MSc Thesis
OUTSOURCING MAINTENANCE OF ROAD INFRASTRUCTURE IN UGANDA
Performance-Based Contracting in Sub-Saharan African Context

J.P. van Ham
Delft University of Technology
August 2015
Cover image: roadside view at S 1° 05'07" E 29° 37'54"
Preface

This thesis is part of a graduation process based on the CME2000 Graduation Thesis Guideline (2014) by Verlaan and Schoenmaker to finish the 3TU-CME MSc program at the Delft University of Technology. The process includes a number of activities listed in the guideline. The weight of the graduation project is 32 ECTS. The findings in this thesis are based on data sources including documents, observations and 20 expert contacts and semi-structured interviews from a field visit to Uganda between September and November 2014. The topic has followed from a strong interest in infrastructure systems and emerging economies, particularly in Sub-Saharan Africa. It also follows from an interest in performance-based contracting (PBC) for road maintenance, which was an element of the 2013-2014 MSc course Integration and Orientation (CME1210) whereby different approaches for tackling multidisciplinary design, engineering and management challenges were dealt with within a framework of asset management. COWI A/S, an international consulting group specializing in engineering, environmental science and economics, has been contacted following on their involvement in PBC (pilot) projects for road maintenance in African countries. Uganda is the first in Eastern Africa to pilot PBC on a key corridor. Initially discussing the challenges and constraints of the environment, the contracting type and their combination, together with the idea to ultimately mainstream practices (a way of dealing with outsourcing maintenance of a road network instead of a single road), the outline of the problem-solving project has been drawn. I like to gratefully acknowledge COWI, UNRA, DIMI, the Graduation Committee and all others that have supported the project.

Copenhagen, August 2015
(this page was intentionally left blank)
Summary

Introduction: problem, goal and question
Challenged by limited resources, reforms and an increasing public demand for improved service levels, road administrations around the world are forced to develop and maintain infrastructural functions more effectively and efficiently. Succeeding the international exchange of practices and ideas, both developed and developing countries are thereby advancing to performance-based contracting (PBC).

Uganda’s road infrastructure investments in the past mainly focused on road development. Road maintenance has been underfunded and attracting little attention, resulting in a practice characterized as *build and collapse*. Development partners support Uganda through *Road Sector Development Programs* (RSDPs) as Uganda faces difficulties to make road infrastructure meet realistic standards. RSDP3 (FY 2012-2022) emphasizes the involvement of the private sector. The role of Ugandan road agencies thereby shifts from ‘micromanager’ to that of ‘strategic manager’ and becomes confined to planning, policy and regulation.

Uganda is now the first in Eastern Africa to pilot a performance-based maintenance contract on a key corridor. It includes 340km of a trunk road linking South Sudan, parts of the DRC, northern and eastern Uganda to the port of Mombasa in Kenya. Financed by World Bank, the nine-year contract is based on the World Bank *Output and Performance-based Road Contract* (OPRC) concept.

The 2014 *Review of Performance Based Contracting in the Road Sector* led by OPUS and commissioned by World Bank points out however that a tendency for a ‘one-size-fits-all’ approach to implement such concept is not the way forward to make PBC succeed in different contexts and selection of an appropriate PBC type requires taking into account country-specific characteristics. Locally a mismatch seems to exist for example between an underdeveloped local construction industry and the requirements for the OPRC valued at USD 251 million. Next, if an OPRC is considered successful, the challenge remains to make an infrastructure development project like this go beyond ‘islands of success’. A way of dealing with outsourcing maintenance of a road network instead of a single road in line with the new philosophy is still missing.

This thesis has the following overall aim: *to explore an integrated approach for outsourcing maintenance of road infrastructure in Uganda, taking into account the country’s specific characteristics*. Therefore the research present findings which give an answer on the problem definition: *what could an integrated approach for outsourcing maintenance of road infrastructure in Uganda look like, taking into account the country’s specific characteristics?*

Methodological approach
The target is constrained to PBC. This means choosing an appropriate PBC-type in line with an appropriate outsourcing degree. A PBC is not seen as ‘a goal in its own right’ but as means to achieve asset management objectives. This way this research is an exploration about possibilities in line with result-based financing strategies introduced in Uganda. The research is characterized by an open-ended inquiry about the object of interest.

The research orientation includes the road network, the agenda outline and the environmental and cultural aspects. An appropriate PBC-framework is also seen to require insight in local industry issues, management issues and legal issues. A case study thereby
seemed an appropriate strategy to uncover what stands in the way of / interferes with meeting realistic standards.

The findings tell the story of two occurrences: (1) the everyday business through force-account and FIDIC / FIDIC-inspired input contracts (admeasurement contracts) and (2) the ongoing OPRC pilot, introducing interventions in the everyday business that aim to make Uganda advance on road infrastructure performance. Next, an interpretation of these findings follows. The analysis uses the idea of a cause and effect diagram whereby problem areas impacted by OPRC are highlighted and evaluated. Theoretical perspectives that were (initially) seen relevant are used to explain what is happening / what different viewpoints on what is happening. The two occurrences are compared along with a key problem brought forward by each of the perspectives, resulting in a statement about a preferable way to deal with the key issue. Although the (complex) environment eventually did not seem to correspond well to the conceptual framework, the key problems that are drawn from the perspectives nevertheless seem relevant.

Findings are based on data sources including documents, observations, expert contacts and semi-structured interviews from a field visit to Uganda between September and November 2014. A primary technique of data collection in this thesis is a semi-structured interview guide with direct (participative) observations (prior consent given) that yield qualitative data, extended with documents (both qualitative and quantitative data).

What is the object of outsourcing?
The object of outsourcing is maintenance of the UNRA network. It includes road related assets and items that are to be maintained within the road reserve / up to right-of-way limits. Activities include rehabilitation, routine and periodic maintenance activities, improvement and emergency works. The UNRA network is the classified national roads network. It includes trunk roads (original network) and feeder roads (mostly additional network, previously part of DUCAR). Together with the remaining DUCAR network, it forms Uganda’s public road network. It includes roads with different functional classes. Design standards and service level standards are directed by the functional class and traffic volumes of different vehicle types in different types of terrain. Trunk roads are typically paved. Feeder roads are typically unpaved. The original network is mostly in fair condition. The additional network is mostly in poor condition.

Empirical findings: what are the specific characteristics to take into account?
A PBC framework is seen to require insight in local industry issues, management issues and legal issues. This uncovers what stands in the way of / interferes with meeting realistic standards. These constraints are the characteristics that follow from the empirical analysis.

Three critical themes seem to cause that Uganda faces difficulties to make road infrastructure meet realistic standards: (1) insufficient maintenance (and other activities), (2) low quality interventions and (3) an underdeveloped local construction industry. Four critical consequences follow from the research orientation: (1) safety issues, (2) reduced asset value, (3) restrained market access and (4) increased vehicle-operating costs.

The critical themes create the outline of a situational analysis. Insufficient maintenance and other activities are understood to result from underfunded maintenance, increased cost and delayed activities, all due to funding issues (there seems a steady allocation to road infrastructure overall but an under-allocation to maintenance with late releases) on the one hand and strategic issues (incoherent strategies and insufficient capacity) on the other hand. Low-quality interventions are seen as a result of deficiencies in both planning and design
related activities and delivery related activities. Regarding an underdeveloped local construction industry, local contractors seem unable to take part in contest, outcompeted by force account or international contractors and over-exposed to risk.

Problem areas impacted by OPRC are evaluated next. Key interventions so far are a shared and updated asset inventory, securing long term funding for maintenance activities and emphasis on supervision. A considerable investment is made in the resources necessary to introduce OPRC in Uganda. OPRC includes institutional support (training and knowledge transfer) and provides learning possibilities for local consultants from international expertise. Areas that seem positively impacted so far include the first two critical causes and the last three critical consequences. Safety issues are not included for the reason that overloading measures have not yet been implemented. Another critical theme where the OPRC pilot falls short is an underdeveloped local construction industry. The authorities experience difficulties to outsource activities to local service providers and particularly for (routine) maintenance activities this seems problematic.

The situational analysis can be used to evaluate other PBC-strategies than OPRC. It allows evaluating to what extent the targeted framework deals with the multidisciplinary design, engineering and management challenge.

**Theoretical implications: what are the specific characteristics to take into account?**

Theoretical perspectives that were (initially) seen relevant are used to highlight what is happening / what different viewpoint on what is happening they provide. To do so, each perspective brings forward a key problem. Findings from the field are compared along with the theoretical perspectives, resulting in a statement about a preferable way to deal with the key problems. Like mentioned, although the (complex) environment eventually did not seem to correspond well to the conceptual framework, the key problems that are drawn from the perspectives nevertheless seem relevant.

**Transaction cost economics (TCE):** TCE’s rationale is that decision makers choose whatever governance structure minimizes the transaction costs. This does not seem to explain OPRC, namely because of the required monitoring resources for a single road covering a larger (remote) geographical area. The insight is taken over that the focus should not only be on transaction costs, but also on transaction benefits. Findings show that knowledge transfer is an important aspect of the OPRC. Uncertainty is taken as a key problem to evaluate the transaction. Uncertainty seems a more relevant element of TCE to evaluate the transaction agreement. In line with behavioural and environmental uncertainty and the limited local capabilities a preference seems to remain to specify the what, when and/or how of maintenance activities. The resulting hybrid nature of the piloted PBMC seems to remain a preferable way to deal with uncertainty.

**Agency theory (AT):** Information asymmetry is taken as a key problem to evaluate the contract. Compared to the everyday business, with OPRC the problem of information asymmetry is limited by steering on results. Information asymmetry still exists, but the impact of its consequences is limited. Also the interaction / ex-post flexibility is limited. Shifting from ‘micromanager’ to ‘strategic manager’ the performance measures that have in the pilot contract been specified with great detail may over time become more abstract or diverging from well defined to ill defined, resulting in more ex-post flexibility and requiring more interaction and participation and a more hybrid form of contract.

**Performance measurement (PM):** Measurement complications are taken as a key problem. Monitoring in the everyday business is characterized by visual inspection and interaction to
‘measure’ contractor performance. OPRC introduces a complex PM system that is primarily oriented on payment reduction. It has a limited variety of indicators and limits interaction. Interaction however is believed to be an important characteristic of PM. If matching the complexity of the PBC to a less developed construction industry it seems to make sense to start with simple measures and interaction.

*Formal / informal institutions:* Ugandan political reality seems to demonstrate the key problem of a mismatch between formal and informal institutions on top level. This seems due an underlying competing informal institution. This underlying could have been an accommodating informal institution if formal institutions were effective. A preferable way to deal with the key problem would then be to (1) design effective formal institutions and (2) take account of the informal institutions.

**Conclusions and recommendations**

This part synthesizes the findings which give and answer on the problem definition: *what could an integrated approach for outsourcing maintenance of road infrastructure in Uganda look like, taking into account the country’s specific characteristics?*

The integrated approach is about a way of dealing with outsourcing maintenance of a road network instead of a single road whereby the target has been constrained to PBC. This means choosing an appropriate PBC-framework in line with an appropriate outsourcing degree.

The research orientation includes the road network and cultural aspects among the context. Overall the orientation outlines that an appropriate PBC-strategy could advance on the rehabilitation required before maintenance and an interactive community-based approach. It can be challenging that the object of outsourcing includes maintenance of paved and unpaved roads with different functional classes and conditions, although for PBC it seems an advantage that overall rehabilitation is required to bring the required function up to pre-defined standards / a maintainable condition first. *Build and collapse* this way changes to *rehabilitate and maintain*. Multiple activities under the same contract and public procedures are believed to reduce corruption and increase transparency. With the pilot project considerable resources are allocated to managing and monitoring a single facility in a larger (rural) area. Alternatively the resources are allocated to managing and monitoring multiple facilities in the same area at the same time for greater efficiency. Involving roadside communities allows including both road users and workforce in the approach. Further, cultural dimensions indicate that Ugandans seek to fulfill a useful role in their local communities. Ugandans are understood to have a short-term orientation, while at the same time some future orientation is supposedly included following from securing a continuous income, community commitment and remaining with one organization for most of the working life. For a management style the dimensions suggest involvement in decision-making, more direction and clear procedures together with disciplinary actions. This seems to match a strategy that uses straightforward requirements and an interactive community-based approach that links reward to performance and assures long-term funding.

Further insight in local industry issues, management issues and legal issues uncovers what stands in the way of / interferes with meeting realistic standards. These constraints are the characteristics that followed from the empirical analysis. Overall the analysis outlines that an appropriate PBC-strategy requires not only including performance improvement areas related to the critical themes of insufficient maintenance and low-quality inventions but also to the critical theme of an underdeveloped local construction industry. The *problem mess* following from the case study on the everyday business and OPRC has been represented in
the form of cause and effect whereby OPRC intervention areas are highlighted. Key interventions so far are a shared and updated asset inventory, secured long term funding for maintenance activities and emphasis on supervision. OPRC includes institutional support and provides learning possibilities for local consultants from international expertise. Areas that seem positively impacted so far include the critical themes of insufficient maintenance and low-quality interventions. The critical theme where the OPRC pilot seems to fall short is an underdeveloped local construction industry. The authorities experience difficulties to outsource activities to local service providers and particularly for (routine) maintenance activities this seems problematic. The local construction industry faces even more challenges to take part if they now have to deal with a larger role in the maintenance process (beyond work scheduling and/or work execution) now the role of authorities becomes confined. At the same time the authorities seem to require strengthening too. This could provide opportunities for international service providers to help out with analysis, data management, work identification, planning / design, prioritization and measurement / inspection and to outsource suitable activities to local service providers.

The theoretical perspectives have provided a viewpoint on the outsourcing relation. Overall an appropriate PBC-strategy seems bound to a hybrid arrangement / contract whereby the rigidity of the pilot contract makes place for more interaction / participation. The OPRC pilot uses a hybrid arrangement and from a TCE perspective this also seems a preferable way to deal with uncertainty. Next, information asymmetry is taken as a key problem to evaluate the contract from an AT perspective. Compared to the everyday business, with OPRC information asymmetry is limited by steering on results. It still exists, but the impact of its consequences seems limited. Ex-post flexibility and interaction are limited too, while eventually more abstract performance measures in line with the changing role of the authority could result in a situation of more ex-post flexibility and requiring more interaction / participation and a more hybrid form of contract. Further, OPRC introduces a more complex (highly detailed), static and unvaried performance measurement system that is primarily oriented on payment reduction whereas literature points out the importance of variety and dynamics within the system together with interaction and limiting the impact of individual measures. Finally, both formal and informal institutions are perceived to influence a contract. Thereby designing effective formal institutions and taking account of informal institutions seem a preferable way to deal with a mismatch between formal and informal institutions.

In short, an appropriate PBC-strategy could advance on overall rehabilitation required before maintenance and an interactive community-based approach. The strategy not only seems to require including the identified performance improvement areas related to the critical themes of insufficient maintenance and low-quality inventions but also those related to the critical theme of an underdeveloped local construction industry. Further an appropriate framework seems bound to a hybrid arrangement / contract whereby the rigidity of the pilot contract makes place for more interaction / participation. The strategy could advance on existing (functioning) systems where possible, such as the HDM4 decision support system for road development and management already used today.

Recommendations for an appropriate PBC-framework
In short, for an appropriate PBC-framework it seems sensible to:

- Involve the local construction industry / roadside communities in what could reasonably be expected and enable the local construction industry to participate;
- Switch from build and collapse to rehabilitate and maintain: start introducing PBMC on rehabilitated sections of the network;
- Outsource multiple activities under the same contract: fewer transactions and public procedures could reduce corruption and increase transparency;
- Use simple performance measures and an interactive (community-based) approach;
- Include the critical themes that seem to cause that Uganda faces difficulties to make road infrastructure meet realistic standards;
- Use international expertise / service providers to bridge the gap in the maintenance process between local authorities and local contractors: this could help out with management activities as well as provide support and additional skills;
- Outsource suitable activities to local service providers;
- Allocate managerial resources such as used under OPRC to manage and monitor a single facility in a larger (rural) area to multiple facilities in that area;
- Keep using existing (functioning) facilities where possible; for example HDM4 to determine affordable service level standards and evaluate economic rationale; and
- Keep working with a combination of payment principles (hybrid structure) like in the pilot contract but leaving more flexibility and creating interaction.

Recommendations to the international community
In short, for the international community it seems sensible to:

- Review the OPRC concept. This research highlights multiple advancements (in line with the above), such as early involvement of the construction industry in what could reasonably be expected; use of simple performance measures and more interaction instead of the rigidity and inflexibility of the concept; and matching PBC-complexity with local capabilities;
- Overall review the development approach from a New Institutional Economics (NIE) viewpoint. The research uses findings and ideas from related (and within the scope of the research limited) theoretical perspectives that are linked to what is seen as NIE. The (complex) environment eventually did not seem to correspond well however to the conceptual framework, although the key problems that are drawn from the perspectives nevertheless seemed relevant. Namely the understood rationale of TCE did not seem to explain the OPRC concept.

Recommendations for further research
This research draws from earlier work but at the same time the problem definition illustrates a rather open-ended inquiry in line with what is already researched: relatively little. Numerous areas can be pointed out for further research. Limited research exists for example on the cultural aspects of the environment. Limited research exists on OPRC: there could be a case study involving other pilot projects (in Sub-Saharan Africa). Limited research seems to exist on the New Institutional Economics and developing countries (also see recommendations to the international community): in line with what was encountered during this research, there could be more research on what aspects are more relevant and what aspects are less relevant for a certain environment.
# List of Contents

Preface ......................................................................................... ii

Summary ...................................................................................... iv

List of Contents ................................................................................ x

List of Figures .................................................................................. xii

List of Tables .................................................................................... xiii

List of Appendix Figures ................................................................... xiv

List of Appendix Tables ..................................................................... xv

Abbreviations and Acronyms ............................................................ xvi

I. Introduction ..................................................................................... 1

  1.1 Overall introduction .............................................................. 1

  1.2 Problem definition .............................................................. 2

II. Orientation ....................................................................................... 4

  2.1 Overall orientation .............................................................. 4

   2.1.1 An integrated approach ................................................ 4

   2.1.2 What is asset management? .......................................... 4

   2.1.3 What is maintenance? .................................................. 5

   2.1.4 What does outsourcing mean? ...................................... 7

   2.1.5 What is the object of outsourcing? ............................... 8

   2.1.6 What is performance-based contracting? .................... 8

   2.1.7 Performance-based contracting and risk management .... 10

   2.1.8 Output and Performance-based Road Contracts (OPRCs) . 11

   2.1.9 Advantages and disadvantages of performance-based contracting .......... 14

   2.1.10 What complicates maintenance? ................................. 14

  2.2 Problem context ........................................................................... 15

   2.2.1 Uganda ........................................................................ 15

   2.2.2 What’s on the agenda? .................................................. 16

   2.2.3 Cultural dimensions .................................................... 19

  2.3 Assignment and deliverables ..................................................... 21

  2.4 Project approach ........................................................................ 21

III. Theoretical Perspectives ................................................................. 23

  3.1 Transaction cost economics ..................................................... 23

   3.1.1 Transaction cost economics: definition and dimensions .... 23

   3.1.2 TCE and this research .................................................. 25

  3.2 Agency theory ............................................................................ 26

   3.2.1 Agency theory .............................................................. 26

   3.2.2 AT and this research .................................................... 27

  3.3 Performance measurement ....................................................... 28

   3.3.1 Performance measurement ........................................... 28

   3.3.2 Performance measurement and this research ................ 29

  3.4 Formal and informal institutions ................................................. 30

   3.4.1 Formal and informal institutions ................................... 30

   3.4.2 Formal and informal institutions and this research .......... 34

  3.5 Integrating Ideas and Findings .................................................. 34

IV. Methodological Approach ............................................................... 35

  4.1 What type of research? ............................................................. 35
Appendices

Appendix A: North Eastern Road-Corridor Asset Management Project ........................................ 88
Appendix B: National major roads work programme FY 2013/2014 ........................................ 89
Appendix C: Field visit Uganda .................................................................................................. 90
Appendix D: Process steps model of the maintenance process ..................................................... 91
Appendix E: Agency roles and responsibilities ............................................................................ 92
Appendix F: Road maintenance plan preparation flowchart ......................................................... 93
Appendix G: Poverty incidence and population density ................................................................. 94
Appendix H: Pilot contract performance measures ....................................................................... 95
Appendix I: Pilot contract interdependence of activities ............................................................... 101
Appendix J: Key findings from engineering audits ....................................................................... 102
Appendix K: Semi-structured interviews, themes to be explored ................................................. 108
Appendix L: Typical Service Levels for unpaved roads ................................................................. 112
Appendix M: Main Environmental Impact Assessment requirements ........................................... 113
Appendix N: Road station equipment inventory .......................................................................... 114
Appendix O: OPRC performance measurement ......................................................................... 115
Appendix Q: Pilot project risk allocation ..................................................................................... 116

Conclusions and Recommendations .......................................................................................... 75

VI. Conclusions and Recommendations....................................................................................... 75

6.1 Conclusions ............................................................................................................................ 75

6.1.1 Object of outsourcing ......................................................................................................... 75
6.1.2 Empirical findings .............................................................................................................. 76
6.1.3 Theoretical implications ..................................................................................................... 77
6.1.4 Limitations of the study ..................................................................................................... 79
6.1.5 Overall conclusion ............................................................................................................ 79

6.2 Recommendations ................................................................................................................ 81

References ................................................................................................................................... 83

V. Results ..................................................................................................................................... 41

5.1 Findings from the field ............................................................................................................. 42

5.1.1 Everyday business .............................................................................................................. 43
5.1.2 OPRC pilot in Uganda ....................................................................................................... 53

5.2 Analysis .................................................................................................................................. 61

5.2.1 Validation of the field problem .......................................................................................... 61
5.2.2 Situational analysis: cause and effect diagram ................................................................. 61
5.2.3 Everyday business and OPRC pilot: comparison and reflection ........................................ 67

5.3 Wrapping up the results chapter .......................................................................................... 73

4.2 Quality criteria ....................................................................................................................... 36
4.3 Case selection ......................................................................................................................... 37
4.4 Data collection ......................................................................................................................... 38
4.5 Data analysis .......................................................................................................................... 38
4.6 Wrapping up the methodological approach .......................................................................... 40
List of Figures

Figure 1.1. AM roles: exploring a degree of outsourcing (based on Schoenmaker, 2013a) ........... 3
Figure 2.2. Categorization of maintenance activities (extended/modified from Kothamasu et al., 2006) ....................................................................................................................... 6
Figure 2.3. Model of the maintenance process (redrawn from Schoenmaker, 2011, p. 23, based on Dunn, 1999 and Murthy & Kobbacy, 2008, pp. 373-391) ....................................................................... 7
Figure 2.4. Levels of outsourcing (redrawn from Schoenmaker & Verlaan, 2013b) ....................... 7
Figure 2.5. Asset management value chain (redrawn from Porter, 2005) ........................................ 9
Figure 2.6. Risk context (based on Hill et al., 2010) ........................................................................ 11
Figure 2.7. Uganda cultural dimensions in comparison to the UK, Denmark and China (Hofstede et al., 2010; Rarick et al., 2013) ................................................................. 20
Figure 2.8. Conceptual project design for diagnosis and exploration of solution directions (based on Van Aken et al., 2012) ................................................................. 22
Figure 3.1. Transaction cost economics model (redrawn from Boudreau et al., 2007, p. 3) .......... 24
Figure 3.2. Transaction costs and benefits model (redrawn from Boudreau et al., 2007) ............ 25
Figure 3.3. Summary of logical choices for most efficient contract type (redrawn from Schoenmaker, 2011, based on the propositions by Eisenhardt, 1989, pp. 60-63) .............. 27
Figure 3.4: Input / output model (redrawn from Schoenmaker, 2011, p. 80, based on Pollitt and Bouckaert, 2004, p. 106) ................................................................. 28
Figure 3.5. Different concepts of institutions (redrawn from Parlevliet, 2007) ......................... 31
Figure 3.6. Linking ideas and findings (based on Kugonza, 2010; Williamson, 2000; World Bank, 2003) .............................................................................................................. 34

Table 5.1. Outline of findings from the field: everyday business (through force-account and FIDIC / FIDIC-inspired input contracts) and OPRC pilot ................................. 42

Figure 5.1. FIDIC / FIDIC-inspired contract input contracts: role of the contractor (dark) in the maintenance process (appendix D further describes the process steps) ............... 46
Figure 5.2. Institutional relationships (based on URF, 2014) .................................................. 46
Figure 5.3. OPRC contract: role of the contractor (dark) in the maintenance process (appendix D further describes the process steps) .......................................................... 55
Figure 5.4. Implementation matrix for the North Eastern Road-corridor Asset Management Project (based on COWI, 2014, Word Bank, 2014) .................................................. 55
Figure 5.5. Input for the cause and effect diagram, compiling information from the problem definition (after CrossRoads, 2013; World Bank, 2014a, 2014b) and the findings: insufficient maintenance (and other activities) .................................................. 63
Figure 5.6. Input for the cause and effect diagram, compiling information from the problem definition (after CrossRoads, 2013; World Bank, 2014a, 2014b) and the findings: low quality interventions ............................................................................................................ 64
Figure 5.7. Input for the cause and effect diagram, compiling information from the problem definition (after CrossRoads, 2013; World Bank, 2014a, 2014b) and the findings: an underdeveloped local construction industry ................................................. 65
Figure 5.8. Cause and effect diagram compiling information from the problem definition (after CrossRoads, 2013; World Bank, 2014a, 2014b) and the findings whereby OPRC intervention areas are highlighted (orange) .......................................................... 66
Figure 6.1. Cause and effect diagram compiling information from the problem definition (after CrossRoads, 2013, World Bank, 2014a, 2014b) and the findings whereby OPRC intervention areas are highlighted (orange) .......................................................... 77
List of Tables

Table 2.1. Uganda’s public road network characteristics (URF, 2014) ............................................. 8
Table 2.2. Input – output – outcome (Bennett, 2014) ........................................................................ 9
Table 2.3. Risk allocation with various types of maintenance contracts (based on Zietlow, 2004) 10
Table 2.5. Contractor free to decide… (based on Schiessler, 2007; World Bank, 2009a) .......... 12
Table 2.6. Comparison with other modes of contracting (Rao, 2012) ............................................. 12
Table 2.7. Typical service levels for paved roads (World Bank, 2009a, p.182) .............................. 13
Table 2.8. Physical infrastructure objectives and strategies 2010/11 – 2014/15 (NPA, 2010) ...... 16
Table 3.1. Discriminating alignment: two independent variables (Klein, 2006) .............................. 24
Table 3.2. Examples of transaction benefits (Boudreau et al., 2007) ................................................ 25
Table 3.3. Propositions for choosing an agency relationship (based on Eisenhardt, 1989a, pp. 60-63) ........................................................................................................................................... 27
Table 3.4. Hierarchy of institutions and the relationship with social capital (not to scale, based on Kugonza, 2010; Williamson, 2000; World Bank, 2003) ........................................................................ 30
Table 3.5. Dimensions of institutions (Camarinha-Matos & Afsarmanesh, 2007; Kugonza, 2010; Van Hees, 1997, 2000) ...................................................................................................................... 31
Table 3.6. Formal-informal paradigm (Li, 2007) .................................................................................... 32
Table 5.2. Uganda’s public road network characteristics (URF, 2014) ............................................. 44
Table 5.3. Road design class (MoWHC, 2005) .................................................................................... 45
Table 5.4. Conversion factor of vehicle into equivalent passenger car units (MoWHC, 2005) ...... 45
List of Appendix Figures

