stimuli exist: performance-measurement, which determines contract extension. Another incentive is past-performance: being part of the tendering assessment of the Queensland contract, general reputation of a contractor is recognized to be importance for continuity.

Solution versus Solution Space
The solution space is as defined in paragraph 6.2.3. With budget unavailable, innovations that require an initial investment are regarded undesired. Also, the contractor feels regulations limit possibilities for innovation. The flexibility of these demands is regarded essential. As a network steward, the contractor tries to strive for value as defined by the principal. With TMR setting safety as the highest priority, the contractor regards safety as the highest value. Apart from the safety aspect, little guidance is provided on value.

Process
No fixed procedure or format for proposing or putting through innovations is set. The usual procedure is that the contractor develops an innovation internally and is put to the principal informally during a monthly meeting. During the same meeting, generalities of the innovation are discussed and fine-tuning may take place. Per innovation, it is then determined what is the best way to go: some innovations need to be internally approved of within TMR, but others are approved of during the same meeting. If required, a more formal approach is the next step. This will be in the form of a report describing advantages, disadvantages and life-cycle costs.

In the eyes of the contractor the process is efficient and uncomplicated, even when internal assessment by TMR is required. The general feeling of the contractor is that TMR is working along and that procedures do not take much time. The feeling is that TMR is willing to try new ideas out, as for TMR it is an opportunity to learn as well.

The contractor clusters executed improvements in a general database. Also, technology meetings are held during which new innovations are discussed. Being a multinational, innovations that are used in one project are checked on applicability for other projects as well. However, due to the fact that the set-up, regulations and guidelines of contracts differ per state in Australia, improvements are not easily transposed between states. The principal is allowed to share innovations developed by the contractor with other providers, as it is regarded an improvement of which the whole industry might benefit. The gain is that it improves the companies' reputation.

Collaboration
Parties collaborate on a high level. Again, the stewardship role forms the basis: putting oneself in the position of owner, the contractor is to understand the needs of the principal. Therefore, communication is regarded essential. Communication between parties is intense. The monthly meetings play an important, but most communication is informal.

The partnering-agreement underlines the cooperation. Building up trust and taking up ownership are the two most important aspects recognized. While the contract is not set-up as an alliance, both parties feel that in practice it works out as one.
Roles are clear and trust is provided with these roles. With this trust comes freedom; the contractor is to have best knowledge of the network and therefore, a (discretionary) change is proposed, the principal will accept it unless there is a very good reason not to. With only limited funds available, priorities are set in a collaborative way, resulting in problem areas the contractor will focus on, in this case safety. Due to this set-up, the contractor knows its role and the principal in general does not need to interfere. Uncertainties are communicated informally and addressed in cooperation. Still, no goal to innovate or improve is communicated by the principal. Also the partnering-agreement, which is regarded to be a good tool for communicating what the goals are, lacks to denote innovation as one of the requirements.

Adding to the level of equality is the two-way performance measurement; albeit in an informal and verbal way, the contractor assesses the performance of the principal as well.

6.3.3 The Metro RoadTek Case

RoadTek, being part of the organization of TMR, is one of the two parties able to perform under a Sole Invitee status, which is the contract used here. Details are provided in table 8.

<table>
<thead>
<tr>
<th>Case</th>
<th>Contractor</th>
<th>Start</th>
<th>Duration</th>
<th>Length of network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro-RoadTek</td>
<td>Public, RoadTek</td>
<td>1995</td>
<td>1+4 Years</td>
<td>445 km</td>
</tr>
</tbody>
</table>

Table 8 - Details Metro-RoadTek case

Quantitative Consideration

Innovations that take place are not clustered per project, whereby it remains unclear exactly how much innovations were implemented so far.

Most innovations implemented come from the contractor. Innovations coming from the principal are more likely to be highly technical resource related innovations such as new asphalt mixtures. The reason is twofold: RoadTek is not involved in producing asphalt mixtures and such innovations take much time to be approved of. Examples of innovations implemented in the last year are spring steel guideposts (replacing the non-flexible wooden guideposts: an efficiency and safety improvement) and high impact barrier trucks (safety improvement for driver, public and workers).

Incentives

Most important incentive to innovate is the fact that the contractor takes pride in taking care of the network. Taking up the role of owner, the contractor tries to do what is best for the network. As a result, a constant search for improvements is present.

Part of this can be ascribed to the stewardship role, which demands value for money. With all works being prioritized towards safety, safety is regarded to be highest value. Another important aspect of value for money is efficiency, whereby the contractor tries to innovate to reduce costs.

It is the mission of RoadTek to return 4.5% profit percentage to the government, not more, whereby making profit of innovations is not regarded an incentive. Also, no productivity targets are set, opposed to what the contract prescribes. In the past productivity targets were part of the contract, but after ten years it was believed productivity increase was not further possible and were let go of.

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Continuity is an important goal to perform in accordance with the criteria stated in the performance-measurement, as it determines contract extension. With no demand to innovate stated again only an indirect stimulus to search for innovation exists, through the criteria of delivering value for money.

**Solution versus Solution Space**

No extra budget is available for innovation, but this is not regarded a constraint. With the long and continually extended contract period, pay back periods that extend a single contract period are not considered an issue. Both parties also try to make money available through other places internally. When investments are not cost effective at all, but deliver a certain level of value, the principal is always regarded willing to try and find budget so that a trial can be instigated. Innovations that benefit the RoadTek as a whole (the new high-impact barrier trucks) are paid for by internal budget. This might result in higher unit prices. But, when an improvement, the principal is willing to pay a higher price.

It is felt that the regulations and guidelines are easily adapted when required: the principal follows the advice of the stewardship.

**Process**

Innovations are developed to a stage in which it can be implemented straight away before they are taken to Department. Still, advice in doing so is acquired informally, mostly via the phone or through the meetings. Dependant on the type of innovation, a TMR expert might be involved in the (assessment) process. If so, formal reports are required from the contractor. No specific format or assessment procedure exists. These are determined ad-hoc as is with the Metro Downer EDI-case. In general, the process is regarded to be efficient and the contractor feels TMR to be working along in terms of innovation.

The contractor clusters innovations through the quality-system: details of processes and resources used are constantly updated, by which innovations applied are automatically recorded. This does not, however, enable one to keep track of the innovations proposed in a specific project. As with the Metro Downer EDI-case, the principal is allowed to make use of applied innovations in other projects.

**Collaboration**

Communication between both parties takes place on a daily basis via the phone or e-mail. This is supplemented by monthly meetings, allowing for formal communications where required. In this project RoadTek and the principal are equal, which came about through the principal providing trust and freedom. It allows the contractor to develop innovations autonomously. Clarity of roles is present. Still, clarity on the goals for innovation lacks. Safety is an important value, as is cost reduction. But these are deduced from the general goals of the contract: the contractor would welcome a more formal clarification of substance on innovation.

With the partnership established years ago through the partnership agreement, parties now understand roles and mutual goals. Through the collaboration, parties are able to give and take on both sides. This is especially important, as it is recognized that the contractor has not much to stand on in terms of the contract; the principal can easily take up a hierarchical
position, but does not as the contractor does a good job acting as owner. The partnership is maintained through workshops, performed every few years, whenever required. Another aspect safeguarding the partnership is the performance measurement going both ways. Parties sit around the table and discuss the each other’s performance.

6.3.4 The City Council Case

The contract with the City Council is on the basis of Sole Invitée. City councils are, together with RoadTek, the only organizations allowed to operate under a Sole Invitée status. Details of the City Council-case are provided in table 9.

<table>
<thead>
<tr>
<th>Case</th>
<th>Contractor</th>
<th>Start</th>
<th>Duration</th>
<th>Length of network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ipswich-Council</td>
<td>Private, Downer-EDI</td>
<td>1994</td>
<td>1+4 years</td>
<td>275 km</td>
</tr>
</tbody>
</table>

Table 9 - Details Ipswich-Council case

Quantitative Consideration

Innovation is recognized to take place and comes from both TMR and the Council. The majority of innovations coming from TMR are related to resources and adaptations to the product, while the contractor focuses mainly on process related innovations. No clear number of innovations implemented exists.

Incentives

Most important incentive is safety: both TMR and the council consider safety to be priority number one. As it is entangled throughout the organization and all its processes, a constant quest to improve safety is present. Innovation is also stimulated by the stewardship role, which to a certain extend results in a natural longing to improve the network. It is related to the stated demand to produce value for money, which results in a need to increase efficiency. The council works on the basis of a fixed profit margin. However, accounting is not on the basis of open books. Profit is not regarded to be an incentive to innovate; profit made from executing innovations is marginal.