Figure A1. North Eastern Road-Corridor Asset Management Project (World Bank, 2014b)........ 88
Figure B1. National major roads works programme FY 2013/2014 (UNRA, 2014)..................... 89
Figure F1. URF plan preparation flowchart (based on URF, 2014) ......................................... 93
Figure G1. Poverty incidence in % (AICD, 2009)..................................................................... 94
Figure G2. Population density per square km (AICD, 2009)..................................................... 94
Figure I1. NERAMP interdependence of activities (based on COWI, 2014a)......................... 101
Figure O1: Output based routine maintenance measurement process (redrawn fro Rao, 2012). 115
Figure O2: Output based rehabilitation measurement process (redrawn from Rao, 2012)....... 115
List of Appendix Tables

Table C1. Observations................................................................. 90
Table C2. Interviews and expert contacts on location ................................................................. 90
Table D1. Process steps model of the maintenance process (Schoenmaker and Verlaan, 2013) 91
Table E1. Roles and responsibilities (URF, 2014)........................................................................ 92
Table H1. Management Performance Measures (COWI, 2014a) ........................................... 95
Table H2. Road User Service and Comfort Measures (COWI, 2014a) .................................... 96
Table H3. Durability measures (COWI, 2014a) ......................................................................... 98
Table H4. Signaling and Road Safety furniture (COWI, 2014a) ................................................. 98
Table H5. Drainage (COWI, 2014a) .......................................................................................... 99
Table H6. Structures (COWI, 2014a) ....................................................................................... 99
Table H7. Embankments and Cuttings (COWI, 2014a) ........................................................... 100
Table H8. Vegetation Control (COWI, 2014a) .......................................................................... 100
Table J1. Key findings from engineering audits per road contract (OAG, 2010, 2013, 2014) .... 102
Table L1. Typical service levels for unpaved roads (World Bank, 2009, p. 182) ..................... 112
Table M1. Summary of EIA/EISA approval and licensing requirements (World Bank, 2013) ... 113
Table N1. Road station equipment inventory: Soroti Station ...................................................... 114
Table Q1: Pilot project risk allocation (COWI, 2014a) .............................................................. 116
## Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>asphalt concrete</td>
</tr>
<tr>
<td>ADT</td>
<td>average daily traffic</td>
</tr>
<tr>
<td>AfDB</td>
<td>African Development Bank</td>
</tr>
<tr>
<td>AICD</td>
<td>Africa Infrastructure Country Diagnostic</td>
</tr>
<tr>
<td>AM</td>
<td>asset management</td>
</tr>
<tr>
<td>AT</td>
<td>agency theory</td>
</tr>
<tr>
<td>AUC</td>
<td>African Union Commission</td>
</tr>
<tr>
<td>BI</td>
<td>bump integrator</td>
</tr>
<tr>
<td>BoQ</td>
<td>bill of quantities</td>
</tr>
<tr>
<td>°C</td>
<td>degree Celsius</td>
</tr>
<tr>
<td>CME</td>
<td>Construction Management and Engineering</td>
</tr>
<tr>
<td>DBMOT</td>
<td>Design Build Maintain Operate Transfer</td>
</tr>
<tr>
<td>DfID</td>
<td>Department for International Development</td>
</tr>
<tr>
<td>DIMI</td>
<td>Delft Infrastructure and Mobility Initiative</td>
</tr>
<tr>
<td>DRC</td>
<td>Democratic Republic of Congo</td>
</tr>
<tr>
<td>EAC</td>
<td>East African Community</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>EUR</td>
<td>euro</td>
</tr>
<tr>
<td>FIDIC</td>
<td>Fédération Internationale des Ingénieurs-Conseils</td>
</tr>
<tr>
<td>FWD</td>
<td>Four Wheel Drive</td>
</tr>
<tr>
<td>GDP</td>
<td>gross domestic product</td>
</tr>
<tr>
<td>GoU</td>
<td>Government of Uganda</td>
</tr>
<tr>
<td>HDM</td>
<td>Highway Development and Management Model</td>
</tr>
<tr>
<td>IDB</td>
<td>Islamic Development Bank</td>
</tr>
<tr>
<td>IRI</td>
<td>International Roughness Index</td>
</tr>
<tr>
<td>IRR</td>
<td>internal rate of return</td>
</tr>
<tr>
<td>Km</td>
<td>kilometre</td>
</tr>
<tr>
<td>KPI</td>
<td>key performance indicator</td>
</tr>
<tr>
<td>LoS</td>
<td>Level of Service</td>
</tr>
<tr>
<td>MDGs</td>
<td>Millennium Development Goals</td>
</tr>
<tr>
<td>MFPED</td>
<td>Ministry of Finance, Planning and Economic Development</td>
</tr>
<tr>
<td>MLG</td>
<td>Ministry of Local Government</td>
</tr>
<tr>
<td>MoWT</td>
<td>Ministry of Works and Transport</td>
</tr>
<tr>
<td>N/A</td>
<td>not applicable</td>
</tr>
<tr>
<td>NCHRP</td>
<td>National Cooperative Highway Research Program</td>
</tr>
<tr>
<td>NECRAMP</td>
<td>North Eastern Corridor Road Asset Management Project</td>
</tr>
<tr>
<td>NEMA</td>
<td>National Environment Management Authority</td>
</tr>
<tr>
<td>NERAMP</td>
<td>North Eastern Road-corridor Asset Management Project</td>
</tr>
<tr>
<td>NIE</td>
<td>New Institutional Economics</td>
</tr>
<tr>
<td>No</td>
<td>number</td>
</tr>
<tr>
<td>NPM</td>
<td>new public management</td>
</tr>
<tr>
<td>NPV</td>
<td>net present value</td>
</tr>
<tr>
<td>OAG</td>
<td>Office of the Auditor General</td>
</tr>
<tr>
<td>ODI</td>
<td>Overseas Development Institute</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-Operation and Development</td>
</tr>
<tr>
<td>OPRC</td>
<td>output and performance-based road contract</td>
</tr>
<tr>
<td>Abbr</td>
<td>Full Form</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>PBC</td>
<td>performance-based contracting</td>
</tr>
<tr>
<td>PDO</td>
<td>project development objective</td>
</tr>
<tr>
<td>PI</td>
<td>performance indicator</td>
</tr>
<tr>
<td>PMMR</td>
<td>performance-based management and maintenance of roads</td>
</tr>
<tr>
<td>PPIAF</td>
<td>Public Private Infrastructure Advisory Facility</td>
</tr>
<tr>
<td>PPDA</td>
<td>Public Procurement of Public Assets Authority</td>
</tr>
<tr>
<td>PPP</td>
<td>public-private partnership</td>
</tr>
<tr>
<td>QA</td>
<td>Quality assurance</td>
</tr>
<tr>
<td>QC</td>
<td>Quality control</td>
</tr>
<tr>
<td>RAMS</td>
<td>Road Asset Management System</td>
</tr>
<tr>
<td>RAP</td>
<td>Resettlement Action Plan</td>
</tr>
<tr>
<td>RCM</td>
<td>reliability centred maintenance</td>
</tr>
<tr>
<td>RECs</td>
<td>regional economic communities</td>
</tr>
<tr>
<td>RMI</td>
<td>Road Management Initiative</td>
</tr>
<tr>
<td>RSDP</td>
<td>Road Sector Development Program</td>
</tr>
<tr>
<td>RoW</td>
<td>right-of-way</td>
</tr>
<tr>
<td>SBD</td>
<td>Standard Bidding Document</td>
</tr>
<tr>
<td>SN</td>
<td>structural number</td>
</tr>
<tr>
<td>sq km</td>
<td>square kilometre</td>
</tr>
<tr>
<td>SSA</td>
<td>Sub-Saharan Africa</td>
</tr>
<tr>
<td>SSATP</td>
<td>Sub-Saharan Africa Transport Policy Program</td>
</tr>
<tr>
<td>TCE</td>
<td>transaction cost economics</td>
</tr>
<tr>
<td>TPL</td>
<td>Transverse Profile Logger</td>
</tr>
<tr>
<td>UBOS</td>
<td>Uganda Bureau of Statistics</td>
</tr>
<tr>
<td>UGX</td>
<td>Uganda Shillings</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>UNECA</td>
<td>United Nations Economic Commission for Africa</td>
</tr>
<tr>
<td>UNRA</td>
<td>Uganda National Roads Authority</td>
</tr>
<tr>
<td>URA</td>
<td>Uganda Revenue Authority</td>
</tr>
<tr>
<td>URF</td>
<td>Uganda Road Fund</td>
</tr>
<tr>
<td>USD</td>
<td>United States Dollar</td>
</tr>
<tr>
<td>VAT</td>
<td>value added tax</td>
</tr>
<tr>
<td>VfM</td>
<td>Value for Money</td>
</tr>
<tr>
<td>WB</td>
<td>World Bank</td>
</tr>
</tbody>
</table>
I. Introduction

1.1 Overall introduction

Challenged by limited resources, reforms and an increasing public demand for improved service levels (OECD, 2001), road administrations around the world are forced to develop and maintain infrastructural functions more effectively and efficiently. Succeeding the international exchange of practices and ideas, both developed and developing countries are advancing to so-called performance-based contracting (Stankevich et al., 2009). Uganda’s road infrastructure investments in the past mainly focused on road development. Road maintenance throughout the country has been underfunded and attracting little attention, resulting in a practice characterized as ‘build and collapse’ (World Bank, 2014b, p. 4).

Looking for ways of improving and following the idea of active private sector involvement, Uganda is now the first in Eastern Africa to pilot a performance-based maintenance contract on a key transport corridor. It includes 340km of a trunk road linking South Sudan, parts of the DRC, northern and eastern Uganda to the port of Mombasa in Kenya. Financed by World Bank, the nine-year contract is based on the World Bank Output and Performance-based Road Contract (OPRC) concept.

The 2014 Review of Performance Based Contracting in the Road Sector led by OPUS and commissioned by World Bank points out however that a tendency for a ‘one-size-fits-all’ approach to implement such concept leads to ‘a variation in the success of any implemented PBCs, as well as a significant proportion of the proposed PBCs not making it to the contract award stage’ (Gericke et al., 2014a) and better guidance is needed to select an appropriate performance-based contract type (Gericke et al., 2014b) taking into account country-specific characteristics (Bennett, 2014). Locally a mismatch seems to exist for example between an underdeveloped local construction industry and the requirements for such OPRC valued at USD 251 million (World Bank, 2014c). Next, if an OPRC is considered successful, the challenge remains to an infrastructure development project like this go beyond ‘islands of success’ (CrossRoads, 2013). A way of dealing with outsourcing maintenance of a road network instead of a single road in line with the new philosophy is still missing.

Combined with the objective of mainstreaming practices towards an integrated approach, this thesis has the following overall aim: to explore an integrated approach for outsourcing maintenance of road infrastructure in Uganda, taking into account the country’s specific characteristics.

Thesis outline

This first chapter continues with the problem definition, research objectives and the research questions. The second chapter includes the orientation on the topic of interest. The third chapter includes the findings and ideas from the theoretical perspectives used for data collection and analysis. The fourth chapter describes the methodological approach. The fifth chapter presents the findings from data gathered and the results from data analysis. Lastly the sixth chapter presents the conclusions and recommendations of this thesis.

Overall, this thesis (32 ECTS) is part of a graduation process based on the CME2000 Graduation Thesis Guideline (2014) by Verlaan and Schoenmaker. The process includes a number of activities listed in the guideline. The findings are based on data sources including documents, observations and 20 expert contacts and semi-structured interviews from a field visit to Uganda between September and November 2014 (also see chapter IV).
1.2 Problem definition

Steady economic growth has enabled Uganda to reduce the amount of people living below the poverty line from 56% in 1993 to 22% in 2013 (World Bank, 2014a, p. 2) whereby road infrastructure is seen as a key constraint for growth. Uganda faces difficulties however to make road infrastructure meet realistic standards.

Challenges reportedly include prioritization, identification and actual implementation of road interventions (World Bank, 2014b). The Government of Uganda (GoU) has been supported through Road Sector Development Programs (RSDPs) to advance on asset management practices. GoU has been limiting its role to formulating policies, strategic planning, setting standards, keeping oversight and monitoring. Executive functions (including those for implementation and regulation) are being delegated to specialized entities (World Bank, 2014a, p.3). One of the results is the Uganda National Roads Authority (UNRA), set up in 2008, responsible for maintaining the Ugandan trunk road network (World Bank, 2014a).

Although road sector performance has reportedly improved, it remains unsatisfactory (World Bank, 2014b). Reported issues include roads in bad condition, shortage of expertise, too little attention to maintenance, no clear procedures on output/outcome based management processes and the mainstreaming of those systems / procedures within UNRA (CrossRoads, 2013; World Bank, 2014a). Road safety issues, restrained market access, reduced asset value and high vehicle operating costs remain (CrossRoads, 2013; World Bank, 2014b).

RSDP3 (FY 2012-2022) emphasizes the involvement of the private sector in development and maintenance. The role of road agencies thereby shifts from ‘micromanager’ to that of ‘strategic manager’ (Stankevitch et al., 2009) and becomes confined to planning, policy and regulation. GoU is now piloting a 9 year performance-based maintenance contract (PBMC) - or more specifically an Output and Performance-based Road Contract (OPRC) based on World Bank sample bidding documentation - on 340 km of a key transport corridor linking South Sudan, parts of the Democratic Republic of Congo, northern and eastern Uganda to the port of Mombasa in Kenya, under the North-Eastern Road-corridor Asset Management Project (NERAMP). Uganda is the first in East Africa to use such contracting type to on a key asphalt/concrete corridor. The project development objective is ‘to reduce transport costs, enhance road safety, and improve and preserve the road assets sustainably by applying cost effective performance based asset management contracts’ (World Bank, 2014b).

Like mentioned, the 2014 Review of Performance Based Contracting in the Road Sector led by OPUS and commissioned by World Bank however points out that a tendency for a ‘one-size-fits-all’ approach to implement such concept leads to ‘a variation in the success of any implemented PBCs, as well as a significant proportion of the proposed PBCs not making it to the contract award stage’ (Gercke et al., 2014a, p. 12) and better guidance is needed to select an appropriate PBC type (Gercke et al., 2014b) taking into account country-specific characteristics (Bennett, 2014). Locally a mismatch seems to exist for example between an underdeveloped local construction industry and the requirements for such OPRC valued at USD 251 million (World Bank, 2014c). Next, if an OPRC is considered successful, the challenge remains to an infrastructure development project like this go beyond ‘islands of success’ (CrossRoads, 2013). A way of dealing with outsourcing maintenance of a road network instead of a single road in line with the new philosophy is still missing.

COWI Uganda Ltd. in association with COWI A/S, an international consulting group specializing in engineering, environmental science and economics, entered into contract with
UNRA for the assessment and preparation of the OPRC under NERAMP. Initially discussing with COWI (the consultant) and UNRA (the asset manager) the challenges and constraints of the environment, the contract and their combination, together with the aim to ultimately mainstream practices (a way of dealing with outsourcing maintenance of a road network instead of a single road), the outline of the problem-solving project has been drawn. Basically it comes down to exploring an appropriate degree of outsourcing (Schoenmaker & Verlaan, 2013b) including the object that in outsourced, the performance indicators / incentives, the governance and the role division (Schoenmaker et al., 2011; Schoenmaker & Verlaan, 2013b). Figure 1.1 illustrates the explored relation in this thesis in line with the overall aim to explore an integrated approach for outsourcing maintenance of road infrastructure in Uganda, taking into account the country’s specific characteristics.

Figure 1.1. AM roles: exploring a degree of outsourcing (based on Schoenmaker, 2013a)

Therefore the objective of the research is to present findings which give an answer on the problem definition; what could an integrated approach for outsourcing maintenance of road infrastructure in Uganda look like, taking into account the country’s specific characteristics?

The following theoretical sub-questions will be answered:
- What is meant by an integrated approach?
- What is meant by maintenance?
- What does outsourcing mean?

The following case specific / empirical sub-questions will be answered:
- What is the object of outsourcing?
- What are the specific characteristics to take into account, based on an empirical and theoretical analysis?
- What are the recommendations for an integrated approach, succeeding the analysis?

The target has been constrained to performance-based contracting. This means choosing an appropriate PBC-framework in line with an appropriate outsourcing degree. PBC is not seen as ‘a goal in its own right’ (Gericke et al., 2014) but as means to achieve asset management objectives in line with result-based financing strategies introduced in Uganda. The next chapter introduces the definitions, concepts and models in use following from the theoretical sub-questions and familiarizes with the subject.
II. Orientation

This chapter introduces the definitions, concepts and models in use and familiarizes with the subject. First an overall orientation is provided. Then the problem context is described. Next, the assignment and deliverables are listed. Finally, the project approach section outlines the conceptual project design and the operational project plan. Next, chapter III links findings and ideas from literature regarding the topics included in the conceptual project design.

2.1 Overall orientation

This part first defines the way an integrated approach, maintenance and outsourcing are seen in this thesis. Next the object of outsourcing, performance-based contracting (PBC) and PBC and risk management are introduced. The part on Output and Performance-based Road Contracts (OPRC) provides an outline of the PBC-type piloted in Uganda. Finally, some advantages and disadvantages of PBC are highlighted.

2.1.1 An integrated approach

Definition of integrated approach

Oxford Dictionaries (2014a) gives the following definition for integrated: ‘with various parts or aspects linked or coordinated’. Approach is understood as ‘a way of dealing with a situation or problem’ (Oxford Dictionaries, 2014b). In this thesis the integrated approach refers to tackling a multidisciplinary design, engineering and management problem within a context of asset management, to a strategy to maintain a road network (instead of a single road). A key understanding in this thesis is that successful systems properly address all three factors processes, people and technology (Bennett, 2014). This is illustrated by figure 2.1.

Figure 2.1. Successful systems (based on Bennett, 2014)

2.1.2 What is asset management?

The making of new definitions of asset management (AM) seems to continue, for example with the development of the new ISO55000 standard. The draft ISO definition is: ‘the coordinated activity of an organization to realize value from assets’ and the draft definition of asset is ‘something that has potential or actual value to an organization’ (IAM, 2012). An existing and often used definition for management of physical assets, PAS 55, is as follows: ‘systematic and coordinated activities and practices through which an organization optimally
and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their life cycles for the purpose of achieving its organizational strategic plan’ (BSI, 2008a). In case of Rijkswaterstaat (part of the Dutch Ministry of Infrastructure and the Environment) for example, key aspects that can be identified are a systematic approach, an economic rationale and the public’s expectations (Schoenmaker, 2013b). Schoenmaker (2013b) also identifies the following on why to do asset management:

- Knowing the extend and condition of our infrastructure;
- Knowing the risks in operation of various functions;
- Minimizing and avoiding unnecessary costs, and;
- Balancing acceptable risks and available budgets.

In line with the above in this thesis a definition following from the one by the World Road Association (PIARC) from OECD will be used. They see asset management as ‘a systematic process of effectively maintaining, upgrading and operating assets, combining engineering principles with sound business practice and economic rationale, and providing the tools to facilitate a more organized and flexible approach to making decisions necessary to achieve the public’s expectations’ (OECD, 2001, p. 9). In line with the definition of maintenance in use in this thesis (in combination with outsourcing), it may be considered functions of assets in the above. This results in: ‘a systematic process of effectively maintaining, upgrading and operating functions, combining engineering principles with sound business practice and economic rationale, and providing the tools to facilitate a more organized and flexible approach to making decisions necessary to achieve the public’s expectations’.

2.1.3 What is maintenance?

Definition of maintenance

Maintenance in the context of this thesis is seen as ‘the set of activities that is needed to keep the required function(s) available at the agreed level of service’ (Schoenmaker, 2013a).

Maintenance activities

Fix it when it breaks may be ‘the oldest and most common repair strategy’ (Kothamasu et al., 2006). Serious consequences of unscheduled downtime of the required function(s) however, provide the incentive to perform maintenance activities before problems arise (Kothamasu et al., 2006). In their work Systems health monitoring and prognostics – a review of current paradigms and practices, Kothamasu et al. (2006, p. 1014) discuss various repair strategies and provide a brief breakdown of what is involved in maintenance in two main categories: (1) reactive or unplanned maintenance that consists of (a) corrective- and (b) emergency maintenance; and (2) proactive or planned maintenance that consists of (c) preventive maintenance including age based-, constant interval- and imperfect maintenance; and (d) predictive maintenance including reliability centered- and condition based maintenance. Although clearly categorized, their emphasis is more on the functioning of a certain (technical) part and less on keeping a required function (referring to the purpose of a thing that may consist of various of those technical and other parts) available at the agreed level of service (Schoenmaker, 2011) like it is in this thesis, whereby maintenance also involves aspects such as services, management, rehabilitation and improvement (World Bank, 2014a).

Whereas Kothamasu et al. (2006) distinguish reactive or unplanned maintenance and proactive or planned maintenance, this thesis rather refers to it as activities, like unplanned...
maintenance activities and proactive or planned maintenance activities. Figure 2.2 illustrates a more appropriate categorization in the context of this thesis based on the grouping by Kothamasu et al. (2006). Rehabilitation and improvement could fall out of the scope of maintenance, for example where rehabilitation relates to the activities needed to bring a required function up to pre-defined standards or maintainable condition (World Bank, 2014) before keeping it at the agreed level of service or where improvement (adding new characteristics) goes beyond the agreed level of service. There may also be reasons from for example an accounting point of view to include a certain activity among maintenance the one time and to not include it the other time, like Schoenmaker (2014) indicates.

Figure 2.2. Categorization of maintenance activities (extended/modified from Kothamasu et al., 2006)

While this provides an overview of what kind of activities maintenance may involve, it does not reflect an everyday road maintenance categorization in use in the field. Various sources for this thesis explicitly distinguish activities referred to ‘routine maintenance’ or ‘periodic maintenance’ and combinations of those, like ‘routine mechanized maintenance’ (COWI, 2014a; URF, 2014; World Bank, 2009a). Routine maintenance activities in this thesis refer to various activities frequently necessary (World Bank, 2009) to maintain a road infrastructure function, like repairing potholes, cleaning drains, sealing cracks, cutting vegetation, etc. Periodic maintenance activities are seen as ‘predictable and more costly measures of a less frequent nature designed to avoid road degradation’ (World Bank, 2009), like grading, drainage work, resurfacing, asphalt concrete (AC) overlays, etc.

Model of the maintenance process

In this thesis a model of the maintenance process (figure 2.3), the so-called six-stage model (Schoenmaker, 2011), is used to explain the degree of outsourcing, including the role of asset owner, asset manager and service provider(s).

Maintenance, ‘the set of activities that is needed to keep the required function(s) available at the agreed level of service’ (Schoenmaker, 2013a), is represented by the cyclic process (Schoenmaker & Verlaan, 2013b) within the dotted line. It includes measurement, analysis, work identification, planning, work preparation and execution. The performance requirements following from the goals / objectives are the input of the model. The system performance is the output. Appendix D further describes the process steps.
2.1.4 What does outsourcing mean?

Definition of outsourcing

Outsourcing in the context of this thesis is seen as making ‘an arrangement where an external organization […] performs part of an organization’s function or process […]’ (ISO55000:2014).

Levels of outsourcing

In their IPWEA 2013 conference paper Analysing Outsourcing Policies in an Asset Management Context: A Six-Stage Model, Schoenmaker and Verlaan (2013b) use the earlier introduced model of maintenance process (figure 2.3) to illustrate three levels of outsourcing (figure 2.4). ‘At level C the contractor is only providing resources to schedule and execute the work. This is the minimal level of outsourcing: the client does all the maintenance management and only uses the market to do the actual work in the field. At level B the contractor has more freedom to decide to do what and when, based on the specifications by the client. At level A the contractor is free to take all decisions that are required to keep the output at the required level’ (Schoenmaker & Verlaan, 2013b).

Figure 2.4. Levels of outsourcing (redrawn from Schoenmaker & Verlaan, 2013b)
2.1.5 What is the object of outsourcing?

The object of outsourcing is maintenance of the UNRA network. It includes road related assets and items that are to be maintained within the road reserve / up to right-of-way (RoW) limits.

Activities include rehabilitation, routine and periodic maintenance activities, improvement and emergency works. The UNRA network is the national roads network. It includes (inter)national trunk roads and feeder roads (previously part of the DUCAR network). Together with the DUCAR network, it forms Uganda’s public road network (table 2.1). A district in Uganda typically has two network types: UNRA and DUCAR. This division is not always functional, but administrative. The additional UNRA network listed in table 2.1 used to be part of the DUCAR network. The additional network is mostly in poor condition. The original network is mostly in fair condition (appendix L defines indicators).

Table 2.1. Uganda’s public road network characteristics (URF, 2014)

<table>
<thead>
<tr>
<th>Network (UNRA)</th>
<th>Length (km)</th>
<th>Condition of network</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Paved</td>
<td>Unpaved</td>
</tr>
<tr>
<td>Original</td>
<td>3,242</td>
<td>7,703</td>
</tr>
<tr>
<td>Additional</td>
<td>10</td>
<td>9,607</td>
</tr>
<tr>
<td>Overall</td>
<td>3,252</td>
<td>17,310</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Network (DUCAR)</th>
<th>Length (km)</th>
<th>Condition of network</th>
</tr>
</thead>
<tbody>
<tr>
<td>District roads</td>
<td>0</td>
<td>22,500</td>
</tr>
<tr>
<td>Urban roads</td>
<td>1,100</td>
<td>4,500</td>
</tr>
<tr>
<td>CAR</td>
<td>0</td>
<td>30,000</td>
</tr>
</tbody>
</table>

2.1.6 What is performance-based contracting?

Definition of performance-based (maintenance) contracting

Succeeding the aim to increase the efficiency and effectiveness of maintaining their road network, both developed and developing countries are advancing to so-called performance-based contracting (Stankevich et al., 2009). A definition of a performance-based contract (PBC) used in the 2014 Review of Performance Based Contracting in the Road Sector led by OPUS and published by World Bank is ‘a type of contract in which payment for the deliverable is explicitly linked to the contractor’s successfully meeting or exceeding certain clearly defined performance indicators’ (Gericke et al., 2014a). The earlier work De Ingeslagen Weg (2011) by Schoenmaker in addition explicitly refers to maintaining performance requirements over a time period when it comes down to maintenance.