Continuity is not an incentive either: the Council mainly takes up the contract to have some control over what happens to the roads within its boundaries. The maintenance budget is constantly being minimized. The contractor is on the edge of giving up the contract, as no further leverage for maintaining current quality of the network exists. At the same time the shortage of budget stimulates innovation, as cost efficiency needs to be optimized.

Solution versus Solution Space

The solution space is as defined in paragraph 6.2.3. The contractor feels that regulations are easily adapted in negotiation with the principal, essential for innovations to be implemented. Regulations considering complex technical aspects require a more formal assessment. These procedures often being lengthy, the Council refrains from proposing such innovations.

Process

The process is as with the other two Queensland cases: no formalized process, format or assessment procedure exists. Instead, the ad-hoc approach is embraced, enabling to decide per innovation what is the best approach. Preferably, innovations are discussed verbally during the monthly meetings and whenever required, advice is requested and provided for by

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both parties. Advantages and disadvantages are made clear. Implementing an innovation is
done without formalization, unless formal approval outside those directly involved with the
contract is required, allowing for instant implementation. Whenever formal approval is
required, processes do take up a lot of time: requests can take up two years before addressed
properly, or even can get lost within the bureaucratic environment within TMR.
As network steward, the Council is supposed to have best knowledge of what is best for the
network. Thereby, the strategy of TMR is to, in the basis, agree on the proposal of an
innovation, unless there is good reason not too. Should an improvement be refused, the
reasons for doing so are clearly communicated.

Innovations are clustered by the Council to a certain extend, as formalized records are
recorded in the quality-system. With the Council being a close-knit organization, innovations
are interchanged between this project and the Councils own network. The council is happy to
share any innovations, as it could improve maintenance throughout the industry.

Collaboration
Both the formalized meetings and informal contact contribute to parties' satisfaction on the
level of communication. Still, it is unclear to the contractor what is value to the principal,
knowledge required to steer innovations towards increasing benefit.
The collaboration is a relationship built on trust, which came about over time (15 years).
Through the people involved, who are willing to cooperate and to reach joint benefit, a
partnership was established. With this partnership it is felt that parties try to take up their
own responsibilities while respecting each other's core values. The contractor takes up the
stewardship role, while the principal provides the contractor freedom in doing so, while
providing assistance and advice when required. In the past, partnering workshops were
performed. The last few years this has not been updated, but no demand to do so is felt
present. However, it is felt that one party being a local government while the other is a state
government, priorities and values should pretty much be the same (i.e. safety).
7 Analysis

In this chapter the reader is taken on a reflective journey through Dutch and Queensland current practice. The criteria derived from the LBC form the basis herein. The finger will be put on strengths and weaknesses of both current practices. Recommendations for maximizing these strengths and diminishing the weaknesses are drawn up. Throughout the chapter, the tables provide overview of the analysis.

In the first two paragraphs, both strategies are reflected upon individually. First, an analysis is made on the basis of the three cases researched, after which current practice is compared to the goals derived (in paragraph 5.1.2 and 6.1.2). In 7.3, both practices are compared and held against the light of the criteria derived from theory. The discussions are concluded with a reflection upon LBC theory. In 7.4, findings are converted into conclusions and recommendations.

7.1 Dutch Current Practice

7.1.1 Case Analysis

Roles and Responsibilities
The three cases show a similar set-up: in general, the principal has stepped away from the process. It is up to the contractor to come up with and propose improvement-propositions, as defined clearly in the contract. The contractors acknowledge this role and demand. All try to come up with favourable improvement-propositions.

A difficulty in doing so is that in all cases the contractor is unaware of what is value to the principal, the reason being that value has not been clearly defined. As a result, the contractors cannot place oneself in the position of owner in steering improvement-propositions. Thereby, in the Zeeland-case and The Netherlands East-case the principal has become involved in the process: contractors consult the principal before working out an improvement-proposition.

All contractors record proposed and applied improvement-propositions, which enabling use thereof in other projects. And while control documents demand communication of improvement-propositions beyond district level, in none of the cases the principal has done so. Important aspect is that, unless remunerated for the development, intellectual ownership over an improvement-proposition stays with the contractor.

Incentives
Forming the basis is that contractors feel obliged to propose improvement-propositions, as the thereof is clearly stated in the contract.

At the same time, a contractor is offered the possibility to earn profit from improvement-propositions. This possibility is created in two ways: (1) By providing budget for initial investments of improvement-propositions (as with the Zeeland-case and The Netherlands East-case) and (2) by allowing cost savings to be for the account of the contractor (as with the The Netherlands East-case and IJsselmeer-case). As a result, the Zeeland-case contractor steers on quality improvements while the IJsselmeer-case contractor steers on cost savings. In the The Netherlands East-case, where both opportunities are available, improvement-propositions are steered towards both. It shows how providing a budget steers improvement-
propositions towards quality improvements, while allowing profit to be made from cost savings steers improvement-propositions towards the latter. As no fixed strategy is set by the contract, responsibility for determining strategy currently lies with the districts.

Another incentive recognized by is contract extension. During contract extension, most profit can be made as the contractor by then is familiar with the project. Therefore, contractors actively steer on contract extension. This is currently based on general principal satisfaction. Lastly, all contractors recognize market position as incentive: developing desirable and appealing improvement-propositions can improve status, which in turn could attract skilful employees or take part in future past-performance judgements. Also, with improvement-propositions opportunities exist for increasing quality/cost rating of future tenders.

**Solution or Solution Space**

As explained above and in paragraph 4.3.1, the type of improvement-propositions is influenced by availability of budget: if unavailable, improvement-propositions requiring an initial-investment by RWS (the pay-back period exceeds the contract period) are ruled out. Budget can become available through DVS for propositions that create extraordinary and nationwide benefit. In the Zeeland-case, it stimulated the search for outside-the-box solutions. All contractors regard the functional demands to be strict, while technical and process related demands are believed to be more flexible. The principals are willing to change demands where necessary, as long as scope is preserved.

All parties involved regard regulations that exceed contract scope (e.g. environmental and safety regulations) to be strict. At the same time, information gaps exist on the content of these regulations. All in all, the contractors feel the contract provides sufficient freedom.

**Process**

Even though the contract control documents prescribe a fixed process for proposing improvement-propositions (i.e. two stages), in practice processes differ(ed) from this set-up. In an extra stage, contractors prefer to consult the principal on feasibility before working out an improvement-proposition. Parties agree it allows for steering towards joint benefit in an early stage, which increases chances of implementation.

The format, assessment procedure and assessment criteria in general suffices to what is stated in the contract, but in all cases is attuned to own desires. Striking is the fact that the process is fixed. Contractors agree: innovations come in many different shapes and sizes, whereby static procedures can be unnecessarily lengthy and complicated.

**Collaboration**

On the level of collaboration, differences exist between the three cases. Especially on the level of contentment with the way parties collaborate. Most satisfied are the parties in the Zeeland-case, where the collaboration is regarded as intense. Collaborating in the Zeeland-case is defined as ‘creating equality, maximizing trust and reaching joint goals’. The partnering-agreement is regarded to be at the basis of the collaboration.

The other parties are less satisfied about the level of collaboration. The intention to collaborate is present, but in the The Netherlands East-case and IJsselmeer-case, the pursuit of joint goals is less intense as ambiguity and opaqueness of information is greater.
During the project, in all cases collaboration has intensified, as the contractors intensified principal consultation on improvement-propositions. One particular aspect dissatisfying contractors is that whenever an improvement-proposition is refused, the reason is not communicated. The contract does not prescribe guidance on the level of collaboration. A PSU is applied in all cases, which is regarded a useful opportunity to underline and make concrete the intent to collaborate. Still, in all cases the contact is leading in the way parties act.

7.1.2 Practice versus Intentions

Market Unless...
The Market Unless principle implies (1) steering from a distance, so that (2) the contractor is provided freedom, so that (3) market innovation is stimulated and made use of.

(1) The principal in all cases is trying to take a step backwards, in order to leave the process of executing maintenance to the contractor. The maximized responsibility is envisioned to maximize contractor knowledge of the network necessary to develop improvement-propositions. The contractors affirm the line of reasoning and its justness, but with value undefined, principal involvement is required in order to steer towards improvement-propositions creating joint benefit.

(2) Freedom is provided by the functional demands and limited by the regulations and aspect demands. Limiting initial investments by RWS, (lack of) budget is another constraint. Technical and process related demands are flexible and in general contractors feel free to develop and propose improvement-propositions.

(3) Freedom is recognized to facilitate improvement-propositions, not stimulate. The contractual demand, the possibilities to make profit and to improve market position are the critical stimuli. RWS has not yet optimized making use of improvement-propositions. Primary cause is that improvement-propositions are not clustered, which inhibits knowledge from being distribution organization-wide.

Collaborating
Being a reliable partner implies cooperating with contractors through (1) creating equality and trust between parties, (2) collaborating to determine mutual interests and pursue joint goals and (3) providing unambiguous, and clear information.

(1) The level of collaboration varies throughout the cases. In general, equality and trust can be increased. RWS is too often still meddling in the maintenance process, which is diminishing trust and equality.

(2) At the same time, the principal is involved so that joint goals can be pursued. Mutual interests are made concrete with a partnering-agreement. What is value to the principal remains unclear.

(3) All contractors think clarity of information of process, format or assessment procedure of improvement-propositions should be improved.

Optimize
In being an efficient partner, the goal is to (1) centralize and (2) optimize processes, and to (3) ensure consistency in practices, while (4) working towards innovation.
(1) With clustering being absent, centralizing knowledge on improvement-propositions lacks. As a result, RWS is unable to make use of applied optimizations in other projects.
(2) The process for proposing improvement-propositions is adjusted during the project. It indicates a certain need, but shows a desire and flexibility to optimize as well.
(3) With the process, format and assessment criteria differing between projects, RWS is not yet consistent in working towards innovation. If clustering remains absent in the future, chances are that districts will grow apart, thereby hampering consistency in practices due to working towards improvement-propositions.
(4) With improvement-propositions, the focus is on innovation. Still, parties needed to become familiar with the set-up and demands before being able to work towards innovation. Those involved believe this can be improved by optimizing the processes and by communicating value and information gaps at the start of the collaboration.

Table 10 provides an overview of the above.

<table>
<thead>
<tr>
<th>Derived Goal</th>
<th>Strengths</th>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steer from Distance</td>
<td>Contractor-led, principal decides</td>
<td>Value undefined, principal involved</td>
</tr>
<tr>
<td>Provide freedom</td>
<td>Functional demands, budget</td>
<td>Aspect demands, unclear regulations, unavailability of budget</td>
</tr>
<tr>
<td>Stimulate and make use of innovation</td>
<td>Contractual demand, profit, continuity, market position</td>
<td>No clustering</td>
</tr>
<tr>
<td>Create equality and trust</td>
<td>Partnering-agreement</td>
<td>Involvement in process</td>
</tr>
<tr>
<td>Determine mutual interests and joint goals</td>
<td>Partnering-agreement</td>
<td>Value undefined</td>
</tr>
<tr>
<td>Clear and unambiguous info</td>
<td>-</td>
<td>Process, format and assessment unclear</td>
</tr>
<tr>
<td>Centralize processes</td>
<td>-</td>
<td>No clustering</td>
</tr>
<tr>
<td>Optimize processes</td>
<td>Change during project</td>
<td>Static process</td>
</tr>
<tr>
<td>Consistency in practices</td>
<td>Processes defined in contract</td>
<td>No clustering</td>
</tr>
<tr>
<td>Work towards innovation</td>
<td>Focus on innovation</td>
<td>Static process, no clustering</td>
</tr>
</tbody>
</table>

Table 10 – Dutch practice versus intentions

7.2 Queensland Current Practice

7.2.1 Case Analysis

Roles and Responsibilities
While a clear demand for innovation lacks, distinction of roles is clear: in all cases innovation is supposed to be contractor-led. The principal as controller has last word on innovations but does not actively stimulate innovations to take place.

The stewardship role stated in the contract creates the division of roles: the contractor is to take up responsibility for the network and to act as if being the owner. Hereby, contractors are committed to improve and innovation is a natural result. A difficulty in putting oneself in the position of owner is that value is not clearly defined on paper. Verbally the primary functional demand is communicated: safety of both road user and employees. Corresponding, the contractors steer innovations towards safety.

The principal does not cluster proposed or implemented innovations. All contractors cluster innovations in an indirect way by taking these up in the quality-system. No dedicated databases for innovations exist. All contractors are happy to share applied innovations.

Incentives
According to all involved, the stewardship role is the most important incentive to innovate, creating a natural longing to innovate through trust, pride and goodwill. The second incentive recognized by the contractors is continuity, which is twofold: continuity through market position and continuity though contract extension. Contract extension on its turn is dependant on performance-measurement, with performance in the stewardship role being one of the indicators. It is believed that market position can be improved through improving status and strategies by innovating. Past-performance plays a role in the Open Competition contract: if a contractor performs well in a certain project, chances of being granted another contract rise.

Making profit is recognized to be a minor incentive. Profit made from optimizing processes or constructing improvements is considered to be too marginal to be a primary incentive. Still, budget is an incentive: a shortage challenges a contractor to innovate towards cost efficiency. In the past, with the Sole Invitee contract, contractors were required to continually increase efficiency. Had the requirement still been active, it would serve as incentive.

**Solution or Solution Space**

Those involved believe a solutions space facilitates innovation through provision of flexibility and freedom for creativity. Still, contractors feel restrained by the limited budget: no dedicated budget is available for innovations and large investments are uncommon.

Part of the contract is a booklet consisting of 231 pages, prescribing an exactly how a contractor is to maintain the product. This opposes the idea of using functional demands, by which freedom is provided. Still, contractors do not feel restrained by these regulations, due to the fact that these solutions are easily adapted.

Regulations that exceed the contract are stricter and more opaque. Therefore, innovations that carry with great uncertainty on the level of safety or technology mostly are avoided.

**Process**

Undefined by the contract, in all cases the procedure and format for proposing an innovation are decided upon ad-hoc, as is the assessment procedure thereof. According to the contractors this saves time, which in its turn facilitates innovation.

The strategy used by the contractors is similar in all cases: in essence, the contractor develops the innovation until ready to be implemented. The contractors inform the principal regularly. All contractors regard the assessment procedure as being uncomplicated and efficient: only when an innovation requires a more in-depth assessment procedure (i.e. due to safety, technical, or cost related uncertainties), the procedures are regarded as being lengthy. As a result, contractors tend to avoid such innovations.

**Collaboration**

All parties consider the project to be a partnership. The contract is secondary to the collaboration. It results in adaptable regulations, allowing innovations to be implemented. In all cases reaching joint benefit is found most important and to be reached through communicating intensively, respecting the other parties core values and maximizing trust. All part of the partnering-agreement and considered by all as a helpful tool in aligning goals: it is regarded to built trust and goodwill and to help understand both parties' processes and core values. Parties are of the opinion that in creating a partnership, attitude and intentions of

Maarten Lindenbergh
individuals involved are most important. Still, while the partnering-agreement mentions innovation, in practice it is not a cornerstone of the collaborations. The principals trust the contractors to deliver satisfactorily, resulting in the strategy to accept a proposed innovation unless there is a very good reason not too. The contractors acknowledge this as a sign of trust. Another aspect nourishing the collaboration is the fact that performance-measurement goes two ways. Albeit informally, contractors are expected to make clear how the principal is performing in their eyes. Contractors feel this adds to the level of equality between parties.

7.2.2 Practice versus Intentions

Take the Lead
It is the goal of E&T to embrace innovations. As a governing party, it is to (1) set the rules and guidelines on innovation in such a way that (2) developing innovation is facilitated, stimulated and made use of. Thereby, (3) its capabilities on the level of innovation are to be increased.

(1) In terms of rules and guidelines for innovation, little is stated by TMR either formally or informally. Innovation is not mentioned in the contract and is anything but a priority. The contractors feel the principal does not put out a clear demand to innovate. Still, innovation does take place.
(2) The facilitation of innovation is hampered by the absence of a solution space. It is only by the flexibility of the formal rules that innovation is made possible. Innovation is stimulated indirectly through the stewardship role. Other stimuli are continuity and market position, supported by the performance-measurement and past-performance. Lacking are guidelines on what is to be considered value. Would the concept of value be clearer, contractors would be better able to steer innovations.
When it comes to implementing innovations, parties discuss matters informally. The process for making use of innovations is determined ad-hoc, whereby the way to go is adapted to the innovation, thereby facilitating making use of innovation.
(3) TMR refrains from clustering innovations whereby these are for a large part limited to the region in which a particular project takes place. Possibilities to increase capabilities thereby are not fully made use of.

Be Working Together
Innovation is to flourish by (1) actively creating partnerships so that (2) TMR is tapped into the industry and through which (3) knowledge is shared.