In this thesis the following definition is used for a performance-based maintenance contract: ‘a contract in which the principal describes the desired situation using performance requirements, applying a link between the delivered performance and payment whereby the performance requirements have to be maintained over a period of time’ (Schoenmaker, 2013a).
From input to outcome

In the Sub-Saharan African context, roughly three different ways to organize road maintenance can be distinguished: (1) force account (in-house units), (2) traditional bill of quantity (BoQ) contracts and (3) performance-based contracts, often referred to as Output and Performance-based Road Contracts (OPRC) when based on World Bank sample bidding documentation. Before 2006 this was named Performance-based Management and Maintenance of Roads Contract (PMMRC). It can be confusing that OPRC today is also used as an umbrella term for performance-based contracting methodologies (Gericke et al., 2014a, p. 13). The differences between the three ways can be illustrated thinking of an input-output-outcome dimension (table 2.2 and figure 2.5).

<table>
<thead>
<tr>
<th>Type</th>
<th>Asset owner specifies</th>
<th>State of development</th>
<th>Risk sharing</th>
<th>Reliance on asset database</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Labor, materials</td>
<td>Ancient</td>
<td>None</td>
<td>None / low</td>
</tr>
<tr>
<td>Output</td>
<td>Schedule of rates</td>
<td>Mature</td>
<td>Some</td>
<td>Medium</td>
</tr>
<tr>
<td>Outcome</td>
<td>Performance standards</td>
<td>Young</td>
<td>Significant</td>
<td>High</td>
</tr>
</tbody>
</table>

Table 2.2. Input – output – outcome (Bennett, 2014)

Force account can be placed on the input side, whereby the road agency has its own workforce and equipment for labor-intensive and equipment-intensive maintenance. In African countries force account is no longer widely applied due to its inefficient nature COWI (2013, p. 5). The BoQ approach operates along the input-output dimension.

In Africa the BoQ is the traditional and most-often used way of organizing road maintenance, whereby the road authority makes a list of works it wants to have carried out on the road and a contractor specifies unit prices for each activity and undertakes the work. Extra work is paid for by a variation order and the contracts are characterized by a short duration, about one year (COWI, 2013). ‘The new type, the output- or performance-based contract goes beyond the output level; it includes outcomes and aims widely at achieving customer satisfaction. This implies that outcomes are specified in terms of that which interests a customer – say, a road user – namely the riding quality, transport time and all year passability. This approach is assumed to be more effective and efficient, but also more demanding towards contractors and authorities as it implies a new and different set of responsibilities for the parties’ (COWI, 2013, p. 5).

Figure 2.5: Asset management value chain (redrawn from Porter, 2005)

Steps towards a performance-based maintenance contract

In their work Performance-based Contracting for Preservation and Improvement of Road Assets Stankevich et al. (2009) clearly explain the ‘type of decision-making process needed’
to implement a performance-based maintenance contract. Summarized, it includes the following aspects that will be taken into account for the synthesis (Stankevich et al., 2009, pp. 3-5):

Pre-bidding stage (ex-ante contract):
- Reasons to consider performance-based contracting
- Existing legislation
- Capacity (skills, expertise) and changing role of the agency
- Capacity and unionization of the contracting industry

Bidding and implementation stage (contract award and ex-post contract):
- Inventory of potentially contracted assets and determination of their condition
- Performance indicators, methodology to measure performance indicator
- Payment conditions
- Contract conditions
- Preliminary cost estimates
- Bid evaluation and selection
- Performance and payment security
- Quality assurance program
- Partnering

2.1.7 Performance-based contracting and risk management

Moving along the input-output-outcome dimension, the risk allocation changes (table 2.3). Together with increased risk for a service provider come profit opportunities (Gericke et al., 2014a; Zietlow, 2004). Risks of performance-based contracting are shared in light of whom can best manage them (Porter & Hatcher, 2010; Rao, 2012).

Table 2.3. Risk allocation with various types of maintenance contracts (based on Zietlow, 2004)

<table>
<thead>
<tr>
<th>In-house maintenance</th>
<th>Outsourcing of specific maintenance activities</th>
<th>Performance-based road maintenance contracts</th>
<th>Long-term road concessions (toll-roads)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Short-term</td>
<td>Medium-term</td>
</tr>
<tr>
<td>Risk to road agency decreases</td>
<td>Risk to contractor increases</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Together with increased risk for a service provider come profit opportunities (Gericke et al., 2014a; Zietlow, 2004). The risks of performance-based contracting are shared in light of whom can best manage them (Porter & Hatcher, 2010; Rao, 2012). Hill et al. (2010) in a research for New Zealand Transportation Agency (NZTA) and Gericke et al. (2014a) in their performance-based contracting review point out however that risk management in road engineering is not a clear-cut process. In their work Case studies and best practice guidelines for risk management on road networks, Hill et al. (2010) propose a categorization of 4 risk areas (planning risks, management risks, delivery risks and physical assets risks) and specific risks for each area within a risk context (figure 2.6).
Figure 2.6. Risk context (based on Hill et al., 2010)

These are extensively detailed in their work. Although Gericke et al. (2014a, p.55) explain that 'most of the available literature have been very theoretical and of little value for the developing countries', the work by Hill et al. (2010) has gone one better: 'It is believed that this framework could be used as a basis for developing similar risk categories that should be considered in setting up a PBC for developing countries' (Gericke et al., 2014a, p. 55). This thesis makes use of their 4 risk area categorization (Hill et al., 2010):

1. **Planning risks**: strategic planning risks, asset management planning risks, level of service risks and natural events, environment risks
2. **Management risks**: system / information risks, people risks, financial risks
3. **Delivery risks**: procurement risks, project management risk, contract management risks, communication risks
4. **Physical asset risks**: risks common to all assets, risks associated with specific asset types

### 2.1.8 Output and Performance-based Road Contracts (OPRCs)

The pilot contract for the North-Eastern road-corridor in Uganda is based on World Bank guidelines for OPRC and OPRC experiences in countries like Liberia and Botswana (COWI, 2014a). The guidelines for OPRC are a further development of the World Bank guidelines for Performance-based Management and Maintenance of Roads Contracts (PMMRC) This part highlights a change of approach under OPRC, the OPRC activities, a comparison with other modes of contracting and the service levels standards.

#### Change of approach

OPRC is meant to ‘better respond to a new approach to road network management’ (Schiessler, 2007). This new way of dealing with road infrastructure is compared to the old one in table 2.4. It not only aims to achieve better roads for the same money, use less money for the same level of service, and reduce administrative effort of the road agency, but also to ensure more stable funding, attract contractors to maintenance activities, create incentives for efficiency and innovation, satisfy road user needs and support local communities (Schiessler, 2007; World Bank, 2009a).

**Table 2.4. Change of approach (Schiessler, 2007)**

<table>
<thead>
<tr>
<th>Old approach</th>
<th>New approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road by road</td>
<td>Road sector efficiency</td>
</tr>
<tr>
<td>(fixing bad roads)</td>
<td>(network management)</td>
</tr>
</tbody>
</table>
OPRC activities

OPRC can be used to (i) maintain (including management activities) existing roads during multi-year periods; (ii) bring roads to maintainable conditions and then maintain them for several years; (iii) rehabilitate (bringing them back to standards they had before) and improve roads (add new characteristics), and then maintain them for several years; and (iv) construction of new roads, followed by a period of maintenance (World Bank, 2009a). While for a number of activities a contractor is hypothetically free to decide what to do, how to do, when to do, where to do and to subcontract (table 2.5), in practice there are certain restrictions, like following procedures or limits to activities subcontracted (COWI, 2014a; Schiessler, 2007; World Bank, 2009a).

Table 2.5. Contractor free to decide... (based on Schiessler, 2007; World Bank, 2009a)

<table>
<thead>
<tr>
<th>Maintenance (including management activities)</th>
<th>Rehabilitation (to pre-defined standards / maintainable condition)</th>
<th>Improvement works (adding new characteristics)</th>
<th>Emergency works (after damage from unforeseeable events)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What to do</td>
<td>Yes*</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>How to do</td>
<td>Yes*</td>
<td>Yes*</td>
<td>Yes* / No</td>
</tr>
<tr>
<td>When to do</td>
<td>Yes*</td>
<td>Time limit</td>
<td>Time limit</td>
</tr>
<tr>
<td>Where to do</td>
<td>Yes*</td>
<td>Yes* / No</td>
<td>No</td>
</tr>
<tr>
<td>Subcontract</td>
<td>Yes*</td>
<td>Yes*</td>
<td>Yes*</td>
</tr>
</tbody>
</table>

*With certain restrictions

Comparison with other modes of contracting

Table 2.6 compares OPRC to traditional contracts (FIDIC input contracts) and PMMRC.

Table 2.6. Comparison with other modes of contracting (Rao, 2012)

<table>
<thead>
<tr>
<th>FIDIC input contract</th>
<th>PMMRC (long term maintenance contract)</th>
<th>OPRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pay in accordance with work progress measured by input; Each intervention (design, construction, supervision, maintenance, etc.) needs separate</td>
<td>Pay in accordance with approved level of service (quality and quantity of the facility; Development/Rehabilitation work must be completed;</td>
<td>Reduced number of transactions, better governance and less potential failed contracts within life-span; Need smaller number of staff with</td>
</tr>
</tbody>
</table>
Service level standards

Performance measures have to be detailed to allow fair and transparent monitoring of maintenance activities (COWI, 2014a). ‘In setting the measures various criteria (both technical and practical) need to be carefully considered, such as (i) traffic volume and composition, (ii) urban vs. rural roads (iii) flat, hilly or mountainous terrain, (iv) subgrade quality and type, (v) quality of available construction materials, (vi) capacity of available contractors, (vii) any environmental constraints, such as protected areas, parks, forest reserves, etc. However, probably the most important criterion is the question of what Service Level can be afforded and economically justified for the road in question’ (World Bank, 2009a). The higher the traffic volume, the higher a standard of maintenance or so-called Level of Service (LoS) is economically feasible (COWI, 2014a). World Bank (2009a) refers to such standard as fair, good, very good or excellent (table 2.7).

Table 2.7. Typical service levels for paved roads (World Bank, 2009a, p.182)
2.1.9 Advantages and disadvantages of performance-based contracting

Both developed and developing countries move towards performance-based contracting as an alternative to their traditional (input-based) way of contracting (Stankevich et al., 2009). Reasons to use PBMC reportedly include the asset owner / asset manager becoming more governance-oriented, road user demand for improved / more reliable levels of service and reducing cost / setting cost at a fixed level to enable long-term financial forecasting (Gericke et al., 2014a). ‘The general perception is that greater autonomy of the contractor and stronger links between performance and payment will lead to (cost) advantages for the principal’ (Schoenmaker et al., 2011).

A link can be made between (cost) advantages and value for money (VfM), which in this thesis refers to ‘a way of thinking about using resources well’ (Jackson, 2012). It is understood to be challenging however to quantify (incremental) advantages of performance-based contracting and value for money, particularly in developing countries without reliable data and agreement for who, of what an by when (Jackson, 2012; Schoenmaker et al., 2011). Yet it is understood that there are three simple criteria for more value for money for the road agency and road users (Hardy, 2001; NCHRP, 2009):

- LoS remain the same at reduced cost;
- LoS improve for the same cost; or
- LoS improve at reduced cost.

Following from available literature PBMC advantages are understood to include (NCHRP, 2009):

- Potential reduction in costs;
- Improved level of service (could cost more);
- The transfer of risk to the contractor;
- More innovation;
- More integrated services;
- Enhanced asset management;
- Ability to reap the benefits of partnering;
- Building a new industry; and
- Achieving economies of scale.

Following from available literature PBMC disadvantages are understood to include (NCHRP, 2009):

- A more costly procurement process;
- A longer procurement process;
- A reduction in competition;
- Uncertainty associated with long-term contracting relationships;
- Challenges in mobilizing; and
- Loss of agency control and flexibility; for example, to reallocate funds when there are large long-term commitments.

2.1.10 What complicates maintenance?

‘The characteristics of maintenance in combination with performance measurement are a sure recipe for (contractual) problems’ (Schoenmaker, 2013a). This section goes into what seems to complicate both maintenance and measuring performance.
First, a categorization of the five ‘complicating features’ of maintenance and their examples (Schoenmaker & Verlaan, 2013b) follows from Schoenmaker (2011): (1) complexity, e.g. ‘the interaction of competing performance requirements, giving a choice of alternative measures, like a rapid response at higher costs or an economic response with more hindrance’; (2) interconnectedness and autonomy, e.g. ‘third parties involved in the same network or when the contractor depends on third parties for permits, information or supplies’; (3) temporal mismatch, e.g. ‘effects of the maintenance activities only show after completion of the contract’; (4) innovation and dynamics, e.g. ‘changing budgets of the client, in the requirements […] or in the developing technology, leading to news ways of working or even new levels of service’; and (5) knowns, unknows and unknowables, e.g. ‘if maintenance that has now been planned for year X will be really necessary by that that time’ (Schoenmaker & Verlaan, 2013b).

Second, performance measurement is understood to be problematic when (1) products are multi-value, (2) the organisation has a strong process orientation, (3) products are created in co-production, (4) products are intertwined, (5) causal relationships are contested or unknown, (6) quality is not fully definable, (7) there is a variety of products, (8) measurement is costly or not timely, and (9) the system or environment is dynamic (Schoenmaker, 2013a; based on De Bruijin, 2007). Performance measurement is further included among the linking of findings and ideas from literature (chapter III)

2.2 Problem context

This part describes the problem context. First, it introduces the Ugandan context at a glance. Then it describes the outline and alignment of the national and international (development) agenda. Next, Uganda’s cultural dimensions are introduced. This context constrains an appropriate PBC-framework.

2.2.1 Uganda

Uganda is located in Eastern Africa. The country has a population of 34,1 million and an area of 236,040 square kilometers (World Bank, 2014b). Uganda is one of Africa’s fastest growing countries (PRB, 2013). Road transport carries over 90% of Uganda’s passenger and freight traffic and provides the only way of access for rural population. The infrastructure system also links other countries to Mombasa, the Indian Ocean port in Kenya. The national roads, of which 3252km are paved according to URF (2014) and 3,490km according to World Bank (2014b), count for about 30% of the classified network (66,000 km) and carry 80% of the total traffic (World Bank, 2014a, p. 3).

Although LRA rebellion between 1987 and 2006 in Northern Uganda reportedly created an ongoing humanitarian crisis, steady economic growth has enabled Uganda to reduce the amount of people living below the poverty line from 56% in 1993 to 22% in 2013 (World Bank, 2014a, p. 2) whereby infrastructure is seen as a key constraint for growth. About 80% of the people live in rural areas where ‘quasi-subsistence’ agriculture (about 37% of GDP) is their main source of income (World Bank, 2013a). The Northeastern road corridor (where the OPRC is piloted) runs through the more rural and poorer Northern region. Improvement and long-term maintenance of the road are expected to increase economic opportunities for agriculture too (World Bank, 2013d). Overall, poverty and population maps (appendix G) show that poverty incidence in Uganda is higher in rural areas than in urban areas and is highest in the Northern region, where population density is lowest. Appendix G also shows the average rainfall and geology.
CrossRoads (2013) indicates that a demand for improved service levels has made road infrastructure provision essential for the popularity of Ugandan leaders and the likelihood they are re-elected, whereby quick wins may interfere with other considerations. Like mentioned, overall maintenance has been underfunded and attracted little attention, resulting in a practice characterized as ‘build and collapse’ (World Bank, 2014b, p. 4). The next part continues with the outline and alignment of the national and international (development) agenda.

2.2.2 What’s on the agenda?

This part describes the national and international (development) agenda. First, the national agenda outlines Ugandan road infrastructure policy. Then the international agenda highlights the international development partners, followed by the alignment of agenda’s.

The national agenda

‘Uganda has been a public sector reform leader in Africa. It has pursued reforms actively and consistently for three decades now, and has produced many laws, processes and structures that are ‘best in class’ in Africa (and beyond). The problem is that many of the reforms have been limited to these kinds of gains—producing new institutional forms that function poorly and yield limited impacts. Various kinds of data showed—in various areas (civil service and public administration, public financial management, revenue management, procurement, and anti-corruption)—that laws are often not being implemented, processes are being poorly executed, and there is insufficient follow-up to make sure that new mechanisms work as intended’ (Andrews & Bategeka, 2013).

With so many things to improve, the Uganda National Development Plan (NDP) 2010/11 – 2014/15 provides an overview of (medium-term) development priorities and their implementation strategies. Improvement and maintenance of the physical infrastructure is now one of the 4 high priority areas (NPA, 2010). Associated objectives and strategies are listed in table 2.8.

Table 2.8. Physical infrastructure objectives and strategies 2010/11 – 2014/15 (NPA, 2010)

<table>
<thead>
<tr>
<th>Objective</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve the stock and quality of road infrastructure</td>
<td>Upgrade specific national roads from gravel to class I en II bitumen standard</td>
</tr>
<tr>
<td></td>
<td>Improve the condition of the national roads network from the current 60 percent in fair to good condition to 85%</td>
</tr>
<tr>
<td></td>
<td>Develop and maintain selected strategic roads for tourism, minerals, oil and gas industry</td>
</tr>
<tr>
<td></td>
<td>Upgrade, rehabilitate and maintain district, urban and community access roads</td>
</tr>
<tr>
<td>Improve the traffic flow within the Greater Kampala Metropolitan Area</td>
<td>Improve transport infrastructure, connectivity, safety, and modernize the public transport system</td>
</tr>
<tr>
<td></td>
<td>Modernize the public transport system</td>
</tr>
<tr>
<td>Increase the volume of passenger and freight cargo conveyed on the rail network</td>
<td>Rehabilitate the existing rail network and increase the haulage capacity, and undertake construction of the standard gauge rail</td>
</tr>
<tr>
<td>Increase the volume of passenger and cargo</td>
<td>Increase international, regional and domestic air flight routes</td>
</tr>
<tr>
<td>Traffic by air transport</td>
<td>Increase the volume of passenger traffic and cargo freight by marine transport</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Increase efficiency and improve effectiveness in service delivery of transport infrastructure and provision of transport services</td>
<td>Strengthen the policy, legal and regulatory framework and coordination amongst stakeholders in the sector</td>
</tr>
<tr>
<td>Strengthen the national construction industry</td>
<td>Improve the policy, legal and regulatory framework for construction industry</td>
</tr>
</tbody>
</table>

In 1996, the Government of Uganda, with support of development partners, formulated a first 10-year Road Sector Development Program (RSDP1), at an estimated cost of US$1.5 billion (World Bank, 2009c). RSDP1 covered the period from FY 1997 to 2006, initially for the national (trunk) road network. The objectives of the RSDP1 were to (1) provide an efficient, safe and sustainable road network in support of market integration and poverty alleviation, with a focus on effective road maintenance, continued road rehabilitation and viable network improvements, (2) improve managerial and operational efficiency of road administration and (3) develop the domestic construction industry (Kumar, 2002). RSDP1 was updated and continued for another 10 years as RSDP2 (FY 2001 to 2011) and its total estimated cost was increased from the original US$1.5 billion to US$2.3 billion (World Bank, 2014b). The update included district roads, which were not part of RSDP1. The findings and lessons of RSDP1 and RSDP2 have been used to develop the RSDP3 program, now also including urban roads, at a total proposed investment requirement of US$10.36 billion for a new 10-year period from FY 2012 to 2022 (UNRA, 2012). RSDP3 emphasizes ‘the provision of a technically sound, economically justified and financially sustainable road transport infrastructure through active participation of the private sector’ (World Bank, 2014b). In order to respond to the growing transport demand on a timely basis, support national economic development and the growing regional trade in a sustainable manner, RSDP3 prioritizes maintenance of key transport corridors (World Bank, 2014a).

Ensuing NDP 2010/11 - 2014/15, RSDP 2012-2022 and NTMP 2008-2023, the following outline of road infrastructure policy in Uganda is understood (MoWT, 2014):

- **Continue reform of the road sector, with the private sector playing the major role in transport operations, central government role becoming confined to planning, policy and regulation;**
- **Create semi-autonomous agencies to perform specific functions such as management of road infrastructure in a commercial manner;**
- **Ensure that infrastructure maintenance remains well-organized and adequately funded;**
- **Pass to district and urban authorities the responsibility for roads in their areas, and to the local councils responsibility for community access roads;**
- **Allow market forces to determine prices for road transport services, except where urban authorities may determine the need to meet social and economical objectives;**
- **Set targets for improvement of measures such as conditions of roads and participation in road works of the local construction sector;**
- **Establish sustainable and efficient maintenance and rehabilitation regimes, with assured long-term funding;**
- **Take measures to reduce road accidents, including the incorporation of safety features in road design and enforcement of traffic rules and regulations;**
- Enforce axle load legislation by providing additional weigh bridges and through a public awareness campaign;
- Introduce environmental considerations into all stages of project planning, design, construction and maintenance.

The international (development) agenda

The international development agenda is guided by the Millennium Developments Goals (MDGs). ‘As we approach the 2015 deadline for the Millennium Development Goals, the international community is elaborating a new framework to promote sustainable development for all beyond 2015, which will build on achievements to date and address new challenges arising from an evolving and complex landscape’ (World Bank, 2013b). The eight Millennium Development Goals (MDGs) to date are: (1) eradicate extreme poverty and hunger, (2) achieve universal primary education, (3) promote gender equality and empower women, (4) reduce child mortality, (5) improve maternal health, (6) combat HIV/AIDS, malaria and other diseases, (7) ensure environmental sustainability and (8) global partnership for development (UN, 2014).

World Bank (2014e) considers infrastructure as missing link in the existing MDGs: ‘Infrastructure - the basic framework for delivering energy, transport, water and sanitation, and information and communication technology services to people - directly or indirectly affects people’s lives everywhere. That relationship is reflected in the MDGs. Yet only two MDG targets touch on infrastructure services: water and sanitation (target 7.C) and telephones and the Internet (target 8.F); energy and transport are missing entirely. And no goal or target addresses the comprehensive role of infrastructure in achieving the MDGs’ (World Bank, 2014e).

A link between transport and the eight MDGs is SSATP (SSATP, 2014). SSATP is the ‘international partnership to facilitate policy development and related capacity building in the transport sector in Africa’ (World Bank, 2013c). It includes 40 African countries, regional economic communities (RECs), continental institutions (AUC), UN agencies (UNECA), public and private sector organizations and international development agencies and organizations (SSATP, 2013a). SSATP thinks the Sustainable Development Goals (SDGs) that succeed the MDGs beyond 2015 should include sustainable transport (SSATP, 2014), ‘Despite the fact that sustainable transport may not be turned into a specific Sustainable Development Goal of the post 2015 development agenda, planning for affordable, safe and clean transport systems is indeed a smart and cost-effective way to address people’s needs and the impact of rapid urbanization across Africa’ (SSATP, 2014).

Financed by the African Development Bank (AfDB), European Commission (EC), Islamic Development Bank (IDB), World Bank, Austria, France, Norway, Sweden, and the UK, three strategic themes haven driven the SSATP agenda between 2009 and 2014: (1) promoting comprehensive pro-poor and pro-growth transport strategies, (2) promoting sustainable institutional and financial arrangements for road infrastructure and rural and urban transport services and (3) improving transit transport along selected international corridors (SSATP, 2013a).

The new 2014–2018 development plan gives more attention to Africa’s rapid urbanization, governance, climatological aspects and the way natural resources are used (SSATP, 2014). It envisions ‘efficient, safe, and sustainable transport for the people in Africa’ (SSATP, 2013a). Ever since their 1990s Road Management Initiative (RMI) in countries like Zambia, Kenya, Ethiopia, Mozambique, Tanzania, Ghana and Malawi, SSATP encourages
commercialization of the road sector (Kumar, 2002; Pinard, 2012; SSATP, 2013a, 2013b, 2014). Commercialization is this context means that ‘activities are carried out in a commercial, business-like manner; decisions are based on clear assessments of options with their relative advantages and disadvantages; and costs and benefits from actions taken are determined as accurately as possible’ (Pinard, 2012, p. 7). ‘However, because roads are a public monopoly and because most roads are likely to remain in government hands for some time to come, commercialization requires complementary reforms in four critical areas’ (Pinard, 2012). These critical areas are (Heggie & Vickers, 1998; Kumar, 2002; Pinard, 2012):

1. **Responsibility** by securing clear definition, separation and assignment of responsibilities with matching authority and performance targets
2. **Ownership** by involving road users and civil society stakeholders in the management of roads to encourage better management, demand for efficiency and control of monopoly power
3. **Financing** by stabilizing road financing through securing an adequate and stable flow of funds
4. **Management** by establishing professional management agencies run according to sound business principles

Thinking of a development agenda beyond 2015 makes development partners review their strategies up until now. In *Financing for Development Post-2015* for example, World Bank (2013b) discusses emerging challenges and required changes in approach and cooperation, advancing on active private sector participation. Both development partners like World Bank and others point out a need to use more country / context-specific strategies (Andrews & Bategeka, 2013; Christie et al., 2013; CrossRoads, 2013; Gericke et al., 2014a; Overseas Development Institute, 2014; SSATP, 2013a; World Bank, 2013c).

**Alignment of agenda’s**

In Uganda the actions to improve and change institutions and practices go way beyond the road sector alone (Andrews & Bategeka, 2013; Kumar, 2002). The outline of the road infrastructure policy highlights a government committed to a strategy of commercialized, performance-driven agencies that outsource activities to the private sector. The international development agenda is committed to the MDGs. Although infrastructure is considered the missing link in the MDGs, it is seen as a key constraint for growth (World Bank, 2014a). The agenda outline shows that SSATP promotes the international philosophy on transport sector management in Africa. Like in other areas, a clear link can be seen between domestic practices and the international development agenda. Both GoU and international development partners see active private sector participation as the way forward. In line with the SDGs that succeed the MDGs beyond 2015 more attention goes to Africa’s rapid urbanization, governance, climatological aspects and the way natural resources are used, advancing on active private sector participation. So far international development partners like World Bank see their one-size-fits-all strategies like OPRC face difficulties to properly implement them (Gericke et al., 2014a). Thinking ahead, this thesis explores a degree of outsourcing advancing on local constraints.

**2.2.3 Cultural dimensions**

It is understood that organizational (change) processes include interrelated technical-economic, political and cultural aspects (Tichy, 1983, Van Aken et al., 2012). This part introduces the cultural aspects using cultural dimensions as a starting point to assess
whether culture – ‘the collective programming of the mind which distinguishes the member of one group or category of people from another’ (Hofstede et al., 2010) - supports organizational goals / strategies and what may be a preferred approach. The cultural aspects constrain an appropriate PBC-framework.

The article An Investigation of Ugandan Cultural Values and Implications (2013) by Rarick et al. is the first to present a ‘preliminary look’ into the classification of Ugandan culture using the 5-dimensional Hofstede model (also see figure 2.7). ‘Hofstede’s model might be of use to performance improvement professionals as they try to solve familiar, and perhaps not so familiar, problems in international settings’ (Sánchez and Curtis, 2008). According to Rarick et al. (2013) Uganda has a ‘low power distance, masculine, collectivist culture that is relatively high in uncertainty avoidance, whose people have a short-term orientation towards time’. As the provided implications following from the ‘preliminary look’ are still limited, the cultural dimensions served starting points / umbrella terms to relate findings from other sources to resulting in a matching view. This is described next.