(1) The partnership is primary in the projects, which is supported by the formal partnering-agreement. All parties are satisfied with the way parties collaborate.
(2) Especially with the private contractor case TMR is tapped into the industry; the contractor is a multinational company performing maintenance works throughout the world. Still, the lack of clustering prevents organization-wide knowledge of market innovation.
(3) Contractor knowledge is used to take on several encountered challenges. TMR is allowed to share knowledge, but the absence of clustering hampers making use of this possibility. Table 11 provides an overview of the above.
### Table 11 - Queensland practice versus intentions

<table>
<thead>
<tr>
<th>Derived Goal</th>
<th>Strengths</th>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set rules and guidelines</td>
<td>-</td>
<td>No focus on innovation</td>
</tr>
<tr>
<td>Facilitate, stimulate and make use of innovation</td>
<td>Flexible processes, stewardship role, performance-measurement</td>
<td>No functional demands, value undefined, no clustering</td>
</tr>
<tr>
<td>Increase capabilities</td>
<td>Willingness to share innovations</td>
<td>No clustering</td>
</tr>
<tr>
<td>Actively create partnerships</td>
<td>Partnering-agreement</td>
<td>-</td>
</tr>
<tr>
<td>Be tapped into industry</td>
<td>Knowledge private contractor</td>
<td>No clustering</td>
</tr>
<tr>
<td>Share knowledge</td>
<td>Openness contractors</td>
<td>No clustering</td>
</tr>
</tbody>
</table>

#### 7.3 Dutch versus Queensland Practice

In this paragraph both practices are compared. Per criteria, first LBC reasoning is briefly explained. Subsequently, both practices are compared against each other in the light of the LBC criterion, to define weaknesses and strengths. Concluding each paragraph is a discussion about how strengths can be maximized and weaknesses minimized.

##### 7.3.1 Innovation should take place

**LBC reasoning**

Innovation is required to maintain consistency between product and environment and to deliver benefit to the end user. This is possible through increasing the quality of the product and by decreasing maintenance costs. To pinpoint possibilities for improvement, first current level of innovation is assessed through a quantification of Innovations.

**Weaknesses and strengths**

**Current practice**

In The Netherlands, in less then three years contractors proposed 91 improvement-propositions. In total 50 were executed and 10 are still under consideration by RWS. From appendix G it becomes clear that 27 of these innovations were aimed towards quality improvement and three towards costs reductions.

In the whole of Queensland in one year the principal has recorded 48 innovations, all contractor-led. The list is provided in appendix G. In the cases researched, multiple innovations were implemented. However, these were not officially recorded. The interviewees were unable to put an exact number to innovations implemented. Parties could not remember an innovation being declined.

Still, from the numbers it becomes clear that innovation does take place in both The Netherlands and Queensland. From the lists of innovations put into practice a clear difference in type becomes apparent: in The Netherlands, most innovations are steered towards quality improvement. In Queensland, most innovations reduce the (long term) costs of maintenances.

**Discussion**

In The Netherlands, in the 3 cases researched more innovations were implemented than were recorded from all 73 projects Queensland together in a year. As it remains unclear how data came about, it is hard to put a number on the average number of innovations a Queensland project produces.

The fact that Queensland parties can only provide a limited amount of examples of innovations implemented can indicate that the number of innovations implemented is
relatively small. It could also indicate that the innovations regard small interventions, by which they are not remembered as being innovations.

LBC and practice are in line: innovation is used to improve quality or to decrease costs. The principal is responsible for creating coherence between product and environment; the extent to which this is safeguarded is discussed in paragraph 7.3.3.

**From problem issue to success factor**

In both The Netherlands and Queensland, the principals indicate a need to increase the amount of innovations implemented. Therefore, possibilities to further stimulate contractors to innovate are to be assessed. Possibilities for doing so are discussed in paragraph 7.3.3. At the same time, in The Netherlands a large percentage of proposed innovations are declined. Thereby, desirability of innovations is an issue that should be addressed, which is discussed in paragraph 7.3.2 below.

Table 12 provides an overview of current practice and the possible improvements.

<table>
<thead>
<tr>
<th>Innovation should take place</th>
<th>The Netherlands</th>
<th>Queensland</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>91 proposed, 50 implemented</td>
<td>48 implemented</td>
<td>Contractor-led</td>
<td></td>
</tr>
<tr>
<td>Improvements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase desirability</td>
<td>Increase Quantity</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Table 12 - innovations should take place, an overview

**7.3.2 Be informed**

**LBC reasoning**

According to the LBC, the principal is to be an informed buyer while the contractor is to be an informed supplier. This implies an autonomous role for the contractor, made possible through the provision of a solution space within which innovations can be developed and necessary in order for creativity to flourish. The principal remains at a distance and responsibilities shift to the contractor. The contractor, in return, advises the principal on all matters whereby the latter no longer is required to possess technical knowledge. The contractor makes use of R&D facilities to deliver its own distinctive range of solutions for problems stated. The principal has knowledge of products available in order to pick the favored solutions and that way remains in control while market creativity is optimized.

**Weaknesses and Strengths**

**Current Practice**

In both Queensland and The Netherlands, development of innovations is contractor-led, while the principal has final word. In order to be creative, all contractors agree a certain amount of freedom is required. Queensland and Dutch contractors both feel free to innovate, but also agree that a further increase of the solution space would be preferred. In The Netherlands, a solution space is provided by the functional demands while in Queensland a solution space only exists trough flexibility of solutions provided.

One issue encountered in both The Netherlands and Queensland is that the vertical dimension of the solution space, value, is not clearly defined. In Queensland, contractors derive value from the strong demand for a safe network and as a result steer innovations towards either
safety or cost reductions. In The Netherlands, value is not defined at all. Contractors argue that with value being undefined, it is difficult to steer innovations towards joint benefit. To ensure desirability of a proposal the principal is involved in the process, whereby contractors no longer act autonomously. In The Netherlands this is done officially, via submittal of a global and indicative proposal while in Queensland an idea is communicated informally. Also, in The Netherlands the format, procedure and assessment criteria of such a proposal are predefined, while in Queensland format, procedure and criteria are attuned to the innovation proposed. Dutch contractors feel the process can be unnecessarily lengthy and complicated, which hampers innovation. In Queensland contractors are satisfied with the flexibility.

Regarding clustering, The Netherlands and Queensland are similar. Contractors cluster innovations, but the principal does not. Dutch contractors make use of dedicated databases. In Queensland contractors take up implemented innovations in the quality system and communicate innovations verbally.

**Discussion**

The goals of RWS (paragraph 5.1.2) and TMR (paragraph 6.1.2) set out the same guideline; the principal is to steer from a distance. In the current situation, steering lacks with value not being clearly defined. As a result, in The Netherlands innovations divert from what is desired and are thereby declined. In Queensland, all the works are prioritized towards safety. Safety therefore is considered a functional demand. But functional demands are both safeguarding and limiting value and therefore not necessarily represent what is value. As a result, currently the principal advises the contractor instead of the other way around. Not so much on the technical level, but on policy.

Another important aspect opaque to the contractor is the regulations. Regulations exceed single projects, whereby importance of clarity increases.

Innovations come in many different shapes and sizes, as shown by the lists provided in appendix G. The flexibility of the Queensland process is in keeping with this variability. Thereby, innovations that do not require an extensive assessment procedure can be implemented fast. In The Netherlands, where contractors feel procedures can be unnecessarily lengthy and complicated, flexibility is hampered by the absence of mandates on project level. Main reasons is higher management being responsible for ensuring coherence with network strategy. The focus of a project team is on project scope on an operational level and is therefore not occupied with strategic choices that concern the network as a whole.

With the principal to pick the right solutions, the principal should have knowledge of the innovations available on the market. Clustering innovations is required to become fully aware of market supply. Only then, full use of innovation can be made: trough benchmarking and comparing innovations and by allowing use to be made of innovations in other projects as well. Regarding the latter, the principal is to have intellectual ownership over innovations, whereby it is required that the contractor is remunerated for the development thereof. Currently, contractors do cluster innovations. Also, in the past innovations were clustered in Queensland. Dedicated databases used in the past could serve as an example for taking up such a system.

If innovations are to be compared to one another, the quality of innovations is to be scored. Therefore, value is not only to be defined but is to be made quantifiable as well. By definition, an innovation is something new to the project. Its unpredictable character makes it difficult to
define a system for quantifying value. Also, it should be taken into account that if the contractor is aware of the scoring of such a system, creativity could be hampered.

In neither The Netherlands nor Queensland, contractors came up with families of products, as envisioned by the LBC. Only one of the contractors has developed a dedicated R&D department. In Queensland, where the shift has been made over 1.5 decade ago, the private contractor (the only Queensland party in pursuit of profit) has specialized towards asphalt related products. The principal regarding this specialization as an important benefit of the collaboration (e.g. being able to put challenges with the contractor and the implementation of new techniques) indicates such a set-up is advantageous for both parties. In The Netherlands, the shift has just been instigated; such a change perhaps is yet to come.

From problem issue to success factor

In The Netherlands the stewardship role should be taken up so that a contractor becomes committed to the project, which should result in a natural longing to innovate. Thereby, Dutch contractors become informed of the requirement to take up responsibility of the network as being the owner. In Queensland, stating in the contract the need for innovation should compensate current lack of focus. Dutch and Queensland contractors being informed on these subjects will create an incentive to innovate, further discussed in paragraph 7.3.3.

In order to decrease chances of innovations being declined and to facilitate a contractor acting autonomously, RWS is to define what is value with regard to innovations. TMR is to do the same, to ensure innovations are steered towards value instead of towards the functional demand. This will facilitate steering from a distance. Value should be specified towards the end-user, as benefit is to be for the account of the end-user. The more detailed value is defined, the less freedom remains for the contractor to be creative. Therefore, balance is required. Lessons can be learned from the functional demands: by defining value in such a way that a solution space is created, steering is provided without putting in the details. The Zeeland case, where value is defined operationally, provides a set-up. Worked out improvement-propositions here are assessed on seven criteria, being: safety, traffic flow, sustainability, public needs, image of RWS, dissemination of information and costs. Communicating these criteria, the concept of value is made concrete, thereby allowing the contractor to take on a pragmatic approach in steering innovation towards value increase. The Zeeland case even provides for a set-up in making value measureable. An improvement-proposition is, on each criteria, assessed on both negative and positive risks; a representative sum of money is attached to these risks and chances of those risks firing are calculated. Multiplying chance with effect, and adding these up for each criteria, the effects are quantified, allowing for the benchmarking of improvement-propositions.

With value defined, deviation of innovations from what is desired should decrease. Still, as long as contractors do not produce fit-for-purpose innovations that come with guarantees, assessment procedures remain necessary. With innovations coming in many shapes and sizes, the Dutch process for innovations should be made more flexible. This facilitates implementation of innovations proposed, through time and cost savings. Also, it will increase contractor satisfaction about the process. Possibilities for providing mandates on project level while coherence with network policy is safeguarded should be investigated.
To further increase freedom for creativity, in The Netherlands aspect demands should be stated functionally. In Queensland current demands should be reshaped into functional demands, whereby the Dutch contract could serve as example. In both societies knowledge gaps that exist with regard to the regulations should be addressed, discussed further in paragraph 7.3.4.

Currently, being unaware of market supply, the principals are not informed buyers. Therefore, the principals should start clustering. This will enable making use of innovations that have proven to be efficient in other projects and at the same time facilitate the assessment of newly developed innovations through benchmarking.

Table 13 below summarizes the findings described in this paragraph.

<table>
<thead>
<tr>
<th></th>
<th>The Netherlands</th>
<th>Queensland</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Be informed</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functional demands</td>
<td>Adaptable demands</td>
<td>Demand for increase of freedom</td>
<td></td>
</tr>
<tr>
<td>Principal consulted</td>
<td>Principal informed</td>
<td>Value not clearly defined</td>
<td></td>
</tr>
<tr>
<td>No R&amp;D</td>
<td>R&amp;D with private contractor</td>
<td>No families of products</td>
<td></td>
</tr>
<tr>
<td>Static process</td>
<td>Flexible process</td>
<td>Contractor clusters, principal not</td>
<td></td>
</tr>
<tr>
<td><strong>Improvements</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take up stewardship role</td>
<td>State need in contract</td>
<td>Define value</td>
<td></td>
</tr>
<tr>
<td>State aspect demands functionally</td>
<td>State demands functionally</td>
<td>Increase solution space</td>
<td></td>
</tr>
<tr>
<td>Make process flexible</td>
<td>-</td>
<td>Cluster</td>
<td></td>
</tr>
</tbody>
</table>

Table 13 - Be informed, an overview

7.3.3 Both should have something to gain

LBC reasoning

According to LBC theory, both parties should benefit from innovation. The contractor should be able to make profit. Being a contractors’ core value, with execution of an innovation a certain profit is to be calculated on top of the price margin, thereby allowing the contractor to make profit. At the same time, an innovation is to provide benefit to the principal. That way both parties have something to gain; a boundary condition for innovation to flourish.

Weaknesses and strengths

Current Practice

As discussed, in The Netherlands, the contract clearly defines the demand for innovation to take place. In accordance, the Dutch contractors take up the role of supplier of innovation. In Queensland the situation is similar, but the origin of the situation differs. In Queensland, no demand for innovation is stated in the contract. Still, a natural longing to innovate is present, created indirectly by the stewardship role taken up in the contract. Required to act as being the owner of the network, contractors feel responsible for the network to such extent that improving the network and maintenance thereof is a natural state of mind.

In The Netherlands, making profit is the primary incentive to innovate. Contractors can be stimulated in two ways: remunerating execution of the innovation and allowing the contractor (part of) the cost savings resulting from implemented innovations. In The Netherlands, a dedicated budget for initial investment of innovations can exist (from which the contractor can make profit). Where budget is absent, a contractor is allowed the cost...
saved through implementation of an innovation. As became clear in paragraph 3.4, in The Netherlands the works are remunerated lump sum, while in Queensland cost accounting on the basis of unit prices determines remuneration. This difference results in the fact that a Queensland contractor costs saved through implementing innovations are not for the account of the contractor. Therefor, no profit incentives exist in Queensland. The primary incentive to innovate is commitment, stimulated by the stewardship role: with the contractor acting as owner a natural longing to innovate exists. Acting as owner, the goal becomes to strive for the highest quality/cost ratio. Contract extension is an incentive recognized in both The Netherlands and Queensland. The contracts arrange contract extension to be dependant on performance-measurement, recognized by all parties to be a good tool for steering as contractors actively steer on contract extension. However, performance-measurement is done off the top of one’s head in The Netherlands, whereby possibilities to steer are not made use of. Similar to contract extension, in Queensland also past-performance works as stimulus; with past-performance, performance in one project plays a role in tender procedures for other projects, thereby stimulating a contractor to perform in accordance with the stewardship role. Yet another incentive recognized is market position, recognized in both The Netherlands and Queensland; contractors feel that by innovating one can increase status, knowledge and workmanship. Thereby the quality/cost ratio of future tenders can be increased. In Queensland, in the past efficiency requirements were used with the Sole Invitee contract to ensure contractors would constantly search for efficiency improvements. Should these be implemented again, the public contractors feel it would serve as incentive to innovate. One important downside of efficiency gains is that a contractor works towards a certain improvement percentage, while no upper limit should be put to the search for improvement.

Discussion
In The Netherlands, budget being (un)available influences the type of innovations proposed. Innovations are either steered towards increasing quality for a slight increase of costs for execution (from which profit can be made) when budget is available. Innovations are steered towards decreasing costs when cost savings are for the account of the contractor. It shows how making budget available steers the type of innovations proposed. If cost savings are for the account of the contractor, t is not before the next tender that the price is reduced. The end-user does not benefit during the contract time-span. Thus, the possibility to make profit has its pro’s and cons: it increases the amount of innovations proposed at the expense of benefit. The principals should be aware of these aspects, and understand that budget can be used to steer innovations.

In both The Netherlands and Queensland, the contract period limits the time span in which an initial investment can be returned. This influences magnitude of innovations proposed. A conflict of interest is the result: contractors focus on innovations that are paid back within contract time span, while the principal is to safeguard long-term public value.

In The Netherlands, making profit is interconnected with all other incentives recognized. In Queensland, the main incentive recognized is the stewardship role, which is commitment based instead of remuneration based. As a result, in essence a Dutch contractor is innovating in order to make profit while in Queensland commitment to perform is main priority, with making profit being secondary and consequential. This is reinforced by the fact that in The
Netherlands, a clear demand to innovate is stated in the contract. As concluded in paragraph 7.3.2, in Queensland this demand is absent. Thereby, stating the demand in the contract not only puts the on innovation, it serves as incentive as well. For the stated desire to serve as incentive, stimulation to perform as stated is required. Contract extension is such a stimuli, which is dependant on performance-measurement. Thereby, if contract extension is to serve as incentive, taking place of innovation is to be one of the criteria of the performance-measurement. Currently, this is not the case in either The Netherlands or Queensland. In The Netherlands, the contract is extended unless excessive shortcomings have taken place. In Queensland, performance in the stewardship role is one of the criteria; an indirect incentive. It is one of the possibilities put the focus on innovation. In Queensland, past-performance is part of the tender procedure, thereby being closely related to the performance-measurement. But, where performance-measurement no longer is an incentive during the final contract period (when no further extension is possible), past-performance still acts as incentive to perform. In The Netherlands, past-performance is not yet part of the contract.