**Figure 2.7. Uganda cultural dimensions in comparison to the UK, Denmark and China (Hofstede et al., 2010; Rarick et al., 2013)**

Power distance (PDI): ‘the extent to which the less powerful members of organizations and institutions (like the family) accept and expect that power is distributed unequally’ (Hofstede et al., 2010). Rarick et al. (2013) provide a PDI score of 38 suggesting that Ugandans have a low level of acceptance of inequality of power and prefer ‘some form of power sharing and participation in the workplace’. The management task however primarily seems viewed as ‘exercise of authority’ (Oppong, 2013) whereby age is the basis for authority. ‘Despite the established group identity, decision making is likely to rest with managers as respect for authority may make employees less willing or even not permitted to participate in the decision-making process’ (Oppong, 2013).

Individualism (IDV): ‘the degree to which individuals are integrated intro groups’ (Hofstede et al., 2010). Rarick et al. (2013) provide an IDV score of 30 suggesting that Ugandan culture is very collectivist, indicating a strong group identity. ‘Groups would serve a useful role in the organization of people and achievement of goals’ (Rarick et al., 2013). Schwartz (2006)
explains such collectivist nature through ‘embeddedness’ in culture whereby people are seen as ‘entities in the collectivity’.

Uncertainty avoidance (UAI): ‘a society’s tolerance for uncertainty and ambiguity’ (Hofstede et al., 2010). Rarick et al. (2013) provide a UAI score of 56 suggesting quite a low uncertainty tolerance. For a management style this implicates ‘more direction and clear policies and procedures’ (Rarick et al., 2013) together with disciplinary action (Oppong, 2013).

Masculinity (MAS): ‘the distribution of emotional roles between the genders’ (Hofstede et al., 2010). Rarick et al. (2013) provide a MAS score of 57 suggesting that Ugandan culture is masculine and driven by aggression, competition, achievement and success.

Long-term orientation (LTO): this describes a societies’ time horizon (Hofstede et al., 2010). Rarick et al. (2013) provide a LTO score of 20 suggesting that Ugandan culture is very short-term oriented and implicating that immediately realizable results are preferred above policies / procedures that emphasize the future and delayed gratification. It also included the appreciation of traditions, social structure and social obligations (Hofstede et al., 2010). At the same time Oppong (2013) shows that some future orientation is included following from securing a continuous income, community commitment and remaining with one organization for most of the working life, in short ‘life-long employment’.

In this thesis the targeted PBC-strategy aims to cover strategic issues following from context specific characteristics. Culture is perceived to influence the interactions of organizations with their environment and the interactions within organizations (Hofstede et al., 2010; Schneider, 1989). The cultural aspects therefore constrain the solution-space of what could be an appropriate PBC-strategy. Towards the conclusions (chapter V) the cultural aspects are synthesized with other constraints.

2.3 Assignment and deliverables

The assignment and deliverables of the problem-solving project in this thesis include:

- A characterization and validation of the field problem;
- Analysis and diagnosis of important causes and consequences of this problem from various relevant perspectives;
- An exploration of solution directions; and
- Contribution to the academic field.

2.4 Project approach

This part introduces the conceptual project design and the operational project plan. First the conceptual project design (figure 2.8) outlines the thesis project approach. Next the operational project plan lists the line of work.

Conceptual project design

The subject of analysis (on the right-hand side in figure 2.8) refers to the explored outsourcing degree (Schoenmaker & Verlaan, 2013b) in this thesis. On the left-hand side four theoretical perspectives are listed: transaction cost economics (TCE), agency theory (AT), performance measurement (PM) and institutions. Following the research orientation, these perspectives (limited within the scope of this thesis) were originally seen as relevant to examine the field problem in relation to the organizational objectives. The arrows in figure 3.1
represent a ‘confrontation between theoretical perspectives and the subject of analysis’ and the implications (Van Aken et al., 2012). The diagnosis in this context is seen as ‘the exploration and validation of the […] problem and its causes’ (Van Aken et al., 2012). The exploration of solution directions refers to the deliverables of this thesis.

Figure 2.8. Conceptual project design for diagnosis and exploration of solution directions (based on Van Aken et al., 2012)

Operational project plan

The operational project plan for the problem-solving project in this thesis is as follows:

- Literature search regarding the topics mentioned on the left-hand side of the conceptual project design. It results in the linking of finding and ideas from literature;
- Methodological approach including the type of research, quality criteria, case selection, data collection and data analysis methods;
- Data collection using the specified methods;
- Empirical and theoretical analysis of the field problem, investigation of the specific characteristics and the validity of the field problem and the exploration of the causes and consequences of the field problem;
- Formulation of conclusions of the main problem, causes and consequences and their mutual relationships, recommendations on solution directions and evaluation;
- Feedback of the (intermediate) results to organization(s) and supervisors;
- Presentation(s) of the research; and
III. Theoretical Perspectives

This part introduces the theoretical perspectives applied in the analysis. Together with the subject of analysis and a confrontation between perspectives and the deliverables of the project, they are part of the conceptual project design (chapter II) that is drawn to present the outline of the problem-solving project (based on Van Aken et al., 2012). It is understood that organizational (change) processes include interrelated technical-economic, political and cultural aspects (Tichy, 1983, Van Aken et al., 2012). Data collection is guided by integrating findings and ideas from related (and within the scope of this thesis limited) theoretical perspectives. Chapter IV continues on the how, what and why of the methods used.

The theoretical perspectives include (1) transaction cost economics (TCE), (2) agency theory (AT), (3) performance measurement and (4) formal / informal institutions. The theoretical analysis (chapter 4) highlights how these perspectives explain what is happening / what different viewpoints on what is happening they provide. To do so, each perspective brings forward a key problem, respectively (1) uncertainty, (2) information asymmetry, (3) measurement complications and (4) mismatch between formal and informal institutions (the techno-economic key problems are after Schoenmaker, 2011).

3.1 Transaction cost economics

The rationale of transaction cost economics is that decision makers choose whatever governance structure minimizes the total transaction cost (Coase, 1937). This part first outlines the understanding of TCE in this thesis and the key dimensions that influence the choice of a governance structure. Next, it illustrates what a governance structure means in practice through a SSATP framework of management aspects. Finally, the application on this research is described.

3.1.1 Transaction cost economics: definition and dimensions

Definition of transaction cost economics

Key terms and concepts of transaction cost economics include the behavioural assumptions of bounded rationality, which is behaviour that is ‘intendedly rational, but only limitedly so’ (Simon, 1956) and opportunism, which is ‘self-interest seeking with guile’ (Williamson, 1996). ‘All complex contracts are unavoidably incomplete by reason of bounded rationality, and the convenient concept of contract as promise (unsupported by credible commitments) is vitiating by opportunism’ (Williamson, 1996, p. 19).

The transaction is the basic unit of analysis in transaction cost economics (Williamson, 1996, p19). A transaction ‘may be said to occur when a good or service is traded across a technologically separable interface’ (Williamson, 1993). Boudreau et al. (2007, p. 3) note that as a transaction cost are ‘cost incurred in making an economic exchange’, they are ‘those over and beyond the price of the product or service procured’, whereby motivation costs and coordination costs can be distinguished (Milgrom & Roberts, 1992). Motivation costs include opportunism (Williamson, 1995) and agency cost (Jensen & Meckling, 1976). Coordination costs include search (Stigler, 1961), input coordination (Alchian & Demsetz, 1972) and measurement cost (Barzel, 1982). Williamson (1996, p. 11) defines the governance structure as the ‘institutional framework in which the integrity of a transaction or related set of transactions is decided’. The governance structure results from the formal and informal institutions enabling an economic transaction and (in the view of transaction cost
economics) requires alignment with transaction characteristics (Williamson, 1985). This is illustrated by figure 3.1.

*Figure 3.1. Transaction cost economics model (redrawn from Boudreau et al., 2007, p. 3)*

In transaction cost economics, the key dimensions for describing transactions are (1) the frequency with which they occur, (2) the degree and type of uncertainty to which they are subject and (3) the condition of asset specificity (Williamson, 1996, p. 59). Williamson (1996, p. 105) refers to asset specificity as the ‘degree to which an asset can be redeployed to alternative uses and by alternative users without sacrifice of productive value’. Asset specificity therefore has to do with the extent to which an investment is specific for a particular transaction and the value of the investment for an alternative use if the transaction fails. Williamson (1996, p. 59) distinguishes six types of asset specificity: ‘(1) site specificity, as where successive stations are located in a cheek-by-jowl relation to each other to economize on inventory and transportation expenses; (2) physical asset specificity, such as specialized dies that are required to produce a component; (3) human asset specificity that arises in a learning-by-doing fashion; (4) dedicated assets, which are discrete investments in general purpose plant that are made at the behest of a particular customer, to which (5) brand name capital and (6) temporal specificity have been added’.

Key sources of uncertainty are environmental variability and behavioural uncertainty (Rindfleisch & Heide, 1997). High environmental uncertainty implicates difficulties in drawing up a complete contract and unforeseen events implicate contractual gaps, which require renegotiation and adaptation (Williamson, 1979). Behavioural uncertainty is based on the ‘threat of opportunism and refers to the difficulty of monitoring and evaluating the behaviour and performance of the transaction partner’ (Boudreau et al., 2007). Environmental uncertainty makes it impossible to fully specify contracts *ex ante* (before the award) and behavioural uncertainty leads to *ex post* (after the award) difficulties (Geyskens et al., 2006). Taking uncertainty and asset specificity as independent variables, Klein (2006) provides a discriminating alignment (table 3.1) that indicates a recommended contractual relationship from a transaction cost economics perspective.

**Table 3.1. Discriminating alignment: two independent variables (Klein, 2006)**

<table>
<thead>
<tr>
<th>Asset Specificity</th>
<th>Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Low</td>
<td>Market transaction</td>
</tr>
<tr>
<td>Medium</td>
<td>Contract</td>
</tr>
<tr>
<td>High</td>
<td>Contract</td>
</tr>
</tbody>
</table>

Based on the insight from other governance structures, such as networks, community, clans and bazaars next to the types (market, hybrid, hierarchy) distinguished by Williamson (1996), Boudreau et al. (2007) argue that the focus should not only be on transaction cost, but also...
on transaction benefits. Transaction benefits (see examples in table 3.2) are the benefits of an economic exchange (Watson et al., 2005) and are ‘over and beyond those benefits over direct financial return’ (Boudreau et al., 2007).

Table 3.2. Examples of transaction benefits (Boudreau et al., 2007)

<table>
<thead>
<tr>
<th>Individual</th>
<th>Organizational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reputation; collegiality; intellectual challenge; skill development; enhanced self-esteem</td>
<td>Market governance: Economies of scale due to specialization and flexibility</td>
</tr>
<tr>
<td></td>
<td>Hierarchy governance: Cumulative learning; increased economies of scope; exploitation monopoly power</td>
</tr>
<tr>
<td></td>
<td>Community governance: Innovation</td>
</tr>
</tbody>
</table>

In addition to the characteristics of transaction cost economics, Boudreau et al. (2007, p. 4) suggest four additional characteristics relevant to transaction benefits: (1) intensity of knowledge, (2) segmentation of knowledge, (3) dispersion of knowledge and (4) scarcity of knowledge. Intensity of knowledge is ‘the degree to which the execution of a transaction relies primarily on knowledge and skill rather than physical good’ (Boudreau et al, 2007, p5). Segmentation of knowledge is ‘the need for involving more than two parties (the principal and the agent) to execute a transaction’ (Boudreau et al., 2007, p. 5). Dispersion of knowledge is ‘the extent to which the knowledge required to accomplish a transaction is dispersed in multiple locations’ (Boudreau et al., 2007). Scarcity of knowledge is ‘the extent to which the knowledge required to accomplish a transaction is rare, i.e., possessed by a few individuals’ (Boudreau et al., 2007, p. 5).

The TCE model (figure 3.1) can be extended by including transaction benefits, resulting in the transaction cost and benefits model (figure 3.2). Also the insight by Boudreau et al. (2007, p. 5) is taken over that information systems (mainly the internet) increase the influence of the transactions characteristics. Taking into account both transaction costs and benefits, it is assumed that organisations will use a governance structure based on a mix of governance types such as mentioned earlier that will result in individual and organisational transaction benefits while minimising transaction cost (Boudreau et al., 2007, p. 6).

Figure 3.2. Transaction costs and benefits model (redrawn from Boudreau et al., 2007)

3.1.2 TCE and this research

This part has described TCE. Part 3.5 links the ideas and findings from the theoretical perspectives. Chapter IV describes the use of literature in this thesis for data collection and analysis. For the analysis the theoretical perspectives are used to explain what is happening / what different viewpoints they provide on what is happening. To do so each perspective brings forward a key problem: for TCE this is uncertainty (after Schoenmaker, 2011).
3.2 Agency theory

The agency theory (AT) focuses on the so-called agency relationship. ‘We define an agency relationship as a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent’ (Jensen & Meckling, 1976, p. 308). This part first outlines the understanding AT in this thesis and the key dimensions. It introduces a model of logical choices for the most efficient contract type and concisely describes the application of AT on this research.

3.2.1 Agency theory

Definition and differences with transaction cost economics

‘TCE and AT are very similar in that both work out of a managerial-discretion setup. They also adopt an efficient-contracting orientation to economic organization’ (Williamson, 1996, p. 173). In an attempt to sketch the differences between transaction cost economics and agency theory, Williamson (1996, p. 172) points out difficulties because both transaction cost economics and agency theory come in two forms: agency theory can be formal or less formal and transaction cost economics can be measurement or governance oriented. In this thesis, agency theory refers to the less formal, so-called positive agency theory, regarding ‘the technology of monitoring and bonding on the form of [...] contracts and organizations’ (Jensen, 1985, p. 234). Likewise, in this thesis transaction cost economics mostly refers to the governance-oriented transaction cost economics. In the transaction cost economics, the transaction is the unit of analysis (Williamson, 1996, p. 175).

In the agency theory, ‘the individual agent is the elementary unit of analysis’ (Jensen, 1983, p. 327). Williamson (1996, p. 176) points out that the agency costs, defined by Jensen and Meckling (1976, p. 308) as the total of ‘(1) the monitoring expenditures of the principal, (2) the bonding expenditures by the agent, and (3) the residual loss’, are key to a focus on ex ante incentive alignment in the agency theory. Transactions cost economics on the contrary, emphasizes the cost ex post, which include ‘(1) the maladaptation costs incurred when transactions drift out of alignment [...] (2) the haggling costs incurred if bilateral efforts are made to correct ex post misalignments, (3) the setup and running costs associated with the governance structures (often not the courts) to which disputes are referred, and (4) the bonding costs of effecting secure commitments’ (Williamson, 1996, p. 176), whereby maladaptation cost are the ‘key feature’ (Williamson, 1996, p. 176). Although the terminology of transaction cost economics and agency theory differs, ‘both TCE and AT work out of substantially identical behavioral assumptions’ (Williamson, 1996, p. 174).

Dimensions of agency theory

Interestingly, whereas Jensen (1983, p. 327) and Williamson (1996, p. 179) refer to the individual agent as unit of analysis, Eisenhardt (1989a, p. 59) refers to the contract between principal and agent as the unit of analysis of the agency theory. ‘Whatever unit of analysis is selected, the critical dimensions with respect to which that unit of analysis differs need to be identified. Otherwise the unit will remain non-operational’ (Williamson, 1996, p. 234). Anyhow, the agency theory emphasizes finding an agency relationship (contract) that minimizes agency costs. The work by Eisenhardt (1989, p. 60) helps identify two ways to do so: (1) steering on behavior (input) and (2) steering on results (output/outcome), also see figure 3.3. If the principal exactly knows what the agent will do and what the result will be, an
input-based contract may be most efficient (from the AT perspective). In case of uncertainty (which is most likely as described earlier), the agent is more likely to behave in the principals’ interest (1) when the contract between the principal and agent is result based and (2) when the principal has information to verify agent behavior (Eisenhardt, 1989, p. 60). Table 3.3 provides an overview of aspects that according to Eisenhardt (1989, pp. 60-63) are either positively or negatively related to the two ways to minimize agency costs.

Table 3.3. Propositions for choosing an agency relationship (based on Eisenhardt, 1989a, pp. 60-63)

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Contract positively related to:</th>
<th>Contract negatively related to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information systems</td>
<td>Behavior-oriented</td>
<td>Result-oriented</td>
</tr>
<tr>
<td>Outcome uncertainty</td>
<td>Behavior-oriented</td>
<td>Result-oriented</td>
</tr>
<tr>
<td>Agent risk aversion</td>
<td>Behavior-oriented</td>
<td>Result-oriented</td>
</tr>
<tr>
<td>Principal risk aversion</td>
<td>Result-oriented</td>
<td>Behavior-oriented</td>
</tr>
<tr>
<td>Goal conflict</td>
<td>Result-oriented</td>
<td>Behavior-oriented</td>
</tr>
<tr>
<td>Trask programmability</td>
<td>Behavior-oriented</td>
<td>Result-oriented</td>
</tr>
<tr>
<td>Outcome measurability</td>
<td>Result-oriented</td>
<td>Behavior-oriented</td>
</tr>
<tr>
<td>Length of agency relationship</td>
<td>Behavior-oriented</td>
<td>Result-oriented</td>
</tr>
</tbody>
</table>

Figure 3.3. Summary of logical choices for most efficient contract type (redrawn from Schoenmaker, 2011, based on the propositions by Eisenhardt, 1989, pp. 60-63)

3.2.2 AT and this research

This part has described AT. Part 3.5 links the ideas and findings from the theoretical perspectives. Chapter IV describes the use of literature in this thesis for data collection and analysis. For the analysis the theoretical perspectives are used to explain what is happening / what different viewpoints they provide on what is happening. To do so each perspective brings forward a key problem: for AT this is information asymmetry (Schoenmaker, 2011).
3.3 Performance measurement

A performance-based maintenance contract (PBMC) requires performance measurement. Whereas the orientation (chapter II) already highlights problematic aspects of measuring performance, this part continues on performance dimensions, functions and effects. The rationale of performance measurement is to synthesize a performance measurement system in such way that it advances on the positive effects and minimalizes the negative effects, thereby finding an appropriate balance while taking into account that the system will most likely be incomplete (Schoenmaker, 2011).

3.3.1 Performance measurement

Dimensions of performance

Dimensions of performance can be illustrated using an input / output model (figure 3.4). The relation between needs (resulting from societal demand) and goals reflects the relevance of the organizational goals. Following the organizational goals, resources are allocated (the input) to activities that result in a certain product (the output). This output interacts with the environment and results in certain intended and unintended long-term and short-term outcomes (Pollitt & Bouckaert, 2004, pp. 106-107). Figure 3.4 also identifies what is meant by economy (minimizing input costs), efficiency (maximum output with minimum input) and effectiveness (doing the right things) (Schoenmaker, 2011; based on Pollitt & Bouckaert, 2004) in this thesis.

Figure 3.4: Input / output model (redrawn from Schoenmaker, 2011, p. 80, based on Pollitt and Bouckaert, 2004, p. 106)

To measure performance, performance indicators are used. In a PMBC the focus shifts from what and how to when, where and why when moving right along the input-output-outcome dimension (also see chapter 2). Although in an outcome contract a contractor hypothetically is free to decide what, how, when and where ‘to do’ to achieve the intended outcome (the why), in practice there are restrictions (COWI, 2014a; Schiessler, 2007; World Bank, 2009b). This points in the direction of the existence of various kinds of performance indicators that (indirectly) prescribe the required activities. Literature suggests these could generally be categorized in four categories (Schoenmaker, 2011, based on Bouckaert & Auwers, 1999): (1) input indicators (2) activity indicators, (3) output indicators and (4) effect indicators. It is
understood when performance indicators become more abstract, this will increase the contractor’s freedom but at the same time increase the problematic aspects of performance measurement (Schoenmaker, 2011, p. 83).

**Positive and negative effects**

The orientation (chapter II) has already highlighted some problematic aspects of performance measurement. In summary, performance measurement is understood to be problematic when (1) products are multi-value, (2) the organisation has a strong process orientation, (3) products are created in co-production, (4) products are intertwined, (5) causal relationships are contested or unknown, (6) quality is not fully definable, (7) there is a variety of products, (8) measurement is costly or not timely, and (9) the system or environment is dynamic (Schoenmaker, 2013a; based on de Bruijn, 2007).

The positive effect can be related to the function(s) of performance measurement (Schoenmaker, 2011). These include (Schoenmaker, 2011; based on De Bruijn, 2006):

1. Transparency (through public procedures and reporting mechanisms);
2. Learning (using measurements to advance on efficiency and effectiveness);
3. Accountability (using measurement for feedback);
4. Clearance (in line with the agreed service levels).

The challenge is understood to synthesize a performance measurement system in such way that it advances on the positive effects and minimizes the negative effects, finding an appropriate balance. In the work by Schoenmaker (2011, pp. 95-100) the following preconditions to find this balance can be found:

1. Variety within the (performance measurement) system;
2. Dynamics within the (performance measurement) system;
3. Limiting the (high) impact of the (individual) performance indicators;
4. Interaction between asset manager and service provider *ex-ante* and *ex-post*.

**3.3.2 Performance measurement and this research**

This part has described performance measurement. Part 3.5 links the ideas and findings from the theoretical perspectives. Chapter IV describes the use of literature in this thesis for data collection and analysis. For the analysis the theoretical perspectives are used to explain what is happening / what different viewpoints they provide on what is happening. To do so each perspective brings forward a key problem. Measurement complications are taken as a key problem to evaluate the performance measurement system (after Schoenmaker, 2011).
3.4 Formal and informal institutions

Not only the formal but also the informal institutions create the institutional environment that is dealt with. Development partners like World Bank increasingly recognize the importance of including informal institutions into development projects (World Bank, 2003, 2014a, 2014b). ‘Consensus is emerging that people’s interaction (work, interchange, trust, distrust) in a given context, conceptualized as social capital, together with institutions influence individual and collective decisions’ (Kugonza, 2010, p. 18; based on Gratovetter, 1985; Standifird and Marshal, 2000; Tsai, 2006; World Bank, 2003).

This part defines formal and informal institutions and social capital, their dimensions and their perceived influence on behavior and actions. First, table 3.4 enlightens the hierarchy of institutions (and the relationship with social capital) as a starting point for understanding the differences and influence between the various aspects of institutions and social capital. Next, the definitions, dimensions, influence (on the contract) are provided. Finally, this part highlights the application on this research.

Table 3.4. Hierarchy of institutions and the relationship with social capital (not to scale, based on Kugonza, 2010; Williamson, 2000; World Bank, 2003)

<table>
<thead>
<tr>
<th>Social capital</th>
<th>Informal</th>
<th>Institutional levels</th>
<th>Formal</th>
<th>Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L1: Embededness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religion</td>
<td>Traditions</td>
<td>L2: Institutional environment</td>
<td></td>
<td>Courts</td>
</tr>
<tr>
<td></td>
<td>Taboos</td>
<td>Formal rules of the game, especially property rights (polity, judiciary, bureaucracy)</td>
<td></td>
<td>Police</td>
</tr>
<tr>
<td>Norms</td>
<td>Conventions</td>
<td>L3: Governance</td>
<td></td>
<td>Civil society organizations</td>
</tr>
<tr>
<td>Shared values</td>
<td>Networks</td>
<td>Play of the game, especially contract (aligning governance structures with transactions)</td>
<td></td>
<td>Firms</td>
</tr>
<tr>
<td>Trust</td>
<td>Rules</td>
<td>L4: Allocation</td>
<td></td>
<td>Government agencies</td>
</tr>
</tbody>
</table>

3.4.1 Formal and informal institutions

Definition of institutions

Different concepts of institutions exist (figure 3.5). Available literature provides both a narrow and a broad view on what institutions are. This part defines what is meant by institutions in this thesis, assuming that ‘which definition of an institution to adopt is not an issue of right or wrong; it depends on the purpose of the analysis’ (Aoki, 2001).
Figure 3.5. Different concepts of institutions (redrawn from Parlevliet, 2007)

The narrow view is represented by A (rules of the game) in figure 3.5. This is understood to be the ‘most rigorous and narrow understanding of institutions’ (Parlevliet, 2007). North (1990, 2005) for example sees institutions as ‘humanly devised constraints that structure political, economic and social interaction’ or in short ‘the rules of the game’, whereby organizations are ‘players of the game’. Parlevliet (2007) provides that ‘these rules can be formal, as encapsulated in constitutions, laws and legally recognized property rights; or they can be informal, as rules that can be found in taboos, customs, traditions and social norms’ (Parlevliet, 2007).

The broad view is represented by A (rules of the game) plus C (organizations) in figure 3.5. This broader view treats both the rules of the game and organizations that facilitate in coordination of human behavior as institutions (Coriat & Dosi, 2002; Greif, 2006; World Bank, 2003). In practice, organizations are referred to as institutions. In the book Business Development in Africa and Asia: the role of government agencies (2002), Jackson notes ‘institutions here are used in a sense of the broad range of implementing agencies’.

In this thesis a view of institutions is taken that includes both the rules of the game and players of the game. B (behavior / institutional outcomes) as institution is excluded. In line with the work by Kugonza (2010), this is considered as one of the dimensions of institutions (also see table 3.5). The most wide-ranging way to consider institutions seems as both formal and informal (Brousseau & Raynaud, 2006; Li, 2007; North, 1989; Tsai, 2006). Formality refers to an objective, cognitive, task-oriented and instrumental process, whereas informality refers to more subjective, affective, people-oriented and sentimental processes (Li, 2007).

Dimensions of institutions

Van Hees (1997, 2000) proposes three dimensions of institutions: (1) structural, (2) procedural and (3) behavioral. These dimensions are described and explained in table 3.5.

Table 3.5. Dimensions of institutions (Camarinha-Matos & Afsarmanesh, 2007; Kugonza, 2010; Van Hees, 1997, 2000)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Constraints due:</td>
<td>Constraints affecting:</td>
</tr>
<tr>
<td>Structural</td>
<td>Organizations, legal systems; Opinion of significant others;</td>
<td>Who is included / excluded;</td>
</tr>
<tr>
<td></td>
<td>Ascribed social roles and expectations of it;</td>
<td>Available strategies to participants;</td>
</tr>
<tr>
<td></td>
<td>Societal channels of communication; Capacity to process and use information</td>
<td>Formation of preferences of individuals;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Distribution of power</td>
</tr>
<tr>
<td>Procedural</td>
<td>Methods;</td>
<td>Links of individual strategies to results</td>
</tr>
<tr>
<td></td>
<td>Mechanisms for decision making;</td>
<td>(e.g. majority voting procedure, consensus type of committee decisions</td>
</tr>
<tr>
<td></td>
<td>Mechanisms influencing access to information;</td>
<td>making etc.);</td>
</tr>
<tr>
<td></td>
<td>Sanctions attached to breaches of</td>
<td>Who submits requests and to who</td>
</tr>
</tbody>
</table>
的影响正式和非正式机构

“Trying to draw a distinction between formal and informal institutions can illuminate the project of attempting to identify what type of institution actually influences the process of public outsourcing and at what point” (Kugonza, 2010). According to (Li, 2007) the distinguishing attributes of formality and informality are: (1) codification, (2) formation, (3) enforcement, (4) power, and (5) personalization (also see table 3.6).

Table 3.6. Formal-informal paradigm (Li, 2007)

<table>
<thead>
<tr>
<th></th>
<th>Formal</th>
<th>Informal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codification</td>
<td>Explicit</td>
<td>Implicit</td>
</tr>
<tr>
<td>Formation</td>
<td>Exogenous</td>
<td>Endogenous</td>
</tr>
<tr>
<td>Enforcement</td>
<td>Tight</td>
<td>Loose</td>
</tr>
<tr>
<td>Power</td>
<td>Hierarchical</td>
<td>Horizontal</td>
</tr>
<tr>
<td>Personalization</td>
<td>Depersonalized</td>
<td>Personalized</td>
</tr>
</tbody>
</table>

Following the formal-informal paradigm three main ways to conceptualize the distinctions between formal and informal institutions are understood: (1) state-societal divide, (2) location of enforcement and (3) whether or not they are openly codified (Kugonza, 2010; Lauth, 2004; Li, 2007; North, 1990; Olsson, 1999; Raiser, 1997). The informal institutions are understood to play an important role in development project outcomes (Manning & Westreicher, 2007). In their the work *Informal Institutions: How Social Norms Help or Hinder Development* (2007) published by OECD, Manning and Westreicher (pp. 144-146) the following ‘lessons learned in exploiting the multiple linkages between informal institutions and development outcomes’ are understood: (1) ‘include informal institutions into development strategies’, (2) ‘design effective policies to gradually adapt the institutional framework’, (3) ‘be aware of the political realities that back up the institutional framework’ and (4) ‘create effective partnerships’ (Manning & Westreicher, pp. 144-146).

影响正式和非正式机构在合同

Both formal and informal institutions influence a contract (Dequech, 2001). This can be illustrated by making a distinction of a contract into (1) legal aspects (formality) and (2) social aspects (shared expectations). A legal-only contract typically fails to recognize ‘fundamental uncertainty’ (Dequech, 2001). The more roles and obligations are specified, the less flexible and more constrained are the adaptive properties to uncertainties (Cannon et al., 2000). A legal only contract disregards ‘the necessity of some non-contractible relations, involving norms and informal rules. In other words, legal contracts are inherently incomplete’ (Kugonza, 2010). Important social aspects include flexibility, solidarity, mutuality, harmonization of conflict and restraint in use of power (Cannon et al., 2000; Macneil, 1980).
'Together, these cooperative norms define properties that influence adaptations to dynamic market conditions and safeguarding the continuity of exchanges subject to task ambiguity unlike in a strictly legal bond. Such contracts benefit from social capital. However, the formal procedures prescribed in public procurement regulations often proscribe close and informal contracts between principal and agent in order to minimize the possibility of corruption. Whether and to what extent informal contracts take place in the public sector is an empirical question' (Kugonza, 2010, p. 70). The next part continues on institutions and social capital.

Institutions and social capital

A concept related to formal and informal institutions is social capital. It is for example part of the World Bank social development strategy, illustrated by reports like Empowering People by Transforming Institutions: Social Development in World Bank Operations (2005). ‘It encompasses institutions, relationships, and customs that shape the quality and quantity of a society’s social interactions. Increasing evidence shows that social capital is critical for societies to prosper economically and for development to be sustainable’ (World Bank, 2014q). In this thesis it seen as the ‘goodwill available to individuals or groups’ (Adler & Kwon, 2002) in relation to relationships, norms and institutions that shape and govern behavior (World Bank, 2003, p. 38).

Individual and collective decisions are seen to depend on both social capital and institutions (World Bank, 2002). The distinction between them can be unclear and the interrelation can be strong, like World Bank (2003, p. 38) notes: ‘For example, the exchange of goods and services may be based on personal networks and other forms of social capital in the village, but on formal institutions in the city. Similarly, general trustworthiness in a society can be strong either because of strong personal networks— or because of good laws and judicial systems that are generally accepted. In fact, as societies become more complex, trust in individuals (based on knowledge of character and frequency of interpersonal contacts) is supplemented by trust in institutions (rules and organizations) when dealing with strangers’.

Adler & Kwon (2002) note ‘radical differences’ between ways of dealing with the concept. In their work they present an all-embracing conceptual model. It links social, market and hierarchical relations to social capital via motivation, opportunity and ability (Adler & Kwon, 2002). Relations create opportunities to take advantage from (Adler & Kwon, 2002). A useful way to illustrate the motivation is the differentiation of in two classes by Portes (1998): (1) ‘consummatory’ (socialization, shared destiny with others) and (2) ‘instrumental’ (rational calculations, enforced trust). The ability is about to the competencies and the resources in relation to the structure (Adler & Kwon, 2002).

Social, market and hierarchical relations are expressed through bonding, bridging and linking by Harper (2002, p.3): (1) bonding is ‘characterised by strong bonds e.g. among family members or among members of an ethnic group [...]’), (2) bridging is ‘characterised by weaker, less dense but more cross-cutting ties e.g. with business associates, acquaintances, friends from different ethnic groups, friends of friends, etc. [...]’, and (3) linking is ‘characterised by connections between those within a hierarchy where there are differing levels of power’ (Harper, 2002, p. 3). These aspects are what Grootaert and Van Bastelaer (2001, p. 4) see as the scope of social capital on a micro level (bonding) and a meso level (bridging and linking). They also work with a macro level. This one is about ‘the social and political environment that shapes social structure and enables norms to develop’ (Grootaert & Van Bastelaer, 2001).
3.4.2 Formal and informal institutions and this research

This part has described formal and informal institutions. Part 3.5 links the ideas and findings from the theoretical perspectives. Chapter IV describes the use of literature in this thesis for data collection and analysis. For the analysis the theoretical perspectives are used to explain what is happening / what different viewpoints they provide on what is happening. To do so each perspective brings forward a key problem: for formal and informal institutions this is a mismatch between formal and informal institutions.

3.5 Integrating ideas and findings

This part links the ideas and findings of the theoretical perspectives. This is used to guide data collection and analysis (also see the what, how and why of this research in the following chapter). The theoretical analysis in the data analysis chapter highlights how the theoretical perspectives explain what is happening / what different viewpoints on what is happening they provide.

The linking of ideas and findings is illustrated by figure 3.6. Within the country context (including the cultural values) networks and getting things done represents the bonding, bridging, linking, motivation, ability and opportunity, etc. following from the social structure. These influence the transaction cost and benefits and they are seen to interact with informal institutions (Boudreau et al., 2007; Grootaert & Bastelaer, 2002). Also the interactive relation between formal and informal institutions is represented. Following the literature review, the informal institutions are expected to have a higher influence where formal institutions are weak. Formal institutions influence the networks and getting things done. The organizational structure is chosen in such way that there will be a balance between not only the costs of a transaction but also the benefits, together with networks and getting things done resulting in a degree of outsourcing. The outsourcing process distinguishes ex-ante contract, contract award and ex-post contract in line with TCE / AT terminology. A feedback loop is added to illustrate ex-post circling into ex-ante again. Contract award and formal institutions interact to provide for new or changing rules and regulations that may be needed for a different degree of outsourcing.

Figure 3.6. Linking ideas and findings (based on Kugonza, 2010; Williamson, 2000; World Bank, 2003)
IV. Methodological Approach

The first chapter has introduced this thesis. This second chapter has introduced the definitions, concepts and models in use and familiarizes with the subject. The third chapter has introduced the theoretical ideas. This chapter presents the how, what and why of the methods used to address the overall aim to explore an integrated approach for outsourcing maintenance of road infrastructure in Uganda, taking into account the country’s specific characteristics. This includes the choice of selected methods and techniques as the most appropriate, the advantages and disadvantage and the research questions. It also includes the inventory of (un)available resources defining the scope. This MSc thesis is part of a graduation process based on the CME200 Graduation Thesis Guideline (2014) by Verlaan and Schoenmaker. The scope of the research involves following a number of activities / procedures listed in the guideline. The weight of the graduation project is 32ECTS.

4.1 What type of research?

This section describes the research type in line with the objectives of this thesis. The overall objective is to present findings which give an answer on the problem definition: what could an integrated approach for outsourcing maintenance of road infrastructure in Uganda look like, taking into account the country’s specific characteristics?

The target has been constrained to PBC. This means choosing a relevant PBC-framework in line with an appropriate outsourcing degree. The research orientation includes the road network, the agenda outline and the environmental and cultural aspects. An appropriate PBC-framework is also seen to require insight in local industry issues, management issues and legal issues. This has followed from the field study.

Succeeding the research orientation (chapter II), chapter III has introduced the theoretical ideas that were (initially) seen relevant to examine the problem underlying the overall objective of this research (eventually the complex environment however did not seem to correspond well to the conceptual framework, also see part 4.5). The role of theory in this thesis is positioned using the ideas on theory informed problem solving by Van Aken et al. (2012), a process roadmap by Eisenhardt (1989, based on Glaser & Straus, 1967, Miles & Huberman, 1984, Yin, 1984) on research methods, (case) study design and theory building; and a framework of methodological fit in management field research by Edmondson and McManus (2007).

This research is primarily qualitative. ‘Qualitative methods are those that are oriented at the discovery of qualities of things, that is, properties of objects, phenomena, situations, people, meanings and events. In contrast, quantitative methods are oriented at the number of amount of these qualities’ (Van Aken et al., 2012). Basically this thesis investigates Uganda-specific characteristics (constraints to improved road infrastructure performance) through manifestations in practice and the implications for the explored degree of outsourcing. Thereby a case study seems an appropriate strategy as the research object is carried out within the boundaries of a social system, cannot be seen separately from its natural settings, requires in-depth understanding and involves various data sources (Swanborn, 2010).

Edmonson and McManus (2007) introduce a contingency framework about the research approach in relation to preceding research / theories and ‘when to mix qualitative and quantitative data in a single research’. Key elements for this are the problem definition, preceding research (like mentioned), research design and contribution to literature
In their work they outline a theory range, from nascent (emerging, new connections) to mature (well developed over time). ‘In general the less known about a specific topic, the more open-ended the research questions, requiring methods that allow data collected in the field to strongly shape the researcher’s understanding of the phenomenon (e.g. Barley, 1990). In contrast, when a topic of interest has been studied extensively, researchers can use prior literature to identify critical independent, dependent, and control variables and to explain general mechanisms underlying the phenomenon’ (Edmonson and McManus, 2007).

The theoretical perspectives include topics that are developed (although separated), and also topics for which little previous research exists. So this study draws from earlier work (chapter I and chapter II) but at the same time the problem definition illustrates a rather open-ended inquiry; the research is not about approaching with hypotheses or predefined variables, rather with questions. Following Eisenhardt (1989b) and Edmondson and McManus (2007), in situations between nascent and mature preferably a combination is used of both qualitative and quantitative data for validation purposes. Within the scope (also see scope, time constraints) this thesis however is constrained to largely qualitative data (also see data collection and analysis). This means for example that for further determining a relative importance of what stands in the way of / interferes with meeting realistic standards additional research will be required. The next section continues on the use of (research-oriented) quality criteria for the problem-solving project.

4.2 Quality criteria

Van Aken et al. (2012) discuss the concept of truth in research. *Intersubjective agreement* (Swanborn, 1996) seems a more useful concept for the problem-solving project in this thesis. ‘*Intersubjective agreement refers to consensus between the actors who deal with a research problem*’ (Van Aken et al., 2012). *Controllability, reliability and validity* (Swanborn, 1996; Yin, 1994) are the quality criteria used to verify the results of this thesis and its sources, increasing the likelihood of intersubjective agreement. These criteria are described below.

Controllability: this chapter is for example part of the controllability. It provides insight in the what, why, how of the research, enabling to verify, redo or evaluate it. Controllability not only requires that the findings from (field) data gathered and the results from data analysis are as precisely as possible (Swanborn, 1996), but also that this research keeps track of literature search and review, case selection, drawing conclusions and circumstances and activities.

Reliability: ‘the results of a study are reliable when they are independent of the particular characteristics of that study and can therefore be replicated’ (Van Aken et al., 2012, based on Swanborn, 1996 and Yin, 2003). Van Aken et al. (2012) summarize four possible sources of distortion of the findings: the circumstances / situation, the respondents, the instruments and the researcher. Without distortion, a replicated research should provide similar results. Schoenmaker (2011) notes that for a case study however replication is *practically impossible* (free translation from ‘praktisch onmogelijk’ in Dutch) therefore requiring fixed procedures and a database for verification purposes. Van Aken et al. (2012) includes explicit procedures under measures to reduce distortion caused by characteristics of the researcher.

The instruments in this research are rather techniques, whereby *triangulation* increases reliability (Yin, 2003). This is seen as a ‘combination of multiple sources of evidence, such as interviews, documents, archives, observations and surveys’ (Van Aken et al., 2012). Data sources for this thesis include documents, observations, expert contacts and interviews.
following from an interview guide and case approach. Not all respondents have been selected in advance. The number of respondents is also not determined in advance. The field research is started with the idea that those involved in the problem area (emerging insight during field visit) are represented. The interviews also served to ask for supporting evidence of provided perspectives. The influence of particular circumstances is limited by a prolonged field visit (also see data collection).

Validity: ‘a research result is valid when it is justified by the way it is generated. The way it is generated should provide good reasons to believe that the research result is true or adequate’ (Van Aken et al., 2012). Following Swanborn (1996) and Yin (2003) three types of validity are included: internal, external and construct validity.

Construct validity deals with an appropriate operationalization of concepts (Van Aken et al., 2012) and assigning appropriate tags to findings. The fit of the data collection is checked with preceding research and operational concepts (chapter I). The combination of multiple sources means that if for example the interview guide fails to cover certain aspects, other sources may.

‘Internal validity concerns conclusion about the relationship between phenomena. The results of a study are internally valid when conclusion about relationships are justified and complete’ (Van Aken et al., 2012). To avoid misinterpretation, the analysis (also see analyzing data) in this thesis makes use of theoretical triangulation (Van Aken et al., 2012) by viewing the problem from multiple perspectives and reviewing the interpretation of findings. Results are checked with the experts involved.

The external validity is the extent to which general conclusions can be drawn, in short the ‘generalizability’ or ‘transferability’ (Van Aken et al., 2012). For theory building this is very important, but for solving the unsatisfactory performance in a specific environment (the field problem, also see problem definition) this may be less relevant. However the case selection includes a pilot study and this has generalizability concerns within the specific environment. The next section describes the case selection.

4.3 Case selection

This section describes the case selection. First, a unit of analysis is determined. This is seen as the ‘type of object that is the focus of the interest’ (van Aken et al., 2012). The field research is concerned with the outsourcing relation between asset manager and service provider (chapter I) for a particular process (road maintenance) in a particular context and the impact on the adequateness of road infrastructure. Therefore the unit of analysis is seen as an (organizational) arrangement (referred to as the degree of outsourcing, also see chapter I) instead of for example a product, project, event or organizational unit.

Like mentioned, a case study seems an appropriate strategy as the research object is carried out within the boundaries of a social system, cannot be seen separately from its natural settings, requires in-depth understanding and involves various data sources (Swanborn, 2010). Following the work by Eisenhardt (1989b), Glaser and Strauss (1967) and Yin (2003), Van Aken et al. (2012) provides an overview of strategies and preconditions for case selection. Considering the availability of cases, the case selection in this research is rather based on pragmatic grounds. Following the focus of interest and the orientation (chapter II), in the same context two occurrences have been identified: (1) the everyday business through force-account and FIDIC / FIDC-inspired input contracts and (2) the
ongoing OPRC pilot, introducing interventions in the everyday business that aim to make Uganda advance on road infrastructure performance.

4.4 Data collection

This section describes the data collection. The findings are based on data sources including documents, observations and 20 expert contacts and semi-structured interviews from a field visit to Uganda between September and November 2014 (also see appendix C: field visit Uganda). COWI and UNRA (both technically and intellectually) and DIMI (financially) have enabled this field visit. Initially discussing with COWI and UNRA the challenges and constraints of the Ugandan environment, new contracting methods and their combination, together with the aim to ultimately mainstream practices (a way of dealing with outsourcing maintenance of a road network instead of a single road), the outline of the problem-solving project has been drawn within the scope of the graduation process, with the facilitation and permission (in writing) to gather data (from interviews, observations, documents, site visits) on location. Of course the set-up has also been discussed with the thesis committee.

Procedures and techniques

It is understood that organizational (change) processes include interrelated technical-economic, political and cultural aspects (Tichy, 1983, Van Aken et al., 2012). Data collection is guided by integrating findings and ideas from related (and within the scope of this thesis limited) theoretical perspectives (chapter III). For both occurrences (everyday business and OPRC pilot) the degree of outsourcing (including the object that is outsourced, the performance indicators / incentives, the governance and the role division in maintenance) is examined using those linked ideas and findings. This is made operational for data gathering: the primary technique of data collection in this thesis is a semi-structured interview guide (also see appendix K) with direct (participative) observations (prior consent given) that yield qualitative data, extended with documents (both qualitative and quantitative data).

The interviews and observations have been captured by taking notes, and also by audio recording of meetings. Like mentioned, not all those involved in the field research have been selected in advance. The field visit commenced with the thought that those involved in the problem area (emerging insight during field visit) had to be represented. The interviews also served to ask for supporting evidence of provided perspectives by the respondents. The influence of particular circumstances is limited by a prolonged field visit. The first interview served as a pilot interview. Readily provided documents by World Bank and COWI preceding the field visit have helped to align the used wording in the interview set-up with the way something is expressed in the field. For the participant the open-ended inquiry itself however seemed different, as the participant in Uganda was rather used to surveys or providing answers to questions in writing. This insight has helped to introduce the interview and the objectives more extensively with following participants.

4.5 Data analysis

The analysis further identifies features of the Ugandan environment. The research orientation includes the road network, agenda outline and environment and cultural aspects. An appropriate PBC-framework is also seen to require insight in local industry issues, management issues and legal issues in the field. The analysis reviews what stands in the way of / interferes with meeting realistic standards. The analysis uses the idea of a cause and effect diagram whereby problem areas impacted by the OPRC pilot are highlighted and
evaluated. The analysis builds on the ideas explained in the work *Problem Solving in Organizations* by Van Aken et al. (2012) on representing a problem mess in cause and effect. A problem tree analysis is understood as a well recognized way among the development partners such as World Bank and DFID to help find solutions by mapping out the ‘anatomy of cause and effect’ (ODI, 2014). The cause and effect diagram whereby problems areas impacted by the OPRC pilot are highlighted compiles information following from the problem definition (after CrossRoads, 2013, World Bank 2014a, 2014b) and the findings.

Theoretical perspectives are used to highlight what is happening / what different viewpoint on what is happening they provide. To do so, each perspective brings forward a key problem. Findings from the field are compared along with the theoretical perspectives, resulting in a statement about a preferable way to deal with the key problems. Although the (complex) environment eventually did not seem to correspond well to the conceptual framework, the key problems that are drawn from the perspectives nevertheless seemed relevant. This means for example that from a transactions cost economics (TCE) perspective, the transaction cost focus did not seem to explain the OPRC occurrence as an alternative to the everyday business, but taking the TCE-aspect of uncertainty as a key problem to evaluate the transaction agreement nevertheless seemed relevant.

For the analysis, the content is analyzed in an inductive way whereby critical themes followed from the data (Patton, 1990) and in a more inductive way taking the theoretical perspectives as an initial coding input (Zhang & Wildemuth, 2009). Initial codes (that represent content) are assigned to pieces of prepared data. There codes are worked through, refined, categorized and grouped. The outcome is structured in line with the critical themes.

**Theoretical perspectives applied in the analysis**

This part briefly recaps the theoretical perspectives (chapter III) applied in the analysis. Together with the subject of analysis and a confrontation between theoretical perspectives and the deliverables of the project, they are part of the conceptual project design (earlier introduced in chapter I) that is drawn to present the outline of the problem-solving project (Van Aken et al., 2012). These perspectives include (1) transaction cost economics (TCE), (2) agency theory (AT), (3) performance measurement and (4) formal / informal institutions. The perspectives are used to highlight what is happening / what different viewpoints on what is happening they provide. To do so, each perspective brings forward a key problem, respectively (1) uncertainty, (2) information asymmetry, (3) measurement complications and (4) mismatch between formal and informal institutions (the technical-economic key problems are drawn from Schoenmaker, 2011, also see chapter III). Like mentioned, although the (complex) environment eventually did not seem to correspond well to the conceptual framework, the key problems that are drawn from the perspectives nevertheless seem relevant.

**Drawing conclusions**

The conclusions summarize the insight provided by the research. In this research (observational, no hypotheses) the conclusion wraps up the data analysis and establishes the research contribution. It also suggests directions for additional research. Further, it evaluates the flaws (using the earlier mentioned quality criteria) and the benefits of the research. To answer the main question, this thesis provides recommendations based upon the conclusions. This final piece unites the findings.
4.6 Wrapping up the methodological approach

This section wraps up the methodological approach. The research is characterized by an open-ended inquiry about the object of interest. A case study seems an appropriate strategy. The findings are based on data sources including documents, observations, expert contacts and semi-structured interviews from a field visit to Uganda between September and November 2014 (also see appendix C). A primary technique of data collection in this thesis is a semi-structured interview guide (also see appendix F) with direct (participative) observations (prior consent given) that yield qualitative data, extended with documents (both qualitative and quantitative data). The analysis uses the idea of a cause and effect diagram whereby problem areas impacted by the OPRC pilot are highlighted and evaluated.

Theoretical perspectives are used to highlight what is happening / what different viewpoint on what is happening they provide. To do so, each perspective brings forward a key problem. Findings from the field are compared along with the theoretical perspectives, resulting in a statement about a preferable way to deal with the key problems. Controllability, reliability and validity are the quality criteria used to verify the results of this thesis. The next chapter presents the results of the research.
V. Results

The first chapter has introduced this thesis. The second chapter has introduced the definitions, concepts and models in use and familiarizes with the subject. The third chapter has introduced the findings and ideas from literature. The fourth chapter has elaborated the research design and introduces the data collection process. This chapter presents the findings from data gathered and the results from data analysis. This way it enlightens what is discovered.

The findings

This section briefly wraps up the story the findings tell and the approach that has been in elaborated in the previous chapter. The findings tell the story of (1) the everyday business through force-account and FIDIC / FIDIC-inspired input contracts and (2) the ongoing OPRC pilot, introducing interventions that aim to make Uganda advance on road infrastructure performance. The findings include the explored outsourcing degree in both occurrences, including the object that is outsourced, the performance indicators / incentives, the governance and the role division. In addition to the introduction (chapter I) and orientation (chapter II), the findings from both occurrences are preceded by a further introduction. Summarized from chapter IV, data sources include the documents, observations, expert contacts and semi-structured interviews from a field visit to Uganda between September and November 2014 (appendix C). The description includes the formal structures in place and the manifestations in practice around the formal structures.

Like mentioned in the methodological approach, it is understood that organizational (change) processes include interrelated technical-economic, political and cultural aspects (Tichy, 1983, Van Aken et al., 2012). Data collection has been guided by integrating findings and ideas from related (and within the scope of this thesis limited) theoretical perspectives. These include transaction cost economics (TCE), agency theory (AT), performance measurement and formal / informal institutions.

The analysis

Next, an interpretation of these findings follows. Like the previous section, this section briefly wraps up the content of the analysis and the approach following from the previous chapter. The analysis further identifies features of the Ugandan environment. The research orientation includes the road network, agenda outline and environment and cultural aspects. An appropriate PBC-framework is also seen to require insight in local industry issues, management issues and legal issues in the field. The analysis reviews what stands in the way of / interferes with meeting realistic standards. The idea of a cause and effect diagram is used whereby problem areas impacted by the OPRC pilot are highlighted and evaluated. The analysis builds on the ideas explained in by Van Aken et al. (2012) on representing a problem mess in cause and effect. A problem tree analysis is understood as a well recognized way among the development partners to help find solutions by mapping out the ‘anatomy of cause and effect’ (ODI, 2014). The cause and effect diagram whereby problems areas impacted by the OPRC pilot are highlighted compiles information following from the research orientation and the findings. Theoretical perspectives are used to explain what is happening / what different viewpoints it provides on what is happening: along with the key problems brought forward by the theoretical perspectives the findings from the outsourcing degree in both the everyday business and the OPRC project are compared, resulting in a statement about a preferable way to deal with the key problems.
5.1 Findings from the field

First, the findings tell the story of everyday business through force-account and FIDIC / FIDIC-inspired input contracts. Then the ongoing Output and Performance-based Road Contract (OPRC) pilot is described, introducing interventions that aim to make Uganda advance on road infrastructure performance. The findings include the explored degree of outsourcing in both occurrences, including the object that is outsourced, the performance indicators / incentives, the governance and the role division. The elaboration of the OPRC and everyday business includes the formal structures in place and the manifestations in practice around the formal structures. Table 5.1 provides an outline of findings from the field from both everyday business and OPRC pilot.

Table 5.1. Outline of findings from the field: everyday business (through force-account and FIDIC / FIDIC-inspired input contracts) and OPRC pilot

<table>
<thead>
<tr>
<th></th>
<th>Everyday business</th>
<th>OPRC pilot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contracting mode</td>
<td>Force account, FIDIC (red book, 1987, 1999) / FIDIC-inspired input contracts; outsourcing through separate, input-based contracts for various activities, following PPDA regulations</td>
<td>OPRC (based on World Bank sample specifications, 2009); outsourcing through single hybrid contract, not yet provided for in PPDA regulations, requiring separate approval</td>
</tr>
<tr>
<td>Method of payment</td>
<td>Pay in accordance with work progress measured by input</td>
<td>Combination of payment principles</td>
</tr>
<tr>
<td>Risk allocation</td>
<td>Road agency deals with most risks</td>
<td>Risks handled by those assumed best able to deal with the risks</td>
</tr>
<tr>
<td>Object of outsourcing</td>
<td>Share of rehabilitation, routine and periodic maintenance activities, emergency and improvement works for road related assets and items to be maintained within the road-reserve / up to right-of-way limits</td>
<td>Rehabilitation, routine and periodic maintenance activities, emergency and improvement works for road-related assets and items to be maintained within the road-reserve / up to right-of-way limits</td>
</tr>
<tr>
<td>Role of contractor in the maintenance process</td>
<td>Work scheduling and / or work execution</td>
<td>Analysis, data management, work identification, planning / design, work scheduling, work execution</td>
</tr>
<tr>
<td>Organizational capacity / strategy</td>
<td>Insufficient capacity; emphasizing outsourcing while not really enabling involvement of private sector</td>
<td>Insufficient capacity; following a side-track to implementation</td>
</tr>
<tr>
<td>Procedures</td>
<td>Lengthy / complex (procurement) procedures</td>
<td>Lengthier / more complex (procurement) procedures, increased costs</td>
</tr>
<tr>
<td>Fraud / corruption</td>
<td>In multiple occasions</td>
<td>No information found</td>
</tr>
<tr>
<td>Data availability and information sharing</td>
<td>Inaccurate and unshared data; authorities have their own but limited asset inventory; use of HDM4</td>
<td>Updated and more detailed asset inventory; use of HDM4</td>
</tr>
<tr>
<td>Funding</td>
<td>Insufficient funding, inconsistent funding and delayed payments; maintenance funding through URF</td>
<td>Long-term allocation to maintenance; requiring separate funding</td>
</tr>
<tr>
<td>Advancing on new technology, materials and methods</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Expertise and learning facilities</td>
<td>Little consultant expertise and</td>
<td>Involving local organizations</td>
</tr>
</tbody>
</table>
learning facilities; little contractor training; missing regulation and coordination (explicitly consultants) and providing learning possibilities

Local contractors

Difficulties to understand regulations, inability to meet criteria, insufficient capital / financial access

Little insight in what is expected, increased inability to meet criteria, more financially demanding

Physical resources

Areas with insufficient standard materials and inadequate (force account) equipment

Areas with insufficient standard materials, need for extended mobilization period

Supervision and enforcement

Use of monitoring consultant; insufficient measurement and inspection; difficulties to enforce requirements; monthly check-ups in remote areas nearly unfeasible

Use monitoring consultant; requirements on the qualifications, the inspection frequency and overlap by the required self-control unit make monitoring costs increase

5.1.1 Everyday business

Whereas the OPRC occurrence in Uganda only applies to 340 km of an international trunk road (class A road) in Uganda, the common way of outsourcing UNRA network maintenance activities is found through FIDIC (red book, 1987, 1999) and FIDIC-inspired (as promoted by development partners) input contracts, together with the occurrence of force-account (the road authority’s in-house workforce) referred to as the ‘everyday business’ in this thesis. Thereby UNRA’s vision is ‘to operate a safe, efficient and well-developed national roads network’ (UNRA, 2012). UNRA’s mission is ‘to develop and maintain a national roads network that is responsive to the economic development needs of Uganda, to the safety of all road users, and to the environmental sustainability of the national roads corridors’ (UNRA, 2012). One of the insights already provided in the problem definition of this thesis (chapter I) is road maintenance throughout the country has been underfunded and attracted little attention, resulting in a practice characterized as ‘build and collapse’ (World Bank, 2014a, p. 4) that requires an appropriate remedy.