From problem issue to success factor
In Queensland the focus should be put on innovation; first order stimuli should be created. First and foremost, innovation should be taken up in the contract. In The Netherlands, contractor commitment could serve as a new inventive. Currently, in The Netherlands contractors are focused on making profit. With the current responsibility shift, ideally contractors feel responsible for the quality of the network and not solely for sufficing to demands stated. Even though currently many people regard it to be a utopia, Queensland practice shows it to be possible. The first step would be to take up the stewardship role in the contract. Responsibilities will not change, but it could make the contractor more aware.
Performance measurement and past-performance support the stewardship role. In Queensland, with putting the focus on innovation, it should also be taken up as criterion in the performance-measurement and past-performance. In The Netherlands, performance-measurement is to be defined. Provisions are already made, the right tool is to be developed. Also, past-performance is to be implemented. Innovation and performance in the stewardship role should be a criterion in both in order to stimulate the search for innovations in both a direct and indirect ways.
Table 14 provides an overview of current practice and the possible improvements.

<table>
<thead>
<tr>
<th></th>
<th>NLD</th>
<th>QLD</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strengths and Weaknesses</strong></td>
<td>Focus on innovation</td>
<td>Focus not on Innovation</td>
<td>Longing to increase quantity</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td>Profit can be made</td>
<td>Commitment through stewardship role</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Performance-measurement undefined</td>
<td>Performance-measurement and past-performance support</td>
<td>Continuity, market position</td>
</tr>
<tr>
<td><strong>Improvements</strong></td>
<td>Take up stewardship role</td>
<td>State need in contract</td>
<td>Use performance-measurement and past-performance support</td>
</tr>
<tr>
<td></td>
<td>Apply past-performance</td>
<td>Decide on making profit</td>
<td>Decide on budget</td>
</tr>
</tbody>
</table>

Table 14 - Both should have something to gain, an overview
7.3.4 Parties should collaborate strategically

LBC reasoning
The LBC states that parties should collaborate strategically instead of operationally working apart together. So what does this mean? According to the LBC, it implies the establishment of joint goals and a feasible demand at the start of the project. With joint goals and a feasible demand being clear, an end-goal is established. The second cornerstone of the collaboration is that working towards this end-goal should be on the basis of equality and trust, to be safeguarded by parties sticking to their own roles. The line of reasoning here is that only through trust, a principal is able to step away, allowing the contractor to work autonomously. The third LBC cornerstone for collaboration is openness, to be maximized through extensive communication, especially with regard to core values and critical demands.

Weaknesses and strengths

Current Practice
In The Netherlands, the contract is considered primary. In Queensland the partnership is considered primary while the contract serves as footing for this partnership. Queensland parties are more satisfied with the collaboration then their Dutch colleagues, indicating that in Queensland collaboration is of a higher level.

In Queensland and in the Dutch Zeeland-case, parties work on the basis of a partnering-agreement, by which the desire to put the partnership first is communicated. A joint goal is established whereby both parties’ core values are respected. In Queensland, the network is kept safe for a good quality/cost ratio (core value of the principal), whereby the contractor is allowed to make profit (contractors’ core value) from maintenance activities. The principal trusts the contractor in supplying satisfactorily and remains at distance: control is executed only through monitoring money spend and by performing a minimized number of inspections. This allows the contractor to work autonomously, which shows in the way innovations are developed: the contractor is open about innovations (to be) developed, by which informally innovations can be steered towards maximizing joint benefit. The principal is informed rather then consulted, as is the case in The Netherlands. In Queensland, with the principal having faith in the contractor to supply satisfactorily, demands become adaptable and innovations do not necessarily require an extensive assessment procedure. In return, when assessment is required the contractor trusts the principal to work towards implementation of the innovation. The total shows how strategic collaboration provides for a dynamic atmosphere, which facilitates innovation.

In The Netherlands, no joint goal is established, neither in general nor with regard to innovations. This shows in the way parties work towards the end-goal: in The Netherlands, with value undefined, it is impossible for a contractor to always provide fit-for-purpose solutions. As a result, the contractor cannot work autonomously but is steered by the principal during the development of innovations. And while the principal is consulted even on request of the contractor, it contrasts sharply with Queensland practice, where innovations are seldom declined.
Discussion

The link between the three cornerstones of the collaboration is apparent. One cannot do without the other; the interrelation is shown in figure 21. Openness is required at the start of the project in order to communicate core values and to establish joint goals. Making these crystal clear is essential in order for parties to provide trust and to be equal: how is the principal to trust the contractor in delivering satisfactorily when demand is not clear? Completing the cycle, parties need to work on the basis of both equality and trust: if no trust and equality exist, how can parties be willing to share information? With the principal having last word, inequality and mistrust will lead to the principal telling the contractor what to do. This, in its turn, will impair openness, as the principal is not fully open for ideas put forward by the contractor.

The partnering-agreement plays an important role: at the start of the project joint goals and core values are established. It allows for the principal to communicate desires: putting the focus on innovation (Zeeland-case) or communicating what is value to the principal (Queensland). Again, only with the desires being crystal clear the contractor can supply as demanded, allowing the principal to step away from the process. In the cases where a partnering-agreement was not made use of, communication is more formal and definition of value is more opaque. Apparently, informal communication benefits openness. It is important to recognize that such collaboration allows for strong relationships that exceed project time-span, by which flexibility and thereby steering towards (changing) joint goals is supported. Therefore, strategic collaboration is preferred over static and inflexible, contract based collaboration.

While the above seems to be a clear guideline for collaborating strategically, it must be taken into account that a partnership is not established without tears. The partnering-agreement serves as a basis, through which intentions to collaborate are made clear by both parties. Core values and joint goals can be communicated in partnering workshop. But in order for openness, trust and equality to be generic and to be part of the project, more is required. As the contractors agree, attitudes of those involved make an essential contribution: a professional collaboration is not dependent on the provisions made in the contract but on the intentions of the parties involved. It requires time and effort to create a relationship in which collaboration flourishes. So how to create the intention to put effort and time in collaborating strategically? One precondition is parties being aware of the advantages: if nothing is to gain, no incentives exist.

From problem issue to success factor

In conjunction with the Queensland setup, a partnership should be created in The Netherlands. In order to create a partnership from the start, parties need to be aware of the advantages as soon as possible. Therefore, at the start of the project, it should be made clear to all how trust and openness are required to share core values and to establish joint goals. It should also be made clear how maintaining openness, trust and equality during the project is
required to maintain working towards joint goals. The benefit to be gained is that in the end the joint goal is reached.

Other incentives that might be made use of are performance-measurement and past-performance. If the way parties collaborate is taken up as criteria, an incentive to let go of the old game of cat and mouse is created. Also, in order to support equality, performance-measurement should go both ways: if parties are to collaborate, the principal is to try to be an efficient partner as well and to regard the opinion of the contractor equally important.

In The Netherlands, the PSU is the equivalent of Queensland partnering workshops. However, so far the PSU workshops have not established the same result. The PSU does provide a basis similar to the Queensland partnering workshop. Importance of the PSU is perhaps underestimated. It should be explored what is preventing the PSU from having the intended result. Important here is to recognize that during the PSU, openness should be maximized, so that parties can honestly communicate core values, by which joint goals can be established. Equality and provision of trust during the project should be agreed upon to safeguard openness and the quest for joint goals while the project is underway.

In line with the LBC guidelines on collaboration (paragraph 4.3.3) and the findings of current practice (paragraph 7.3 and 7.1), openness is understood to be the communication of the variables and constants of the solution space: both value and the boundary conditions should be crystal clear to the contractor. Knowledge gaps currently exist. If these gaps are pinpointed, the principal can provide to the contractor the information required.

Currently, the principal is still involved in the (innovative) process of the contractor. The principal is to understand that only by letting go the contractor will learn to act independently, thereby taking up responsibility. Chances are that R&D facilities are developed and that families of beneficial and innovative products are developed, just as with all other consumer markets.

Table 15 provides an overview of current practice and the possible improvements.