Everyday business: the object of outsourcing and the observations

The object of outsourcing is a share of the maintenance (also see role division, figure 4.1) of the UNRA network. It includes road related assets and items that are to be maintained within the road reserve / up to right-of-way (RoW) limits. Activities include those related to rehabilitation, routine and periodic maintenance activities, improvement and emergency works (also see chapter I), outsourced through separate, input-based contracts following regulations by the Public Procurement and Disposal of Public Assets Authority (PPDA).

‘Of the works execution, about ninety percent is outsourced now. We often experience bids above the estimates. Then the accounting officers must recheck the estimate. We experience difficulties with the estimates because of the long and difficult processes and road deterioration in meantime. Now we find we cannot accept many bids, the bids can be very high. In that case we still use force account. This is still in line with the new PPDA regulations, that state that in principle the works on the UNRA network are to be outsourced unless doing ourselves is more economical’ (Interview UNRA Contracts Committee, 2014).

Although new PPDA regulations (2014), following up on outdated small contract and public supplies regulations by PPDA (2003), increase the emphasis on outsourcing for all of Uganda’s public assets, UNRA (2014) on the contrary reports a slight increase in using in house units over 2014-2015. This also has to do with the PPDA complexity:
Understanding of Ugandan regulations remains a major challenge, also for Ugandan contractors. And then it is a strict process, very strict process. Interpretation requires at least one professional, the regulations are only written in English, the bidding documents are not simplified. For example, here in this document, we have emergency works for a railway crossing. It is over one hundred pages. A Ugandan contractor cannot do like this. A big contractor will not be interested in it’ (Interview UNRA Contracts Committee, 2014).

Within the updated PPDA regulations, outsourcing maintenance still remains input-based through separate contracts for various maintenance activities, whereby UNRA and / or UNRA’s consultants mostly design the interventions on the UNRA network.

‘Newer types of contracts, like the combined ones, like OPRC the guys at NSU [Network Strategies Unit] are doing, here in Uganda is not yet provided for in the new regulations. You will have to apply to PPDA separately’ (Interview UNRA Procurement, 2014).

The UNRA network
The UNRA network is the national roads network. It includes (inter)national trunk roads and feeder roads (previously part of the DUCAR network). Together with the DUCAR network, it forms Uganda’s public road network (table 5.2). A district in Uganda typically has two network types: UNRA and DUCAR. This division is not always functional, but administrative. The additional UNRA network listed in table 5.2 (it is found that UNRA, 2014, World Bank, 2014b, and URF, 2014, list different lengths and conditions) used to be part of the DUCAR network. The additional network is mostly in poor condition. The original network is mostly in fair condition (appendix L defines indicators).

Table 5.2. Uganda’s public road network characteristics (URF, 2014)

<table>
<thead>
<tr>
<th>Network (UNRA)</th>
<th>Length (km)</th>
<th>Condition of network</th>
<th>Paved</th>
<th>Unpaved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Good</td>
<td>Fair</td>
</tr>
<tr>
<td>Original</td>
<td>3,242</td>
<td>7,703</td>
<td>10,945</td>
<td>53%</td>
</tr>
<tr>
<td>Additional</td>
<td>10</td>
<td>9,607</td>
<td>9,617</td>
<td>-</td>
</tr>
<tr>
<td>Overall</td>
<td>3,252</td>
<td>17,310</td>
<td>20,562</td>
<td>-</td>
</tr>
<tr>
<td>Network (DUCAR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>District roads</td>
<td>0</td>
<td>22,500</td>
<td>22,500</td>
<td>Up-to-date data on network condition not available</td>
</tr>
<tr>
<td>Urban roads</td>
<td>1,100</td>
<td>4,500</td>
<td>5,600</td>
<td>Up-to-date data on network condition not available</td>
</tr>
<tr>
<td>CAR</td>
<td>0</td>
<td>30,000</td>
<td>30,000</td>
<td>Up-to-date data on network condition not available</td>
</tr>
</tbody>
</table>

The network includes roads with different functional classes. Two systems of functional road classification are in use, one for rural roads (including trunk roads) and one for DUCAR. The additional UNRA network falls within both functional systems. The rural roads are divided into five functional classes in line with their function in the road network (MoWHC, 2005): international trunk roads (class A), national trunk roads (class B), primary roads (class C), secondary roads (class D) and minor roads (class E). Such functional class has design requirements (table 5.3), which can be found in Uganda’s Road Design Manual (MoWHC, 2005). It is supposed to be paved for example. Roadway width and design speed depend on
design traffic. Traffic volumes of different vehicle types in different types of terrain are expressed in passenger car units (PCU). The conversion from average daily traffic (ADT) to PCU is listed in table 5.4. A service level standard is attached to the road (also see part 1.2.7). The road reserve (demarcated in the field by white reinforced concrete UNRA markers) leaves space for future road expansion. Appendix A provides a road network map.

Table 5.3. Road design class (MoWHC, 2005)

<table>
<thead>
<tr>
<th>Design class</th>
<th>Capacity (PCU/day)</th>
<th>Roadway width (m)</th>
<th>Design speed (km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Level</td>
</tr>
<tr>
<td>Ia paved</td>
<td>12,000 – 20,000</td>
<td>20.80 – 24.60</td>
<td>120</td>
</tr>
<tr>
<td>Ib paved</td>
<td>6,000 – 10,000</td>
<td>11.0</td>
<td>110</td>
</tr>
<tr>
<td>II paved</td>
<td>4,000 – 8,000</td>
<td>10.0</td>
<td>90</td>
</tr>
<tr>
<td>III paved</td>
<td>2,000 – 8,000</td>
<td>8.6</td>
<td>80</td>
</tr>
</tbody>
</table>

Table 5.4. Conversion factor of vehicle into equivalent passenger car units (MoWHC, 2005)

<table>
<thead>
<tr>
<th>Vehicle type</th>
<th>Level</th>
<th>Rolling</th>
<th>Mountainous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger cars</td>
<td>1.0</td>
<td>1.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Light goods vehicle</td>
<td>1.0</td>
<td>1.5</td>
<td>3.0</td>
</tr>
<tr>
<td>Medium goods vehicle</td>
<td>2.5</td>
<td>5.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Heavy goods vehicle</td>
<td>3.5</td>
<td>8.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Buses</td>
<td>2.0</td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Motorcycles, scooters</td>
<td>1.0</td>
<td>1.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Bicycles</td>
<td>0.5</td>
<td>0.5</td>
<td>NA</td>
</tr>
</tbody>
</table>

A tool (Highway Development and Management Model 4 - HDM4) is used in the everyday business to determine affordable service level standards. This tool has been introduced earlier in line with the Road Sector Development Programs (RSDPs) described in the orientation (chapter II). Once an affordable service level is determined, UNRA and / or UNRA’s consultant first propose and then design the interventions after mostly yearly maintenance plan approval by the Uganda Road Fund (URF), that is supposed to allocate and divide the road maintenance budget among Ugandan road agencies, including UNRA (URF, 2014). The next section continues on the role division in the maintenance process.

Everyday business: role division in the maintenance process and the observations

In this section the model of the maintenance process introduced in chapter II, the so-called six-stage model (Schoenmaker, 2011), is used to explain the degree of outsourcing, including the role of asset owner, asset manager and service provider(s). In the everyday business through FIDIC / FIDIC-inspired input contracts (admeasurement contracts), BoQs are used to show quantities to be carried out for the prices quoted, whereby the contractor is responsible to execute the work in line with UNRA drawings / specifications and quantities used in practice are measured at the end of the contract to recalculate costs. The observed role division in the maintenance process is illustrated by figure 5.1. For some activities, like routine maintenance activities in the districts, the role of the contractors (mostly local) can be limited to work execution only (like grass cutting, whereby the work is scheduled by the district authorities).
UNRA, the asset manager, represents the asset owner as far as the national roads network is concerned and signs the contracts with the asset maintainer / service provider. The representation and position of UNRA within the institutional context is illustrated by figure 5.2. Uganda’s designated road agencies not only include UNRA but also those responsible for the DUCAR network. Among them the annual road maintenance budget is divided.

The Uganda Road Fund (URF) prepares *Annual Road Maintenance Plans* and 3- and 5-yearly plans. A URF plan preparation flowchart is included in appendix F. The road maintenance plans are based on proposed interventions and proposed prioritization (figure 5.1) by UNRA and other agencies. After approval URF allocates the maintenance budgets the agencies have to work with, also based on their own asset inventory but still using the same tool,
HDM4. The further roles and responsibilities of the various parties involved, including UNRA, are included in a framework in appendix E.

Everyday business: manifestations around the formal organization and the observations

The previous section introduced some of the institutional relations and regulations (together with some difficulties experienced). Ugandan rules, regulations, documents, charts etc. are available through public web portals of authorities such as IG or PPDA (if their servers do not experience downtime). Chapter II already provides that Uganda’s formal framework score is among the highest in the world (Global Integrity, 2012) but their actual implementation score is amongst the lowest, expressed as ‘very weak’ (Global Integrity, 2012, p. 36). From this perspective it would not surprise if road maintenance processes in the field were not exactly the way they are ‘formalized’ (an expression used in the field to put something on paper) either.

This part continues on the manifestations in practice around the formal structures. At UNRA a tendency to ‘formalize’ has been experienced first hand. Once something has been ‘formalized’, it seems to serve as a continuous reference. If interviewing about institutional arrangements for example, the respondents do not necessarily explain what happens, but rather refer to organizational charts (like figure 5.2) that explain what is supposed to happen. Comparing the formal structures to the manifestations in the field, it is indeed found that the way it is supposed to happen on paper differs from the way it happens in practice. One of the key results of this thesis is the insight in the manifestations in the field around the ‘formalized’ picture. The findings below continue the story of the everyday business through force-account and FIDIC / FIDIC-inspired input contracts in Uganda.

Uganda allocates about 17% of its 2014/2015 national budget to improve and maintain road infrastructure and has reportedly sustained this level over multiple years (CrossRoads, 2013; NPA, 2010; URF, 2014; World Bank, 2014b). The organization is found to face difficulties to outsource activities and allocate resources well. Like mentioned, formal procurement requirements are not uncommon to remain off limits for service providers (for example due to their inability or unwillingness to meet criteria). This chapter further presents findings on the (perceived) functioning of the Ugandan (institutional) environment. This includes aspects like unreliability and unpredictability, exposing service providers to risks they are unable or unwilling to take and/or resulting in the ‘very high bids’ like mentioned by UNRA’s Contract Committee. It also includes fraud and corruption. One of the first of observations from the field visit actually was the aftermath of a fraudulent tender, which The Independent (2014) refers to as a ‘massive Christmas gift’ and ‘sophisticated corruption’.

A week before the Uganda field visit, four UNRA directors, including the executive director and director of planning, also responsible for the Network Strategies Unit (NSU) implementing OPRC at that time, have been suspended over fraud on a UXG 165 billion road project tender. Two of Uganda’s largest newspapers, both partly government owned newspaper New Vision (2014) and the privately owned newspaper Daily Monitor (2014), have indicated this is not the first example of large scale fraud or corruption since UNRA’s relatively recent establishment (also see chapter I). Throughout the field visit, internal investigations were taking place at UNRA in Kampala. As measure of greater transparency, UNRA’s oversight board had placed A0-sized posters at the area where visitor enter the elevators, publicly listing for example the normal (monthly) salary of every UNRA employee to allow for checks on dubious possessions.
Use of force account

When the road authority is faced with difficulties to outsource (execution related) activities, it may decide to perform it themselves if more economical. Here yet another difficulty is found:

‘Most of our road equipment old and in need of repair. So actually gear has to be hired for force account operations’ (Interview UNRA Operations, 2014).

During site visits (appendix C) it was observed that a quite some, if not most, road equipment is indeed old and in need of repair. Management at district stations visited explained that releases do not provide for buying and replacing equipment, as this remains a responsibility of the UNRA in Kampala. They explained that the machines and equipment were always breaking down causing the stations to hire privately owned road equipment if available. The privately owned equipment that is commonly hired includes motor graders, bulldozers, crane trucks and water bowser to carry out road maintenance works as part of the in house operations (force account). The problem of old equipment is seen to become very acute during the rainy seasons when various roads become impassable and need urgent repair and opening up, which the old equipment cannot handle. It was also noted that hiring of privately owned equipment is relatively expensive and negatively affects maintenance of the old equipment. Table 5.5 illustrates the rundown district station equipment for mechanized maintenance activities. The full inventory of the rundown equipment is included in appendix N.

<table>
<thead>
<tr>
<th>Reg. No.</th>
<th>Type</th>
<th>Year</th>
<th>Make</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>UG.0105W</td>
<td>Crane Truck</td>
<td>1987</td>
<td>Mitsubishi</td>
<td>Broken down (requires new crane assembly)</td>
</tr>
<tr>
<td>UG.1199W</td>
<td>Pick-up Single cabin</td>
<td>2001</td>
<td>Nissan S/cabin</td>
<td>Broken down (due for disposal, uneconomical to repair)</td>
</tr>
<tr>
<td>UG.1086W</td>
<td>Pick-up Double cabin</td>
<td>2000</td>
<td>Mitsubishi D/cabin</td>
<td>Broken down (requires engine repair)</td>
</tr>
<tr>
<td>UG.1268W</td>
<td>Pick-up Double cabin</td>
<td>2003</td>
<td>Mitsubishi D/cabin</td>
<td>Broken down (requires engine replacement)</td>
</tr>
<tr>
<td>UG.0965W</td>
<td>Motor Grader</td>
<td>2000</td>
<td>Komatsu</td>
<td>Broken down (requires engine replacement)</td>
</tr>
</tbody>
</table>

Further, during the site visits (appendix C) it was reviewed if local service providers, as far as their know-how is concerned, could execute common force account activities such as routine or periodic maintenance activities. One of the district station chiefs explains that the basic know-how of local contractors may be there, but mainly from practice only and not ‘formalized’ (e.g. being able to operate a quarry plant but not having the required certificate to meet formal criteria, whereby there is actually no industry coordination found) and they do not seem to have the basic management and engineering capacity the district stations have (at least one engineer is observed to work at the road stations). As the local contractors reportedly have very limited resources, they would have to hire equipment from larger
(international) suppliers (if they allow them to) in a similar way like the force account operations, for which they then fully depend on government releases (that may be uncertain, also see funding section). The district station chief explains this way outsourcing is not yet advancing over force account for maintenance activities.

**Organizational capacity**

In the everyday business the Uganda national roads authority together with other authorities submit their yearly maintenance plans to the Uganda Road Fund (URF). Some of the plans are approved by URF and the road authorities outsource some of the maintenance activities, mostly execution related activities, to market parties. The outsourcing is characterized by input-based contracting. In Uganda this is mainly by FIDIC (red book 1987 and 1999) and FIDIC-inspired (set up by development partners) contracts. A governance structure has been set up accordingly (UNRA is a result of development partner supported road sector reforms). As FIDIC and UNRA’s support are anticipating over time on newer types of contracting, so is UNRA. This is found be in early stages though and by far the majority of works is on Bill of Quantities (BoQ) tendered rates and to a lesser extent force account. At UNRA the processes can be seen as hierarchical but at the same time a highly participative (collective) decision-making on transactions is observed walking around at the UNRA departments and attending meetings (appendix C). For the Roughton specialists hired by UNRA to advance on sound business practices at the road authority, this seems a bit frustrating at times:

‘They have no […] time left for their normal things to be done because they are discussing all the time what they are going to do’ (Discussion Roughton official, 2014).

Thereby with the Roughton specialists the concept of *African time* has been discussed. On the one hand they seem to recognize the rather event oriented instead of time oriented practice in the Ugandan environment, whereby multiple in-depth discussions may take place at the same time and punctuality is as good as non-existent (on several occasions COWI showed up at UNRA for scheduled meetings that in the end did not take place the same day); on the other hand, in line with the NSU and World Bank (2014b), they also point out that the organization is a bit overworked due to shortage of specialized expertise, specially now a number of claims from earlier projects had to be solved while they were already facing a backlog and putting time and energy in the pilot project (also see OPRC findings). In addition, some of the departments appeared understaffed compared to their intended size. For example the *Procurement and Disposal Unit* (PDU) was initially set up to have 21 engineers and procurement specialists, while 17 positions have been filled.

**Procurement process**

At UNRA the contracts committee approves all procurement, evaluations and other relevant documents. The contracts committee consists of five members from various departments within UNRA. The *Procurement and Disposal Unit* (PDU) prepares all documents. These documents go to advert and PDU receives the bids after a bid procedure with or without prequalification (appendix P) depending on the requirements from the PPDA.

PDU then nominates an evaluation team of three to five members (this happens ad-hoc and the members are changing all the time). At least one member is part of the PDU. The other members belong to other departments. This evaluation team makes a recommendation and PDU receives the report. After a check by PDU the report goes to the contracts committee. If the contracts committee approves the awards, it goes back to PDU. PDU then takes care of the public display and notification to bidders. A draft contract goes to the Solicitor General
for approval if the contract value exceeds UGX 50 million. The contract is then returned to the accounting officer and finalized with the contracts committee and PDU.

‘Everything exceeding fifty million shillings has to be approved by the Solicitor General. So the Solicitor General has a lot work. This results in a painfully slow process’ (Interview UNRA Procurement, 2014).

The road authority has introduced a form of term maintenance (routine maintenance activities on unpaved roads) to avoid going through the yearly procurement process:

‘Normally, we make maintenance plans on a yearly basis. The maintenance is based on estimates. Since we experience so long processes the estimate is not correct anymore at the time of works. The road is worse and our budget is not sufficient […]. By the time of approval we have to start again already and go through the same process, again and again. This is why have now, lets say, a shift to term maintenance. Three years is common. This has several advantages, like avoiding the long procurement process every year, job security, and we experience lower prices. This is only for unpaved roads yet. But in Uganda those are the main part of our network’ (Interview UNRA Contracts Committee, 2014).

To speed up the process, the road authority occasionally makes informal agreements with contractors to make works commence parallel to lengthy procurement processes:

‘Approval without approval of the SG [Solicitor General], yes I have seen it happen. What I think, sometimes it cannot wait. […]. These type of non-official agreement happen more often at the Road Stations, Jinja, Soroti… The approval from SGO [Solicitor General’s Office] follows later, sometimes if the works have already finished’ (Interview UNRA Procurement, 2014).

Change orders occur when estimates are inaccurate and / or over time additional are features desired, for which again a referral to a slow process is observed:

‘The problem we have now is approval of variations. If we have zero to one percent variation, our department can make a decision themselves. The contracts committee and solicitor general must approve one to twenty-five percent variation. Over twenty five percent, there has to be a public advertise. This process is very slow’ (Interview UNRA Operations, 2014).

Data availability and information sharing

In the role division in the every day rehabilitation and maintenance process the service provider is mainly responsible for executing a predefined design taken care of by the client and / or the client consultants. Like shown earlier at the role division, the Uganda Road Fund, UNRA and DUCAR agencies have their own (but limited, often visual inspection only) asset inventories to prepare designs. The agencies make use of the same maintenance management system (HDM4). A contractor is free to do his own surveys and relies on the information provided by the client if lacking capacity. Information-asymmetry easily occurs. The systems are not really linked, however the data insight is shared every now and then as files can easily be loaded on all systems. Faults, shortcomings and change orders of the designs complicate the works execution and make contract costs increase. Thereby information asymmetry is observed to not only exist when it comes down to project characteristics (the contractor relies on limited data provided by the client), but also for work progress and materials (the client relies on limited data provided by the contractor).
Here opportunism plays a role too. Opportunism can be found for example in bringing up the first lot of the NERAMP project road to predefined standards. Late procurement of a monitoring consultant and therefore a lack of supervision has further enabled opportunism. The Ugandan contractor has reported a section as completed to UNRA and this is communicated. For the overall work progress this seems to occur to a lesser extent if the monitoring consultants are timely procured. These consultants (often international) are expected to team up with local consultants (including those of the contractor) for local learning purposes.

Although UNRA is mainly working with BoQs, schedules of rates and mostly centralized procurement (only limited procurement functions are delegated to UNRA district authorities) it was found that an insight in maintenance estimates (cost and frequency) did not seem readily available at the planning (including NSU that prepares maintenance plans) or operations departments in Kampala. At an introductory meeting for the site visits (appendix C) one of the UNRA directors points out that this information may be available at the road stations along the way. COWI is also asked how their maintenance estimates have been derived so far for their work throughout Uganda:

‘We have only been in contact so far with some local contractors working along the road’ (Discussion COWI project manager, 2014).

This then launches the idea to indeed retrieve maintenance estimates at the road stations along the way:

‘Now what we do is to pick up those reports, because those reports should reflect the actual payments, for example for routine maintenance. Then it also shows the activities for which we are paying more frequently than the others. So it actually shows when we cut the grass more frequently, between which months and so on. We need to have a chat with those guys when we go by’ (Discussion UNRA, 2014).

New technology, materials and methods

In the everyday business not much evidence has been found of an organization that is advancing on new technologies, materials or methods. With the new PPDA regulations (March 2014) outsourcing maintenance still remains input-based through separate contracts for various maintenance activities, whereby UNRA and / or UNRA’s consultants mostly design the interventions. Within UNRA’s open bid system (requirements formulated in Uganda’s new PPDA Regulations, March 2014) a double envelope system is now to a larger extent required to be used for works where the contractor’s role in the maintenance process goes beyond execution activities alone. A technical proposal is then evaluated separately from the financial proposal. Although newer, still this is very much on an input basis. The UNRA contract’s committee also brings forward the preferred external monitoring by qualified (preferably international consultants) as an element of increased transparency and trust (Interview UNRA, 2014).

A test track somewhat 25km outside Kampala on a sideway (or feeder road as locally referred to) of the Kampala – South Sudan corridor has been driven along during the site visits (appendix C). Aware of the limited supply of cement in some regions and the costs that come along with it, in 2004 COWI has build this track to experiment with locally available natural raw materials (such as Africa’ red soil, red clay and volcanic ash) as an alternative for the sometimes scarce and expensive conventional materials like cement. The aim of the test track is ‘to establish durable roads which can tolerate both traffic load and the torrential tropical rainstorms. In addition, use of these materials can help reduce energy costs and the
road maintenance costs’ (COWI, 2004b). Such innovations have not yet been found implemented in Uganda’s areas with insufficient standard materials. The key corridors are rather constructed with conventional materials, whereby UNRA fears that the minimum standards as recommended by their (international) consultants are already pushing it too much for Uganda’s limited equipment and expertise:

‘We think that as much as it is recommended to say that three times the aggregate size is okay, we think that that applies to developed economies, Western Europe, North America, where machinery is okay, specialism is okay, but here in Uganda it is very difficult to use to lay this standard’ (Discussion UNRA projects, 2014).

Supervision and enforcement
UNRA is found to supervise through monitoring consultants (both internal and external) and mostly makes payments on BoQ tendered rates for completed maintenance activities. External monitoring consultants seem often procured late (also see appendix J). The input steering is behavior-oriented, but shifts towards result-oriented if payments are made for example after every finished road kilometer. This not only counts for the more costly maintenance activities for example involving overlay renewal, but also for the non-mechanized routine maintenance activities whereby small contractors are paid for completed sections of five kilometers (Interview UNRA station Tororo, 2014). The field visit in Tororo indicates that as the client is aware of the very low payment the local routine maintenance contractors receive, the monitoring style is not so strict and not all required maintenance activities are performed, neither is the quality really checked of the maintenance activities that the contractor does perform. The formal contracts that specify all activities seem to have little meaning here; they just seem a kind of formalization that is officially needed. Another reason why the supervision lacks, are the available resources for remote area checking of maintenance activities:

‘As much as we would like it, the monthly check-up is nearly impossible, it is not feasible now’ (Discussion World Bank official, 2014).

Supervision reportedly occurs due to mistrust in behavior for the input contracts, preferred transparency and learning possibilities. The supervision can be both reactive (like sanctions) and proactive (like experienced consultants working together with local service providers as a learning process). In an interview, the UNRA Contracts Committee (also see appendix C) has explained that often the accomplishments of service providers are seen as unsatisfactory, but sanctions are limited since the already very limited Ugandan contracting industry is not seen to have the capacity to deal with these sanctions anyway. In case of the 5-kilometer non-mechanized routine maintenance contracts like mentioned above, the sanctions are limited because the client is aware the payment is too low anyway. These things are at the same time increasing opportunism and decreasing trust in the institutions. Due to the external monitoring (if in place like the way it is ‘formalized’), there remains a large distance between client and contractor, feeding misunderstanding and mistrust. While on the one hand the endless collective internal decision-making processes within UNRA are frustrating Roughton at times as indicated earlier, so is the lack of working together when it comes down to the external process with the service provider:

‘In Pakistan we have had a contractor walk away. Dakar too was off the wall. Nigeria was a […] nightmare. Here it is all the same again. They […] need team building at every contract. They should […] consider importing a standard on collaborative working, like British Standard 11000’ (Discussion Roughton official, 2014).
In the set up of an outsourcing process, World Bank even takes it a step further back, to managing expectations first before implementing yet another standard:

‘They should try and organize workshops and talk about what is reasonably expected first’ (Discussion World Bank official, 2014).

Thereby this part ends with the understanding that as much as it is pursued to have the so-called ‘international best practices’ with the forthcoming formal structures and qualifications, it is the alignment with the informal institutions that is important to make them work. Practices in the field have found to differ from the practices like they are formalized in Kampala. The earlier assumption that informal institutions play a larger role at lower government levels seems confirmative by the field visits (appendix C), the discussions at UNRA headquarters in Kampala and literature (chapter II), while at the same time it could also be that some practices in Kampala only appear more formal than they actually are or are more influenced by the in-house presence of international consultants and development partners with their requirements. In addition to the earlier mentioned aspects, this informality is basically seen to undermine certainty, trust and availability of reliable data while increasing opportunism (using the formal or informal possibilities in whatever way it serves best). It makes the reality that has to be dealt with.

5.1.2 OPRC pilot in Uganda

Whereas the common way of outsourcing maintenance activities is found through FIDIC (red book, 1987, 1999) and FIDIC-inspired (as promoted by development partners) input contracts, together with the occurrence of force account (the road authority’s in-house workforce) referred to as the ‘everyday business’ in this thesis, OPRC in Uganda only applies to 340 km of an international trunk road (class A road) in Uganda. The so-called Project Development Objective (PDO) is ‘to reduce transport costs, enhance road safety, and improve and preserve the road assets sustainably by applying cost effective performance based asset management contracts’ (World Bank, 2014b). The OPRC under the North Eastern Road-corridor Asset Management Project (NERAMP) is also used to make UNRA advance on asset management practices (World Bank, 2014a). World Bank supports UNRA through technical assistance and financial support to hire consultants to advance on asset management practices. In line with the new philosophy (also see chapter I) and in terms of Stankevich (2009, p. 3) this means that UNRA shifts from the role of ‘micromanager’ to that of ‘strategic manager, regulator and auditor’ in the OPRC pilot.

OPRC pilot: the object of outsourcing and the observations

OPRC activities include those related to rehabilitation, maintenance, improvement and emergency works, outsourced through an integral hybrid contract that is not provided for in the existing PPDA regulations (2014) and URF framework, but has separate approval and funding through GoU. Specific road-related assets and items that are to be maintained under NERAMP include (COWI, 2014a):

- Pavements for carriageway, median, shoulders, sidewalks, bus bays, laybys and junctions up to the right-of-way (RoW) limits being generally 15m each side of the centerline in both rural and urban areas;
- Embankments and cut slopes;
- Drainage structures (bridges and culverts including access culverts);
- Roadside drainage (side drains, mitre drains, cut-off drains, lined drains and gutters, erosion checks and chutes);
- Water and telecom ducts;
- Signs, road marking, km-posts, culvert markers, bollards/delineators, guard rails, road studs, speed humps, rumble strips, and other road safety features.

The condition of the road-related assets is generally seen to be (below) poor (in terms of World Bank service level standards, also see chapter I). This is regarded unsatisfactory.

‘With a current ADT of vehicular traffic on the project road varying from 509 to 872, average about 690, and projected to increase to 990 – 1,725, average about 1,360, after 10 years, it was considered appropriate to apply the good to very good service level standard for the entire project road’ (Discussion COWI, 2014).

Under OPRC the road agency uses the same tool (HDM4) that is used in the everyday business to determine service level standards (that can be afforded). This tool has been introduced earlier in line with the Road Sector Development Programs (RSDPs) described in chapter I. In the pilot project now the system is used to determine performance measures in line with the required level of service. Surveys and investigations that happen to be more rigorous than the everyday business have provided input for studies and conceptual designs, followed by the definition of service levels and a method of measurement.

In view of the construction history and correlation with previous survey and investigation results, it has been found convenient to divide the NERAMP road in three lots instead of introducing a continuous stationing for the entire project road (also see appendix A): (1) Tororo – Mbale – Soroti (151,8km), (2) Soroti – Dokolo – Lira (122,9km) and (3) Lira – Kamlaki (66,5) (COWI, 2014). Because rehabilitation works on the Tororo – Mbale – Soroti section have been delayed and the 12 months defects liability period was not yet completed, it was initially considered that NERAMP should only include the second and third lots, while OPRC for the first lot would be tendered separately about 1 – 2 years later. In developing an appropriate OPRC for the project road, being the first such contract in Uganda, COWI (2014) indicates that in particular the following have been taken into account:

- World Bank OPRC guidelines;
- International OPRC experience such as from New Zealand, Botswana, Liberia and Argentina;
- Special conditions of the North-Eastern corridor such as the on-going rehabilitation of the Tororo – Mbale – Soroti section;
- Making fair risk allocation, appropriate and not too strict qualification criteria and service level standards to ensure that the project will be attractive to potential contractors;
- Providing sufficient information, data and a conceptual design as part of the bidding documents to ensure that the potential bidders will be able to prepare realistic offers.

OPRC pilot: the role division in the maintenance process and the observations

Like in section 5.1, in this section the model of the maintenance process introduced in chapter I, the so-called six-stage model (Schoenmaker, 2011), is used to explain the degree of outsourcing, including the role of asset owner, asset manager and service provider(s). The observed role division in the maintenance process is illustrated by figure 5.3. The earlier mentioned shift from the role of ‘micromanager’ to that of ‘strategic manager, regulator and auditor’ (Stankevich et al., 2009, p. 3) becomes visible in the piloted role division in the maintenance process.
The contractor is responsible for most of the maintenance process, whereby the responsibilities and requirements for the maintenance activities are in detail described in the bidding documentation. Performance requirements are fixed. There is no feedback loop via prioritization. It illustrates the inflexibility of the contract, like a DBFM contract (Schoenmaker & Verlaan, 2013b). The change compared to the everyday business (figure 5.1) requires different skills / expertise from both demand-side and supply-side. At the attended meetings it is observed that UNRA, COWI, Roughton and World Bank officials do not see a Ugandan contractor capable to deal with this.

**Figure 5.3. OPRC contract: role of the contractor (dark) in the maintenance process (appendix D further describes the process steps)**

**Figure. 5.4. Implementation matrix for the North Eastern Road-corridor Asset Management Project (based on COWI, 2014, Word Bank, 2014)**
Institutional framework

The institutional framework for the OPRC pilot differs from the institutional framework in the everyday business. Continuing on the roles and responsibilities in more detail, figure 5.4 demonstrates the institutional framework for implementation of NERAMP. Basically the ‘contractor’ as referred to earlier, in fact is a contractor’s team that has to meet requirements in terms of internal and external specialists (the engineering consultant) as drawn in figure 5.4, as opposed to the much simpler requirements in the everyday business. All maintenance activities listed earlier, the resettlement policy framework implementation and the preparation / implementation of resettlement actions plans are to be done by the contractor’s team.

As part of the contractor’s team, a provision will be made to cater for an environmentalist and sociologist to specifically cover for the needs of the Environmental and Social Management Framework (ESMF) that is introduced through World Bank involvement in NERAMP. A Monitoring Consultant manages the monitoring activities on behalf of the UNRA. The contractor is expected to have its own capacity, referred to as the Self Control Unit (SCU), for its own measurement and inspection for awareness about non-conformances and other data management input.

OPRC pilot: manifestations around the formal structures and the observations

This part continues on the manifestations in practice around the formal structures. Whereas in the everyday business the Ugandan road agencies (UNRA and DUCAR agencies) submit their yearly maintenance plans to the Uganda Road Fund (URF), the pilot project follows a side track via the Ugandan Ministries of Works and Transport and Finance and has a long term maintenance budget secured that does not directly flow through URF. While in the everyday business the outsourcing is characterized by input-based contracting, now a more hybrid structure between input-based and output-based is used.

As much as UNRA prefers what they consider a ‘full’ Output and Performance-based Road Contract (OPRC), in essence the OPRC in itself is rather hybrid by nature if following the World Bank OPRC guidelines (World Bank, 2009) and UNRA’s consultants fear that if not prescribing the what, when and/or how of some of the activities and monitor frequently, the outcome will be a mess given the space for opportunism. Maintenance is taking place within a framework of prescribed activities, whereby namely routine maintenance activities are performance-based and for the mostly costly periodic maintenance activities (asphalt concrete overlay works) frontloading, timing and design is influenced out of mistrust, thereby limiting the contractor’s freedom to decide on what, when and how. The findings below continue the story of the OPRC pilot in the Ugandan environment.

Expertise and learning facilities

A considerable investment is made in the resources necessary to introduce an OPRC in the context of Uganda. There is attention for learning possibilities for local organizations from the international expertise that is brought in and the requirements for such type of contracting alone are perceived to make the road authority advance on asset management practices (also see chapter 1). The pilot project does not necessarily intend to minimize organizational transaction costs only; it also aims on transaction benefits and the potential for future transactions. New in the governance structure is the emphasized attention to the environment: the use of materials and environmental impact assessments and resettlement frameworks for road sections that are rehabilitated before the performance-based maintenance period starts.
Performance measures

Rather than measuring work activities, the pilot project uses the concept of maintaining the various attributes of the road at a specific level of service. The World Bank OPRC specification defines three groups of performance measures (1) management performance measures, (2) road user service and comfort measures and (3) durability performance measures (World Bank, 2014). The costs to maintain a road increase with a higher service level standard. Costs could also increase for the response time. For example, it is seen preferable to the service provider to wait with pothole repairs until there is a more economic amount of a pothole repairs to do. In its reports, COWI has discussed service levels for different indicators. Following the World Bank OPRC specifications (World Bank, 2009), the performance indicators further been divided by COWI into work type groups as summarized below (COWI, 2014a, p. 114):

- Management Performance Measures (M);
- Road User Service and Comfort Measures (C);
- Durability Measures (D);
- Road Safety Measures (F);
- Drainage (W);
- Structures (S);
- Earthworks, Embankments and Cuttings (E); and
- Vegetation Control (V).

The following is defined for each indicator of the above groups: (i) description, (ii) measurement / detection, (iii) time allowed for repair and tolerance permitted, and (iv) payment reduction (COWI, 2014). A summary of proposed service level indicators with description of each service level, measurement/detection, time to respond and Payment Reduction Unit (PRU) rates is included in appendix H.

Interdependence of activities

It is observed COWI, UNRA and World Bank have defined 26 steps for the NERA MP project, referred as ‘fairly generic’ for an OPRC (COWI, 2014a). It includes surveys and investigations, studies and conceptual design, service level definition, the service levels and methods of measurement. Appendix I illustrates the interdependence of these activities in the pilot project in detail. It also illustrates the importance of the HDM4 tool that is already extensively used in the everyday business for service level determination.

Variations and gradual compliance with service levels

All three lots, a total of 340km, should have received one layer of asphalt overlay/strengthening within the first 24 months of the contract. Any rehabilitation/improvement works will also have to be completed within this period and while such works have been going on, it is not seen fair to punish the contractor for not complying with the routine maintenance requirement in meantime. The duration required for compliance depends on the present level of compliance, the amount of rehabilitation/improvement works required and the contractor’s mobilization period, which was estimated 6 months (COWI, 2014c). World Bank considers this timeline to have been somewhat unrealistic for the Ugandan context:

‘There was no point in putting in a very optimistic timeline. A professional contractor immediately prices it differently. He will factor in that you’re basically asking him to mobilize four plants. I think the minimum you are looking at is three years [rehabilitation] and nine-month mobilization and possibly three different quarries in
that situation. Otherwise the quarry distances remain a nightmare too’ (Discussion World Bank official, 2014).

**Method of payment**

Whereas in the everyday business mainly admeasurement contracts (FIDIC / FIDIC-inspired contracts) are used, for OPRC activities a combination of payment principles is agreed (COWI, 2014):

- **Rehabilitation:** monthly lump-sum during an initial period detailed in the bidding documents;
- **Routine maintenance activities:** monthly lump-sum for the whole project period;
- **Periodic maintenance activities (asphalt-concrete overlay works):** lump-sum per km for the various specified minimum thickness, prime/tack coat and pavement markings;
- **Emergency works:** a work order is issued where a lump-sum price has been agreed on BoQ tendered rates;
- **Improvement:** a work order is issued where a lump-sum price has been agreed on BoQ tendered rates.

Aware of the protracted procurement in the everyday business and aware of the more demanding OPRC procurement, COWI has initially proposed to make the payment method match with common practices.

‘The aim has been to enhance the advantages as well as avoiding or at least mitigating the disadvantages for this pilot OPRC in Uganda. In particular that OPRC generally involve a more costly procurement process and a more complex and longer procurement process’ (Discussion COWI, 2014).

For example, it was initially considered that the conceptual design for NERAMP could include a BoQ for the required rehabilitation works, but for tender purposes only. Tendering for these rehabilitation activities would then in principle be similar to a conventional contract avoiding that all bidders otherwise would have to undertake time consuming surveys and prepare tender design. Nevertheless, the successful contractor carries out detailed design of the rehabilitation works according to specified design criteria and such design should be approve. The agreed rehabilitation works quantities would then be multiplied with the bid unit rates to determine the contract price for the rehabilitation works. This way the contractors’ design responsibility would still be maintained. However, as rehabilitation works under the NERAMP are have been limited to about 6km sectional rehabilitation on Lot 3 and also limited on Lot 1 as a Ugandan contractor in meantime has completed the on-going rehabilitation on Lot 1 with at least first bituminous seal, the initial rehabilitation works under NERAMP will be remunerated through a monthly lump-sum.

After rehabilitation the road is expected to require overlay renewal somewhere during the remaining contract period to meet its 20-year design life. COWI does not like the idea of frontloading activities in the Ugandan context and also narrows unwanted solutions in their opinion down by guiding activities through the payment method:

‘We keep routine maintenance by monthly payment and periodic maintenance per kilometer. And that periodic maintenance is whatever overlays may be needed after rehabilitation. Maybe the contractor would want to do the full strengthening in the first two years already, and then there will be no new asphalt concrete overlays
during the remaining contract period. So we took the phase one overlays and included these with the rehabilitation works [...]. The first strengthening is part of rehabilitation works, while the second, if it is needed, has to be included in his wage when it is needed. This is what we like’ (Discussion COWI, 2014).

Risk allocation
OPRC shifts a large portion of the risk of a maintenance contract from the client to the contractor. However, it is found that if the client goes too far in trying to shift risks to the contractor, there can be negative effects. For example, if the contractor should bear the risks related to any unforeseen severe weather, the contractor may increase the bid prices abnormally, refuse to work in the area, or go out of business. The careful analysis of risks and allocating risk to the right party or parties is therefore seen essential:

‘Risk should be considered from the viewpoint of each of the parties to the contract, contractor and employer, and should be handled by those best able to deal with the risk’ (Discussion COWI, 2014).

Appendix Q list the risks that have been identified and describes in detail the risk allocation between contractor and client, including shared risks. In the further risk assessment, again COWI is found very careful when it comes down to the financial hazards for the client:

‘In the model, the contractor will be paid twenty percent upfront without any guarantees. That’s too much. So we don’t like this solution but that is the one included in the tender documents. We don’t like that solution’ (Discussion COWI, 2014).

Another aspect UNRA’s consultant appeared not too enthusiastic about is axle load control. Vehicles in Uganda can be heavily overloaded. Current weighbridges, like the one visited along the corridor, have no offloading and storage facilities. This means that if a vehicle is overloaded, it gets a penalty to be paid to local police before it drives off again. This means that in a current situation there is no compensation for road damage. As new weighbridge is to be constructed and to be operated by the OPRC contractor, COWI does still not think the contractor should have the full risk of road damage:

‘Of course there is now a new weighbridge to be constructed and it will be operated by the contractor during the entire contract period. That will at least somehow control overloading, but it won’t be 100%, maybe transporters will try to run with overloading until they reach the weighbridge or sneak around if that’s a possibility and so on. And even if there’s overloading at the weighbridge station, and even if the weighbridge has capacity for offloading, some things you can’t really offload there and the penalty will not go to the contractor anyway. So you can’t say the contractor can have the full risk’ (Discussion COWI, 2014).

Monitoring
With the Output- and Performance-based Road Contract in Uganda, an independent monitoring consultant monitors the service provider. The requirements on the qualifications of the monitoring consultant, frequency of the inspections and the overlap of the works by the required self-control unit of the contractor make monitoring costs increase. For the various maintenance activities, various payment methods exist. For routine maintenance activities there is a monthly payment with payment reduction for non-conformances, for asphalt overlay works the output is paid by lump sum per kilometer (on BoQ tendered rates, preferably no frontloading) emergency and improvement works are based on quantities
specified (also BoQ tendered rates). The emergency and improvements works tend more towards behavior based contracting, whereby the contractor is faced with the quality of his own work again when maintenance those sections for the remaining duration of the contract and an eventual defects liability period on the works. A contractor with limited financial resources has less freedom to decide what, when and how with since frontloading activities and thereby offering the contractor greater flexibility, is prevented where possible.

The oversight on the monitoring consultant is limited and the choice of a consultant is based on, like things seem to work in Uganda, if it is a respected international company with a good reputation to keep high. The relation between client and consultant is therefore in principle based on trust. In line with the renewed emphasis on transparency in Uganda’s road sector, on this relation also the internal and external auditing takes place. The World Bank is using the consultant’s data together with its own reporting for their own performance indicators on their own goals. These so-called status reports are publicly available.

Measuring performance
In the OPRC the Level of Service (LoS) is translated into performance measures and requirements with a description, and sometimes prescription, of the expected deliverables. The set up of the performance measures is derived from the World Bank OPRC guidelines (World Bank, 2009), divided into work type measures by COWI to provide a clearer and more simplified overview after experiences in Liberia and Botswana. These are integrated with Highway Development and Maintenance Model 4, a management tool by World Bank. Since still working with BoQ tendered rates, the client has some insight in the costs spend on the individual activities. For each performance measure as specified, a payment reduction principle applies for non-conformances, whereby the reduction also depends on whether they have or have not been reported at formal inspections.

The contractor has no direct incentive to ‘over perform’, since this is not rewarded as such. The performance measurement system incorporates experiences in other Sub-Saharan African countries with output and performance-based road contracts and PMMR (also see chapter I). The measurement system in Uganda is not directly a result of interaction with interested contractors locally and an assumption has been made whether or not the severity of the payment reductions would scare them off in the first place. The main contractor’s organization is expected to subcontract various maintenance activities to small local contractors and is thereby expected to translate the more complicated requirements into a workable situation for the local workforce. The question remains how performance is this relation is dealt with and to what extent payments linked to performance take place here.

Matching complexity
Like mentioned, practices in the field differ from the practices like they are formalized in Kampala. The assumption that informal institutions play a larger role at lower government levels seems confirmative by the field visits (appendix C), the discussions at UNRA headquarters in Kampala and literature (chapter III). In the everyday business the awareness already exists that the strict formal procedures following from ‘international best practices’ exceed local capabilities and can therefore only be loosely adhered to by local contractors.

As UNRA and development partners are aware that no Ugandan contractor will be able to meet formal requirements, this role will be for an international contractor that on the one hand has to deal with the formal institutions and on the other hand the informal institutions when working in the field and meeting the expectations to involve local contractors. Basically it becomes his operational responsibility to make a result-based approach work in an environment where the traditional practices do not achieve satisfactory performance. Here
the principle of linking payment to performance is seen as a new way to work with the local workforce, whereby finding an appropriate level of complexity then becomes the main contractors task.

‘The road agency needs to match the complexity of the PBC to the capacity of the contracting industry available in the country. Where the industry is less developed, it would make sense to start with shorter-term, simple PBCs, e.g., contracts for routine maintenance or street lighting only’ (Stankevich et al., 2009).

5.2 Analysis

This part describes the data analysis. The analysis is concerned with the following sub-question: what are the specific characteristics to take into account, based on an empirical and theoretical analysis? The orientation (chapter II) has already described the road network, the agenda outline and environmental and cultural aspects. An appropriate framework for PBC is also understood to require insight in the local industry issues, management issues and legal issues. This uncovers what stands in the way of / interferes with meeting realistic standards. These constraints to improved performance are the specific characteristics that follow from the empirical analysis. First, the field problem is validated. Next, the problem mess (Van Aken et al., 2012) is represented in the form of cause and effect whereby OPRC intervention areas are highlighted. The analysis then compares the outsourcing degree in the everyday business and the OPRC pilot using ideas and findings from literature (chapter III).

5.2.1 Validation of the field problem

In an ideal situation there would be a match between road user demand and road infrastructure supply. This may be an unfeasible target since the introduction and orientation already reveal that Levels of Service (LoS) are quite constrained and demand is increasing. From this perspective, unsatisfactory performance of road infrastructure will likely remain. Satisfactory performance may therefore be unrealistic. Although there may be a target problem (Monhemius, 1984), it is believed however there is also a real problem, seen in this thesis as ‘a situation that in reality does not meet realistic standards’ (Van Aken et al., 2012).

The current situation of the analysis subject is compared to standards from various sources to validate this. The comparison included defined requirements (PPDA, 2014), design standards (MoWT, 2005), strategic plans (MoWT, 2014), implementation status reports (World Bank, 2014b, 2014e), earlier studies / benchmarking (Foster, 2010, 2012; Heggie & Vickers, 1998; Kumar, 2002, World Bank, 2009b) and key findings from road maintenance audit reports (also see appendix J). In short, this means that the everyday business using force account and FIDIC / FIDIC-inspired input contracts (admeasurement contracts) to deliver interventions is seen not to yield interventions of realistic standards. Even if things cannot be made perfect, it still remains open to at least make them better.

5.2.2 Situational analysis: cause and effect diagram

This section represents the problem mess (Van Aken et al., 2012) in the form of cause and effect whereby OPRC intervention areas are highlighted. The cause and effect diagram compiles information from the problem definition (after CrossRoads, 2013, World Bank 2014a, 2014b) and the findings, whereby three critical themes seem to cause that Uganda faces difficulties to make road infrastructure meet realistic standards:
- Insufficient maintenance (and other activities);
- Low-quality interventions; and
- An underdeveloped local construction industry.

Four critical themes are seen as consequences of inadequate Ugandan road infrastructure (also see chapter I, after CrossRoads, 2013, World Bank, 2014b, 2014b):

- Safety issues;
- Reduced asset value;
- Restrained market access; and
- Increased vehicle-operating costs.

The above-mentioned critical themes form the main themes of the cause and effect diagram. The first three critical themes represent the critical causes and the last four critical themes represent the critical effects. In this part of the analysis the cause and effect scheme is build up step by step.

**Insufficient maintenance (and other activities)**

Insufficient maintenance and other activities seem a result of (a combination of) increased costs, delayed activities and underfunded maintenance, all due to funding issues on the one hand and strategic issues on the other hand. This section first describes the strategic issues. Next, the funding issues are describes. Then the corresponding part of the cause and effect diagram is drawn (figure 5.5).

**Strategic issues**

The first aspect is incoherent strategies. While Ugandan regulations emphasize outsourcing, so far GoU does not really seem to enable involvement of the private sector. If the authorities then decide to use force account, is faces rundown equipment. It is then forced to hire (relatively expensive) equipment using maintenance budgets for their own equipment. At the same time insufficient capacity results in delayed activities on top of already lengthy / complex (procurement) procedures. Reliable data has on multiple occasions been unavailable, resulting a mismatch between design and the actual needs (road users seem left out of the process). Delays and road deterioration in meantime further increase the mismatch. Change orders above a threshold could mean stops in activities due to required investigations and the involvement of the solicitor general. In short, the strategic issues include:

- Insufficient capacity;
- Incoherent strategies;
- Lengthy / complex procedures;
- Stops in activities;
- Little user involvement; and
- Inaccurate and unshared data.

**Funding issues**

Like provided in part 5.1, Uganda reportedly allocates about 17% of its 2014/2015 budget to improve and maintain road infrastructure and sustained this level already over multiple years (CrossRoads, 2013; NPA, 2010, 2014; URF, 2014; World Bank, 2014a). Some aspects of the funding environment however seem important constraints, like the under-allocation of resources to maintenance (also see chapter I). On top of that, as the road agencies prepare and submit annual road maintenance plans, not all of them may be approved by URF,
resulting in variations / inconsistencies for multi-year efforts. Delayed payments could result in delayed activities / increased costs (through claims). In short, funding issues include:

- Insufficient funding;
- Inconsistent funding; and
- Delayed payments.

Following from the above, figure 5.5 proposes part of the cause and effect diagram including the causes of insufficient maintenance and other activities.

*Figure 5.5. Input for the cause and effect diagram, compiling information from the problem definition (after CrossRoads, 2013; World Bank, 2014a, 2014b) and the findings: insufficient maintenance (and other activities)*

**Low-quality interventions**

The reasons for low-quality interventions are divided in two main themes: deficiencies in planning / design on the one hand and deficiencies in delivery on the other hand. This section first describes the deficiencies in planning and design. Next, the deficiencies in delivery are described. Then the corresponding part of the cause and effect diagram is drawn (figure 5.6).

*Deficiencies in planning / design*

The findings from the field have illustrated that Uganda so is not advancing on new technology, materials and methods in the everyday business, resulting in little innovation. Little expertise and learning facilities together with a missing industry regulation result in insufficient (technical) capacity that can be relied upon. In short, the deficiencies in planning and design are seen to result from:

- Little innovative strength; and
- Insufficient (technical) capacity;

*Deficiencies in delivery*

Deficiencies in execution related activities could be related to inadequate competences. In the everyday business the *what*, *when* and *how* are defined by the asset manager and the contractor executes the works. Insufficient skills are seen as a consequence of insufficient training, overall shortage of competent contractors operating in Uganda and no industry stakeholder coordination. Physical resources are also problematic: the insight has occurred that a Uganda has areas with shortage of suitable materials and limited access to required equipment to execute works in line with the planning and design related activities. Supervision of works and enforcement or requirements is believed inadequate, providing the opportunity for contractors to get away with their underperformance (and road users with heavily overloaded vehicles). In short, main themes for the deficiencies in delivery include:
- Insufficient skills;
- Insufficient physical resources; and
- Inadequate supervision.

Following from the above, figure 5.6 proposes part of the cause and effect diagram including the deficiencies in planning / design and deficiencies in delivery.

*Figure 5.6. Input for the cause and effect diagram, compiling information from the problem definition (after CrossRoads, 2013; World Bank, 2014a, 2014b) and the findings: low quality interventions.*

**Underdeveloped local construction industry**

It is understood that an underdeveloped local construction industry negatively influences Ugandan road infrastructure performance. GoU experiences difficulties to outsource activities to local service providers in line with the new approach (chapter I) and particularly for (routine) maintenance activities this seems problematic. Local contractors seem overexposed to risk, unable to take part in contest or outcompeted by international contractors or force account. This creates difficulties to participate. Structured in line with main themes, this part further describes the institutional constraints that seem to result in an underdeveloped local construction industry.

**Overexposed to risk**

Local contractors are seen overexposed to risk (of working with local authorities in the road industry) due to their under-capitalization, limited access to finance and an unconvincing performance of GoU, which means they are unable to deal with delayed payments, lengthy (procurement) procedures and stops in activities. In short, reasons for risk overexposure include:

- Little confidence in local authorities;
- Insufficient capital; and
- Limited financial access.