<table>
<thead>
<tr>
<th>The Netherlands</th>
<th>Queensland</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Practice</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract primary</td>
<td>Partnership primary</td>
<td>Collaboration facilitates innovation</td>
</tr>
<tr>
<td>Collaboration is secondary</td>
<td>Collaborating is second nature</td>
<td>Partnering-agreement supports</td>
</tr>
<tr>
<td>No joint goal</td>
<td>Joint goal, no focus innovation</td>
<td>Value required to set joint goals</td>
</tr>
<tr>
<td>PSU insufficient</td>
<td>Informal steering possible</td>
<td>-</td>
</tr>
<tr>
<td><strong>Improvements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use partnering-agreement, define joint goals</td>
<td>Make innovation joint goal</td>
<td>Collaborate towards innovation</td>
</tr>
<tr>
<td>Make aware of benefits</td>
<td>-</td>
<td>Interrelation between trust &amp; equality, openness and core values &amp; joint goals</td>
</tr>
<tr>
<td>Performance-measurement and past-performance support</td>
<td>-</td>
<td>Define value</td>
</tr>
</tbody>
</table>

Table 15 - Collaborate strategically, an overview
7.3.5 Towards a better future

Taking the previous paragraphs into account, it becomes clear how the old situation is to change towards the new. Laid out above, overview is provided below in table 16 and 17.

<table>
<thead>
<tr>
<th>The Netherlands</th>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovations deviating from what is desired</td>
<td>Fit-for-purpose innovations benefit the user</td>
<td></td>
</tr>
<tr>
<td>Innovations steered on maximizing profit</td>
<td>Innovations steered towards maximizing benefit</td>
<td></td>
</tr>
<tr>
<td>The contractor focuses on sufficient to quality</td>
<td>The contractor is committed to deliver quality</td>
<td></td>
</tr>
<tr>
<td>One static process for all innovations</td>
<td>A dynamic process which adapts to innovations</td>
<td></td>
</tr>
<tr>
<td>Value is unclear</td>
<td>Value management creates clarity and coherence</td>
<td></td>
</tr>
<tr>
<td>Performance-measurement and past-performance absent</td>
<td>Past-performance and performance-measurement underline and support intentions</td>
<td></td>
</tr>
<tr>
<td>Principal is uninformed buyer</td>
<td>Principal has market knowledge, innovations are shared</td>
<td></td>
</tr>
<tr>
<td>Contractor desires profit, principal desires benefit</td>
<td>Both strive for user benefit, contractor can make profit</td>
<td></td>
</tr>
<tr>
<td>Contract primary</td>
<td>Partnership primary</td>
<td></td>
</tr>
</tbody>
</table>

Table 16 - The Netherlands, old versus new

<table>
<thead>
<tr>
<th>Queensland</th>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus not on innovation</td>
<td>Innovation is the improving current practice</td>
<td></td>
</tr>
<tr>
<td>No direct incentive present</td>
<td>Contract states demand, past-performance and performance-measurement support</td>
<td></td>
</tr>
<tr>
<td>Little innovations takes place</td>
<td>Many fit-for-purpose innovations benefit the user</td>
<td></td>
</tr>
<tr>
<td>Value aimed on functional demands</td>
<td>Value management creates clarity and coherence</td>
<td></td>
</tr>
<tr>
<td>Principal is uninformed demands</td>
<td>Principal tapped into industry, innovations are shared</td>
<td></td>
</tr>
</tbody>
</table>

Table 17 - Queensland, old versus new

7.4 Observations

Here, a critical observation on both theory and current practices is provided. Shortcomings are defined here, serving as a basis for the recommendations made in the next chapter.

Australia, land of promise?

Many regard Australia as the land of promise on the level of asset management. Queensland, one of the seven states of Australia, was involved in this research as a stepping-stone to investigate asset-management principals regarding innovation in road maintenance. Queensland parties are more familiar with performance-contracts then their Dutch equivalents; contractors know it is their role to take up responsibility of the network and the years of experience have taught these contractors how to take up this role. Thereby, the principal is able to provide trust and steer from a distance. In the basis, the principal is in a position of high power: with remuneration being on the basis of work performed the principal has last word on activities to be performed.

In Queensland advanced asset management strategies were expected to be found, such as aspect systems for recording innovations proposed and implemented, or system specifications determining the relation between value, price and costs. However, for a large part such systems are absent, one of the reasons being that the focus is not on innovation. This lack of focus contradicts the desire to increase the amount of innovations implemented. Currently, no first order stimuli to innovate exist. Also absent is value management, by which...
contractors are unable to steer innovations towards maximizing public benefit. Defining value is not only important to steer the contractor, it is also required to make the principal aware of how innovation best benefits the network and user thereof.

**The Netherlands, a long way to go?**

In The Netherlands, the shift towards contractor-led innovation has been made. Many innovations are proposed. Still, there are some aspects that could be improved, important as the principal declared the desire to further increase the amount of innovations implemented. First and foremost, similar to the Queensland situation, a clear definition of value lacks, whereby contractors are unable to steer innovations accordingly. This inhibits autonomous handling of a contractor and diminishes desirability of innovations proposed. The change towards functional demands has resulted in the fact that contractors feel free to innovate. Still, a demand for an increase of freedom is present. Currently, freedom is hampered by the regulations and the aspect demands. Another aspect hampering innovations is the process being static, which is causing procedures to be unnecessarily lengthy. With innovations being contractor-led, it is up to the principal to decide which innovations are to be implemented. However, without knowledge of market supply and without a system for benchmarking innovations, currently the principal is not able to make an informed decision. On the level of collaboration, the way parties act towards each other is contract based. The goal towards innovation differs; the contractor strives for profit while the principal, striving for public benefit, tries to limit contractor profit. This sometimes results in a game of cat and mouse, as with the former contract. Collaboration thereby is not yet optimal. The PSU is to form the basis for the collaboration and during the meetings joint goals are to be established. However, currently innovation is not steered towards a joint goal.

The change in The Netherlands seems to be going well. Contractors are willing to change albeit partly by force, not really being left a choice. RWS has prepared itself well for the change. Still, here it is determined that in order for innovation to flourish, willingness to change is now required from the principal as well. On the bright side; timing is excellent. Or to speak in the words of Rohm Emanuel: "never let a serious crisis go to waste, it’s an opportunity to do things you couldn’t do before”.

**Two strategies, not so different**

Both The Netherlands and Queensland have their strengths and weaknesses and both can learn from each other. Still, it can be concluded that overall, Dutch current practice does not differ much from Queensland strategy, quite an accomplishment for two societies located at opposite ends of the world. Perhaps one of the reasons is that the Dutch principal has copied of its neighbor Great Britain asset management principles. Apparently, applying Anglo Saxon principles in a Rhine-capitalist culture can be done.
The Living Building Concept

According to the LBC innovation is required to maintain consistency between product and environment. Both practices show this to be the case, with efficiency and effectiveness of both maintenance and the product being improved. The LBC desires innovations to be contractor-led, whereby the contractor acts autonomously. Difficulties exist here, as the concept of value is undefined. According to the LBC, parties should discuss clearly the demand of the project. Concomitantly, the demand for innovation is discussed. Yet, this research has shown this is to be supplemented by a discussion in what is value.

Following the LBC strategy, both parties should benefit from innovation. The contractor is provided profit, at the expense of public benefit. This research has indicated that with regard to innovations, multiple other incentives exist. Making use of these incentives could diminish a contractors desire to make profit from each intervention. This increases public benefit.

According to the LBC, with the current change contractors will start making use of their own R&D facilities to deliver a distinctive range of products. Queensland current practice has shown this to be the case: the private contractor has specialized towards asphalt related products. The principal regards this specialization as an important benefit of the collaboration (e.g. being able to put challenges with the contractor and the implementation of new techniques). This indicates such a set-up is advantageous for both parties. In The Netherlands, the shift has just been instigated; such a change perhaps is yet to come.

Lastly, it should be noted that the strategic collaboration, as envisioned by the LBC, very much resembles the way Queensland parties collaborate. In Queensland this has led to the fact that the partnership is primary to the contract. This allows for joint goals to be reached, as contractual demands and processes become flexible. No game of cat and mouse is played. Perhaps regarded by some as a utopia, such harmony just might be possible in The Netherlands as well.
8 Conclusions and Recommendations

In this chapter the conclusions and recommendations drawn up in the previous chapter are summarized. Thereby, the reader is treated to overview on the outcomes of the research.

8.1 Conclusions

Innovation takes place

The Netherlands

In total, 91 innovations were proposed in just two projects in two years. Over half of the innovations proposed (50 in total) have been put into practice.

Queensland

In the whole of Queensland 48 implemented innovations were recorded in one year.

The Contractor supplies

The Netherlands

Innovations are contractor-led. With the demand clearly stated in the contract, the focus is on innovation. Contractors actively search for improvements and feel free to innovate. This is facilitated by the solution space, created by the functional demands.

Queensland

Innovations are contractor-led. A natural longing to innovate exists, established by the stewardship role, which creates commitment, The process is flexible, allowing it to be adaptable to innovations proposed, which saves time.

Both parties benefit from innovation

The Netherlands

A contractor can benefit, created by the possibility to make profit, which functions as primary stimuli to innovate. Another strong gain is continuity: the prospect of contract extension naturally stimulates a contractor to suffice to the contractual demand to innovate. Another gain (and thus incentive) is market position: through innovation company status and reputation can be improved. The end-user benefits as innovations improve efficiency and effectiveness of both maintenance and product.

Queensland

Pride and continuity are main gains for a contractor. Both stimulate innovation: optimizing (maintenance of) the product creates pride and continuity can be ensured by good stewardship (which creates a natural longing to innovate), being a criterion in past-performance and performance-measurement. For private contractors, another gain (and thus incentive) is market position. Innovations improve efficiency and effectiveness of both maintenance and product, thereby providing end-user benefit.

Collaborate

The Netherlands

A project-team start-up is used to form the basis of the collaboration. The Zeeland case has shown that strategic collaborating facilitates innovation: willingness to adapt is present and parties work towards a joint goal, established by respecting the other parties’ core values. Here, a partnering agreement efficiently underlines intentions.

Queensland

The partnership is primary, which allows for dynamic processes, informal steering and sharing of information. Parties work towards joint goals and respect the other parties’ core values, communicated through openness and safeguarded by trust and equality. Partnering workshops form the basis of this strategic way of collaborating.
8.2 Recommendations

**The Netherlands**

A stewardship role should be taken up in the contract. It will commit a contractor to take good care of the network, thereby creating a natural longing to innovate. Opportunities to make use of past-performance should be investigated. Innovation should be a criterion in performance-measurement and if possible in past-performance as well, thereby creating extra incentives for a contractor to innovate.

**Stimulate**

The demand to innovate should be taken up in the contract. Concomitantly, taking place of innovation should be a criterion in past-performance and performance-measurement. This puts the focus on innovation and underlines its necessity. Thereby, contractors will start to actively develop innovations, whereby the total number of innovations proposed will increase.

**The Netherlands**

The principal should define public value operationally. That way, fit-for-purpose solutions can be created. This allows the principal to step away from the process, allowing the contractor to act autonomously. The principal should store and score innovations in a database, to gain market knowledge. This will enable the principal to make an informed decision and to share innovations with other, similar projects.

**Steer**

The principal should define public value operationally. That way, fit-for-purpose solutions can be created. This allows the principal to further step away from the process, allowing the contractor to act autonomously. The principal should store and score innovations in a database, to be tapped into the industry. This will allow the principal to pick the right solution to make use of innovations in other, similar projects.

**Facilitate**

The detailed aspect demands should be defined functionally to increase freedom in design. Mandates should be provided on operational level, bringing about a dynamic process, adaptable to the innovation proposed instead of the other way around.

**The Netherlands**

Quality, currently safeguarded by stating a predefined solution for each problem to be encountered, should be defined by stating demands functionally. This will create a solution space within which the contractor can search for innovations.

**Queensland**

With parties striving for joint goals already, innovation is to be made on of these joint goals. This will put the focus on innovation, thereby stimulating the contractors to search for improvements.

**Collaborate**

The PSU should create a strategic collaboration: parties should be made aware of the benefits. A partnering-agreement should underline the intent to put the partnership first. Making collaboration a criterion in performance-measurement and past-performance should create another incentive. The total will result in a partnership coming into existence.

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Maarten Lindenbergh

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Definitions and Abbreviations

Definitions

Activities: part of the scope of the Dutch contract, concerning object or route related, non-routine actions necessary to correct determined shortcomings to the desired quality level

Activity standards: the description and administration of activities, including work planning and procedures

Actor: any person or organization that can be positively or negatively impacted by or cause an impact on the project.

Contractor: the legal body, responsible for executing the works and all activities that are necessary in order to do so.

Core values: the principal goals of a company, these reflect its essence

Client: see principal

Defect: any deficiency in the condition of the product.

Discretionary changes: changes made to the quantity of an activity or network Schedules to reflect the needs of the product. See paragraph 3.3.2

Efficiency: the ratio of output to the input of any system

Forward list of work: the list of work on the network

General intervention level: the magnitude of a Defect for undertaking routine maintenance indicating the need for rectification action.

Innovation: a change, not applied before in the same project, to the product, the process or resources, intended to improve the quality/and or of the product and/or the process.

Intervention level: the Initial Intervention Levels and General Intervention Levels

Improvement-proposition: a proposition, proposed by the contractor, to improve long-term (maintenance) functionality of the highway infrastructure process, system or product.

Levels of Service: parameters or requirements for a particular activity or service area against which performance may be measured.

Main roads: roads maintained under the contract, thus owned by the Nation or State

Maintenance: activities under the contract: required for preserving the products’ quality.

Network: those roads included in the contract

Network Schedule: the remuneration agreed upon for completing of an activity.

Network Schedule Total(s): the amount(s) of money agreed upon for completing all activities.

Network stewardship role: one of the roles defined in the Queensland performance- contract. See paragraph 6.2.1

Open competition: a type of contract used in Queensland to contract out road maintenance to both private and public contractors. See paragraph 3.3.4.

Partnering-agreement: statement of intent to collaborate, signed by parties at the start of a project. Dutch and Queensland arrangements differ: see paragraphs 5.3.1 & 6.2.5

Past-performance: rating of a contractors’ performance in other, similar projects, plays a part in the tender procedure with rating the tender offer.

Performance-contract: While multiple variations of this contract exist, here it is defined as the contract with which routine road maintenance is outsourced.
**Performance-measurement:** a tool for assessing the performance of a contractor in a project.

**Principal:** the legal body, responsible for contracting the works and all the activities that are necessary in order to do so.

**Process:** the whole of maintenance processes, described in the project management plan, plus all processes between stakeholders

**Product:** All objects, subject to the maintenance process and system

**Project:** A single road management contract, starting at the signing of the contract and ending with the determination thereof.

**Project Management Plan:** document containing all measures and strategies for implementing those measures, necessary in order to execute and control the works

**Quality-system:**

**Response times:** the time to commence an Activity once the Intervention Level for the related Defect has been reached.

**Routine maintenance:** works performed under the Performance-contract, see paragraph 3.3.2.

**Services:** part of the scope of the Dutch contract, concerning process related and supporting services that are not directly related to the maintenance, but concern relieving the workload of RWS

**Sole Invitee:** a type of contract used in Queensland to contract out road maintenance to public contractors. See paragraph 3.3.4.

**Solution space:** the set of boundaries, specified in the contract, that define the limits for designing the maintenance management plan.

**Stakeholder:** any person or organization that can be positively or negatively impacted by or cause an impact on the project.

**Stewardship role:** see Network stewardship role

**Supplier:** see contractor

**System Directed Contract Governing:** method of integral project management, described in the project management plan.

**Tasks:** part of the scope of the Dutch contract, concerning regular and routine works, of which the time span can be determined within reasonable limits.

**Works:** the between principal and contractor agreed design and execution activities, set by the contract and to be performed by the contractor;

**Abbreviations**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E&amp;T</td>
<td>Engineering and Technology Department</td>
</tr>
<tr>
<td>I&amp;M</td>
<td>The Dutch Ministry of Infrastructure and Environment</td>
</tr>
<tr>
<td>LCC</td>
<td>Life Cycle Costing</td>
</tr>
<tr>
<td>PIM</td>
<td>Partner-program Infrastructure Management</td>
</tr>
<tr>
<td>PSU</td>
<td>Projectteam start-up (Project-team start-up)</td>
</tr>
<tr>
<td>RAW</td>
<td>Rationalisatie en Automatisering en de Grond, Water-, en Wegenbouw (Rationalisation and Automation in Construction)</td>
</tr>
<tr>
<td>RWS</td>
<td>Rijkswaterstaat, Directorate General of I&amp;M</td>
</tr>
<tr>
<td>TMR</td>
<td>Department of Transport and Main Roads</td>
</tr>
<tr>
<td>TU-Delft</td>
<td>Delft University of Technology</td>
</tr>
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</table>
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