**Outcompeted**

Ugandan contractors seem outcompeted. Findings from the field suggest this is partly because international contractors are already advantaged. Although there is a provision in Uganda to have international contractors subcontract around 20% of contract value to local contractors, no evidence is found whether this is actually happening. Force account (the use of in-house units) is supposed to phase out in line with the RSDPs (World Bank, 2014a),
however the findings from the field indicate a recent re-emphasis on force account. This is seen to further effect outcompeting, particularly the small and micro enterprises using labor-based methods. In short, outcompeting seems due:

- Use of force account; and
- Use of international contractors.

**Inability to take part in contest**

Local contractors seem to overall have little skills to coordinate activities. Also, they face difficulties to meet criteria. This creates difficulties for them to take part in contest and this then makes it difficult to participate. In short, reasons why they are unable to take part in contest include:

- Little skills to coordinate activities; and
- Inability to meet criteria.

Following from the above, figure 5.7 proposes a part of the situational analysis including the causes of an underdeveloped local construction industry.

**Figure 5.7. Input for the cause and effect diagram, compiling information from the problem definition (after CrossRoads, 2013; World Bank, 2014a, 2014b) and the findings: an underdeveloped local construction industry.**

**Cause and effect diagram whereby OPRC intervention areas are highlighted**

Combining the various elements of the previous sections together, the analysis now proposes the cause and effect diagram whereby OPRC intervention areas are highlighted (figure 5.8). Like mentioned, the cause and effect diagram compiles information from the problem definition (after CrossRoads, 2013; World Bank, 2014a, 2014b) and the findings. On the left side of figure 5.8 the findings are listed. On the right side of figure 5.8 the key effects already introduced in chapter I are positioned. The area in the middle on the left side of the problem is the interpretation from the analysis. Areas positively impacted by the OPRC pilot so far have been highlighted orange in figure 5.8. This is described in the next.

**OPRC intervention areas**

Figure 5.8 includes multiple performance improvements areas. The overview illustrates that a structural intervention will likely depend on more than a delivery model (like OPRC) alone. Gericke et al. (2014a; 2014b) suggest that the delivery model could however serve as ‘asset management enabler’ too. OPRC is for example understood to require various asset management practices or preconditions to make it work. Some of these of practices or preconditions may also yield better results in the everyday business using input contracts; for example a more appropriate and secured long-term allocation of resources to maintenance and improved supervision.
Like mentioned, positively impacted areas by the OPRC pilot so far have been highlighted orange in figure 5.8. One of the key effects, safety issues, has not been made orange for the reason that axle-load control measures have not yet been implemented. A shared and updated asset inventory, securing long term funding for maintenance activities and emphasis on supervision are key interventions so far. Like the findings show, a considerable investment is made in the resources necessary to introduce an OPRC in the context of Uganda. There is also attention for learning possibilities for local organizations from the international expertise that is brought in. This makes that the areas of underfunded maintenance, deficiencies in planning / design and deficiencies in delivery are positively impacted.

Figure 5.8 illustrates however that for structural improvement OPRC so far does not seem to address some of the key problem areas of the Ugandan environment. A critical theme where the OPRC pilot seems to fall short is an underdeveloped local construction industry. The authorities experience difficulties to outsource activities to local service providers and particularly for (routine) maintenance activities this is problematic. The findings also suggest that OPRC faces the issues of increased contract costs and protracted contracting.

The next part compares the outsourcing degree of the everyday business and the OPRC pilot. Theory is used to explain what is happening / what different viewpoints it provides on what is happening.
5.2.3 Everyday business and OPRC pilot: comparison and reflection

This part compares and reflects the two occurrences: (1) the everyday business through force-account and FIDIC / FIDIC-inspired input contracts and (2) the ongoing OPRC pilot. Thereby the theoretical perspectives (chapter III) are used. These perspectives include: (1) transaction cost economics (TCE), (2) agency theory (AT), (3) performance measurement and (4) formal / informal institutions. The perspectives are used to highlight what is happening / what different viewpoint on what is happening they provide. To do so, each perspective brings forward a key problem, respectively (1) uncertainty, (2) information asymmetry, (3) measurement complications and (4) mismatch between formal and informal institutions (the technical-economic key problems are after Schoenmaker, 2011; also see chapter III).

The perspectives guide the structure of this part. They are wrapped up at the start of the corresponding sections. Along with the key problems brought forward from the theoretical perspectives the findings from the field are compared, resulting in a statement about a preferable way to deal with the key problems.

Transaction cost economics (TCE)

The rationale of TCE is that decision makers choose whatever governance structure minimizes the total transaction costs (Coase, 1937). This part includes a (limited) evaluation of those costs. In this thesis the insight is taken over that the focus should however not only be on transaction costs, but also on transaction benefits (Boudreau et al., 2007). These are the benefits of economic exchange (Watson et al., 2009) and are ‘over and beyond those benefits over direct financial return’ (Boudreau et al., 2007). Next, uncertainty is taken as a key problem (Schoenmaker, 2011) to further evaluate the transaction agreement. Key sources of uncertainty are environmental variability and behavioral uncertainty (Rindfleisch & Heide, 1997). Environmental uncertainty makes it impossible to fully specify contracts ex ante (before the award) and behavioral uncertainty leads to ex post (after the award) difficulties (Geyskens et al., 2006). Along with the key problem of uncertainty the findings from everyday business and OPRC are reviewed, resulting in a statement about a preferable way to deal with the key problem.

TCE: everyday business and OPRC

A transaction costs focus only does not seem to explain the OPRC occurrence as an alternative to the everyday business, namely because of the monitoring requirements / expenses for a single road covering a larger (remote) geographical area. Apart from the Self Control Unit (SCU) the contractor is required to have for measurement and inspection, a better qualified and more expensive (international) monitoring consultant / project management team is used for monthly measurement and inspection of the maintenance activities performed by the contractor. In this thesis the insight is taken over that the focus should however not only be on transaction costs, but also on transaction benefits (Boudreau et al., 2007). Findings show that industry training and knowledge transfer are important aspects of the OPRC pilot. Next, uncertainty is taken as a key problem to further evaluate the transaction agreement. The everyday business through force-account and FIDIC / FIDIC-inspired input contracts and the ongoing OPRC pilot both experience the key problem of uncertainty. This is both environmental and behavioral. High environmental uncertainty implicates difficulties in drawing up a complete contract for outsourced activities and unforeseen events implicate contractual gaps, which require renegotiation and adaption (Williamson, 1979). Behavioral uncertainty is based on the ‘threat of opportunism and refers to the difficulty of monitoring and evaluating the behavior and performance of the transaction partner’ (Boudreau et al., 2007).
Both occurrences deal in different ways with these sources of uncertainty. From a theoretical point of view, the input contracts are rather concerned with ex ante completeness and the PBMC with ex post flexibility (Schoenmaker, 2011).

In the everyday business the input contracts formally require meticulous detailing. Separate contracts exist for separate activities, managed by the client. The findings also illustrate distance between asset manager and service provider and the deficiencies in delivery experiences as a result of inadequate supervision of the rather behavior based approach. For OPRC the findings show that although UNRA prefers what they consider a full PBMC, in essence the OPRC in itself is rather hybrid in nature following the World Bank OPRC guidelines (World Bank, 2009). UNRA’s consultants fear that if not prescribing the what, when and/or how of maintenance activities and monitor frequently, the outcome will be a mess given the space for opportunism. The how, when and what are therefore included in the contract and this limits the ex-post flexibility. Planned maintenance activities are for example defined upfront and for unplanned maintenance activities (like emergency works) a work order is issued where a lump-sum price has been agreed on BoQ tendered rates. This is like the everyday business. For improvement works a similar arrangement is agreed.

The risks allocation for everyday business and OPRC is different. Moving along the input-output-outcome dimension (also see chapter 1) the risk allocation changes. In the everyday business most risks remain with GoU. In general the risks of performance-based contracting are shared in light of whom can best manage them (Porter & Hatcher, 2010; Rao, 2012). Regarding the environmental uncertainty / risk context (chapter I) and the capabilities / willingness of the (local) construction industry to deal with risk, also in the OPRC pilot considerable risk remains with GoU (also see risk allocation, appendix Q).

TCE: a preferable way to deal with the key problem
Uncertainty is taken as a key problem to evaluate the transaction agreement. The outline of road infrastructure policy in Uganda (chapter II) illustrates the role of government agencies becoming confined to planning, policy and regulation. The role of the private sector is increased. This requires a different degree of outsourcing. Moving right along the input-output-outcome dimension, the risk allocation changes and the contractor hypothetically gains more freedom to decide on the what, when and/or how. A preference seems to remain however to prescribe the what, when and/or how of some of the maintenance activities in line with behavioral and environmental uncertainty together with local capabilities and the ability of service providers to actually deal with risk. The resulting hybrid nature of the piloted PBMC is actually already captured in the World Bank OPRC guidelines (World Bank, 2009). A hybrid arrangement seems to remain a preferable way to deal with the uncertainty.

Agency theory (AT)
In this thesis AT refers to the less formal, so-called positive agency theory, regarding ‘the technology of monitoring and bonding on the form of […] contracts and organizations’ (Jensen, 1985, p. 234). AT emphasizes finding an agency relationship (contract) that minimizes agency costs. The work by Eisenhardt (1989a, p. 60) helps identify two ways to do so: (1) steering on behavior (input) and (2) steering on results (output / outcome). In case of uncertainty (which is most likely as described earlier) the agent seems more likely to behave in the principal’s interest when the contract is result based and when the principal has information to verify agent behavior (Eisenhardt, 1989a). Information asymmetry is seen as a key problem: inadequate supervision, new information and situations in which a client for example knows more than the service provider result in situations of information asymmetry that could be misused by either party (Schoenmaker, 2011). Along with the key problem of
information asymmetry the findings from everyday business and OPRC are reviewed, resulting in a statement about a preferable way to deal with the key problem.

**AT: everyday business and OPRC pilot**
The institutional framework for the OPRC pilot differs from the institutional framework in the everyday business whereby the contractor in the OPRC is a more complex organization than in the everyday business. This is illustrated by figure 4.2 and figure 4.4 in the findings. In fact the OPRC contractor is a partnership of organizations that is expected to meet requirements in terms of internal and external specialists (the engineering consultant) as opposed to the much simpler requirements in the everyday business.

The OPRC contractor is not only responsible for a larger number of maintenance activities, but also the resettlement policy framework implementation and the preparation / implementation of resettlement actions plans. As part of the contractor’s team, a provision will be made to cater for an environmentalist and sociologist to specifically cover for the needs of the Environmental and Social Management Framework (ESMF) that is introduced through World Bank involvement in NERAMP. A monitoring consultant manages the monitoring activities on behalf of the UNRA. The OPRC contractor is expected to have its own capacity, referred to as the *Self Control Unit* (SCU), for its own measurement and inspection for awareness about non-conformances and other data management input. The contractor is free to use its own systems however a methodology (also see appendix I: interdependence of activities) has been developed around HDM4. Independently, Ugandan road agencies and Uganda Road Fund also use this tool in the everyday business. A typical finding of information-asymmetry thereby is that UNRA (2014), URF (2014b) and World Bank (2014b) list different road network lengths and road network conditions.

Like in the everyday business, the role of the road agency in the OPRC pilot is seen less about *interaction and participation* (Schoenmaker, 2011). The part on TCE already provides that including the how, when and what in the contract limits ex-post flexibility. Also involving a monitoring consultant concerned with monitoring and overall management / implementation of OPRC keeps the road agency distanced. UNRA is found to supervise through monitoring consultants (both internal and external) in the everyday business too. The supervision can be both reactive (like sanctions) and proactive (like experienced consultants working together with local service providers as a learning process). Often the accomplishments of service providers are seen as unsatisfactory but sanctions are limited since the already limited Ugandan contracting industry is not seen to have the capacity to deal with these sanctions anyway. The findings show that insufficient measurement and inspection and difficulties to enforce requirements typically result in inadequate supervision in the everyday business. All together this makes it problematic for the road agency to steer on behavior.

With OPRC the road agency makes use of a monitoring consultant of a higher caliber and steers on results for specified maintenance activities in an attempt to advance on road infrastructure performance through service providers that better act in the interest of the road agency. The requirements on the qualifications of the monitoring consultant, frequency of the inspections and the overlap of the works by the SCU make agency costs however increase. The distanced role of the road agency can in the terms of Stankevich (2009, p. 3) been seen in line with a shift by UNRA from ‘*micromanager*’ to that of ‘*strategic manager, regulator and auditor*’ in line with the new philosophy (also see chapter I).
**AT: a preferable way to deal with the key problem**

Compared to the everyday business, with OPRC UNRA limits the problem of information asymmetry by steering on results. Information asymmetry still exists, but the impact of its consequences is limited. Like mentioned in the previous part on TCE, also the ex-post flexibility / interaction is limited. Shifting in terms of Stankevich (2009, p. 3) from ‘micromanager’ to ‘strategic manager, regulator and auditor’ in line with the new philosophy (also see chapter II), the performance measures that have in these early stages been specified with great detail (also see appendix H) may become more abstract or diverging from well-defined to ill-defined, resulting in more ex-post flexibility and requiring more interaction and participation and a more hybrid form of contract (Schoenmaker, 2011).

**Performance measurement**

The rationale of performance measurement (PM) to synthesize a measurement system in such way that it advances on the positive effects and minimizes the negative effects, thereby finding an appropriate balance while taking into account that the system will most likely be incomplete (Schoenmaker, 2011). Performance measurement is understood to already be problematic in theory. In the work by Schoenmaker (2011, pp. 95-100) the following preconditions to find this balance can be found: (1) variety within the PM system, (2) dynamics within the PM system, (3) limiting the impact of (individual) performance indicators and (4) interaction between asset manager and service provider ex-ante and ex-post. Along with the key problem of measurement complications the findings from everyday business and OPRC are reviewed, resulting in a statement about a preferable way to deal with the key problem.

**Performance measurement: everyday business and OPRC pilot**

In the everyday business through FIDIC / FIDIC-inspired input contracts (admeasurements contracts), BoQs are used to show quantities to be carried out for the prices quotes, whereby the contractor is responsible to execute the work in line with UNRA drawings. Quantities used in practice are measured at the end of the contract to recalculate costs. Visual inspection is often used to check the works and a defects liability period of typically a year comes with the delivery. The input steering is behavior oriented, but shift towards result-oriented if payments are made for example after every finished road kilometer. This not only counts for the more costly maintenance activities but also for the non-mechanized routine maintenance activities whereby small contractors in a roadside community are paid for completed sections of five kilometers. Here visual inspection is common too, but as the maintenance workers are underpaid, there is a tolerance for non-conformances. As a result of the long procurement processes UNRA has introduced a form of term maintenance to avoid going through the yearly procurement process. Payments are made for (visually inspected) completed sections. The ‘performance measurement’ is a relatively simple process using mainly visual indicators and requires interaction for the compromises made as a result of limited resources.

The situation is quite different for OPRC. Rather than measuring work activities, the pilot project uses the concept of maintaining the various attributes of the road at a specific level of service.

The performance measurement system is driven by payment reductions for non-conformances. COWI has divided the performance indicators based on the World Bank OPRC guidelines (World Bank, 2009) into work type groups of performance measures. These measures along with their attributes are included in appendix E.
The overview of pilot contract performance measures in appendix E initially seems simple from its 8 work type groups (such as ‘Vegetation Control’ and ‘Drainage’). However there are 47 indicators with a detailed description, time allowed for repair and tolerance permitted and a payment reduction scheme. The performance measurement system is driven by payment reductions for non-conformances. For some activities, like vegetation control, whereby ‘conformance’ normally (in the everyday business) is established through interaction and visual inspection, it remains to be seen if the routine maintenance workers (that use machetes to cut crass) will now really be checked with rulers and tape measurement if they indeed cut all vegetation between 25mm and 100mm and otherwise get an eight percent payment reduction. A total number of 47 indicators for a 340km road (through partly rural areas) with a lowest time for repair of 4 hours before payment reduction for non-compliance (also seen appendix E) seems unrealistic to really stick to from a monitoring perspective alone.

Regarding the variety within OPRC performance measurement system, it uses rather technical oriented indicators. The management performance indicators specify the requirements of reports to be produced but do not include process indicators (Schoenmaker, 2011) about to evaluate the overall performance of the service provider. Further, the measurement system is rather static than dynamic. No interaction ex-ante with the construction industry other than consultants is found ex ante regarding the performance measurement system. Ex-post, the performance measurement system is rather distant than interactive. The measurement system in Uganda is not directly a result of interaction with interested contractors locally and an assumption has been made whether or not the severity of the payment reductions would scare them off in the first place.

Performance measurement: a preferable way to deal with the key problem
Where monitoring through supervising consultants is in place in the everyday business, it makes use of mostly visual inspection and interaction to ‘measure’ performance of the service provider. This interaction can be about learning and compromising too: learning because small Ugandan contractors may have no formal education, internships etc. so they learn from doing in the field and compromising because of financial constraints as mentioned earlier. The Output and Performance-based Road Contract introduces a complex system that is primarily oriented on payment reduction, has a limited variety of indicators and limits interaction. Interaction however is believed to be an important characteristic of performance measurement (De Bruijn, 2006; Schoenmaker, 2011, also see chapter II). As Stankevich et al. (2009) points out to match the complexity of a PBC to the local capacity, implicating that Uganda with its less developed construction industry would require a simpler PBC, it seems to make sense to start with a simple measurement system as well. Overall the importance of the four preconditions remains (Schoenmaker, 2011, pp. 95-100): variety within the system, (2) dynamics within the system, (3) limiting the impact of (individual) performance indicators and (4) interaction between asset manager and service provider ex-ante and ex-post.

Formal and informal institutions
In this thesis a view of institutions is taken that includes both the rules of the game and players of the game. Institutions are considered as both formal and informal. Not only formal institutions but also the informal institutions create the institutional environment that is dealt with. Development partners like World Bank increasingly recognize the importance of including informal institutions into development projects (World Bank, 2003, 2014a, 2014b). Institutions relate to social capital. This is for example part of the World Bank social development strategy. ‘It encompasses institutions, relationships, and customs that shape
the quality and quantity of a society’s social interactions. Increasing evidence shows that social capital is critical for societies to prosper economically and for development to be sustainable’ (World Bank, 2014g). Regarding formal structures it is the alignment with the informal institutions that is important to make them work. Along with the key problem of a mismatch between formal and informal institutions the findings from everyday business and OPRC are reviewed, resulting in a statement about a preferable way to deal with the key problem.

Formal and informal institutions: everyday business and OPRC pilot
Chapter II already provides that Uganda’s formal framework score is among the highest in the world but their actual implementation score is among the lowest, expressed as ‘very weak’ (Global Integrity, 2012, p. 36). Road maintenance processes in the field are not exactly like they are formalized either: the way it is supposed to happen on paper differs from the way it happens in practice. One of the key results of this thesis is the insight in the manifestations in the field around the ‘formalized’ picture. Ineffective formal institutions do not directly mean however that informal institutions are present (Helmke and Levitsky, 2003): informal behavior can be something different than an informal institution. For it to be informal institution would require that it is something in terms of shared expectations (also see chapter II). Other reactions to ineffective formal institutions could just be individual responses to some situation. This actually makes extracting informal institutions (and the way they interact with formal institutions) from the findings from the field a bit more complicated. For example the occasional informal agreements at district level with contractors to make works commence parallel to procurement processes are not necessarily an informal institution but could also be a practicality to work around lengthy procedures.

The earlier assumption that informal institutions play a larger role at lower government levels (the districts) seems confirmative however by the field visits (appendix C), the discussions at UNRA headquarters in Kampala and literature review (chapter III), while at the same time it could also be that some practices in Kampala only appear more formal than they actually are or are more influenced by the in-house presence of international consultants and development partners with their requirements.

Helmke and Levitsky (2003) describe informal institutions that are complementary, accommodating, substitutive or competing with (in)effective formal institutions. So far the clearest evidence of informal institutions has been found in the overall context that both the everyday business and OPRC pilot deal with. This regards the so-called competing informal institutions. ‘Competing informal institutions structure actors’ incentives in ways that are incompatible with the formal rules: to follow one rule, actors must violate another’ (Helmke and Levitsky, 2003).

Here Uganda’s neopatrimonialism can be seen as example. Following earlier work by Moore et al. (2003), Therkildsen (2010) explains that performance differences between public organizations throughout various countries are not only because of capabilities and procedures, but also ‘how - and how efficiently - various sections of the state apparatus interact with societal groups’. Thereby it is not uncommon to find Uganda’s regime described as neopatrimonial in literature (for example by Cammack, 2007 and Therkildsen, 2010). This is understood as a ‘universal concept’ (Erdmann, 2007) with various definitions to express a situation whereby ‘real power and decision-making lie outside formal institutions’ (Cammack, 2007). ‘Decisions about resources are made by big men and their cronies, who are linked by informal […] networks that exist outside (before, beyond and despite) the state structure’ (Cammack, 2007). It is explained that it happens all around the world but has stronger presence in African countries not only for cultural reasons (Bratton & Van de Walle,
1994; Therkildsen, 2010) but also for market reasons: ‘Competition promotes efficiency and effectiveness. Eventually, therefore, principles of rationality will extend to all areas, including that of the public sector. This has just not yet happened in Africa’ (Therkildsen, 2010).

Formal and informal institutions: a preferable way to deal with the key problem
‘Trying to draw a distinction between formal and informal institutions can illuminate the project of attempting to identify what type of institution actually influences the process of public outsourcing and at what point’ (Kugonza, 2010). Both formal and informal institutions are seen to influence a contract (Dequech, 2001), which can be illustrated by making a distinction of a contract into legal aspects (formality) and social aspects (shared expectations). A legal only contract for example would disregard ‘the necessity of some non-contractible relations, involving norms and social rules. In other words, legal contracts are inherently incomplete’ (Kugonza, 2010). Manning and Westreicher (2007, pp. 114-146) advise to ‘be aware of the political realities that back up the institutional framework’. The political reality demonstrates the key problem of a mismatch between formal and informal institutions on top level. This seems due an underlying competing informal institution (Helmke & Levitsky, 2003). Following the way formal and institutions interact based on the work by Helmke and Levitsky (2003, p. 12) the underlying competing informal institution would have been an accommodating informal institution if formal institutions were effective. A preferable way to deal with the key problem would then be to (1) design effective formal institutions and (2) take account of the informal institutions (Helmke & Levitsky, 2003).

5.3 Wrapping up the results chapter

This part wraps up the results chapter. This chapter has presented the findings from data gathered and the results from data analysis. This way it enlightens what is discovered.

The findings tell the story of (1) everyday business through force-account and FIDIC / FIDIC-inspired input contracts and (2) the ongoing Output and Performance-based Road Contract (OPRC) pilot, introducing interventions that aim to make Uganda advance on road infrastructure performance. The findings include the explored degree of outsourcing in both occurrences. The description includes the formal structures in place and the manifestations in practice around the formal structures. The analysis provides an interpretation of these findings. First the field problem has been validated. Next, the problem mess (Van Aken et al., 2012) is represented in the form of cause and effect whereby OPRC intervention areas are highlighted. The analysis then compared the outsourcing degree in the everyday business and the OPRC pilot using ideas and findings from literature (chapter III).

Situational analysis: cause and effect diagram
The inadequacy of Ugandan road infrastructure seems attributable to three critical causes: (1) insufficient maintenance (and other activities), (2) low quality interventions and (3) an underdeveloped local construction industry. Four critical consequences of inadequate Ugandan road infrastructure already followed from the problem definition: (1) safety issues, (2) reduced asset value, (3) restrained market access, and (4) increased vehicle operating costs. The cause and effect diagram illustrates that a structural intervention will likely depend on more than a delivery model alone. Positively impacted areas by the OPRC pilot have been highlighted in the cause and effect diagram. OPRC does not seem to address some of the key problem areas.

Everyday business and OPRC pilot: comparison and reflection
This section compared and reflected the two occurrences using the theoretical perspectives from chapter III. Along with the key problems brought forward from the theoretical
perspectives the findings from the field are compared, resulting in a statement about a preferable way to deal with the key problem. Although the (complex) environment eventually did not seem to correspond well to the conceptual framework, the key problems that are drawn from the perspectives nevertheless seem relevant. From a transaction cost economics perspective a hybrid arrangement seems a preferable way to deal with the key problem of uncertainty. From an agency theory perspective a hybrid form of contract seems a preferable way to deal with the key problem of information asymmetry. From a performance measurement perspective interaction is one of the preferable elements to deal with the key problem of measurement complications. From an institutional perspective designing effective formal institutions and taking account of informal institutions seems a preferable way to deal with the key problem of a mismatch between formal and informal institutions.
VI. Conclusions and Recommendations

The first chapter has introduced this thesis. The second chapter has introduced the definitions, concepts and models in use and familiarizes with the subject. The third chapter has introduced the findings and ideas from literature. The fourth chapter has elaborated the research design and introduces the data collection process. The fifth chapter has presented the findings from data gathered and the results from data analysis. This chapter synthesizes what has been discussed throughout this thesis and shares the overall conclusions and recommendations reached as a result of the research.

6.1 Conclusions

In Uganda road infrastructure investments in the past mainly focused on road development. Road maintenance throughout the country has been underfunded and attracting little attention, resulting in a practice characterized as ‘build and collapse’ (World Bank, 2014b, p. 4). Uganda is facing difficulties to make road infrastructure meet realistic standards. Looking for ways of improving and following the idea of active private sector involvement (World Bank, 2014a), Uganda is now the first in Eastern Africa to pilot a PBMC on a key transport corridor. It includes 340km of an international trunk road linking South Sudan, parts of DRC, northern and eastern Uganda to Indian Ocean ports in Kenya. Financed by World Bank, the nine-year contract is based on the World Bank OPRC concept. The 2014 Review of Performance Based Contracting in the Road Sector led by OPUS and commissioned by World Bank points out however that a ‘one-size-fits-all’ approach to implement such concept is not the way forward to make PBC succeed in different contexts (Gericke et al., 2014) and a selection of an appropriate PBC-type requires taking into account country-specific characteristics (Bennett, 2014).

Locally a mismatch seems to exist for example between an underdeveloped local construction industry and the requirements for the OPRC valued at USD 251 million (World Bank, 2014c). Next, if an OPRC is considered successful, the challenge remains to make an infrastructure development project like this go beyond ‘islands of success’ (CrossRoads, 2013). A way of dealing with outsourcing maintenance of a road network instead of a single road in line with the new philosophy is still missing.

Therefore the objective of this thesis is to present findings which give an answer on the problem definition; what could an integrated approach for outsourcing maintenance of road infrastructure in Uganda look like, taking into account the country’s specific characteristics?

The target has been constrained to performance-based contracting. This means choosing an appropriate PBC-framework in line with an appropriate outsourcing degree. A PBC is not seen as ‘a goal in its own right’ (Gericke et al., 2014a) but as means to achieve asset management objectives in line with result-based financing (and output-based aid) strategies. First the case-specific sub-question regarding the object of outsourcing in answered. Then the empirical findings with respect to their corresponding sub-question are synthesized. Subsequently the theoretical implications are identified, followed the limitations of the study. Finally, an overall conclusion is presented.

6.1.1 Object of outsourcing

In this part the following case-specific sub-question is answered: what is the object of outsourcing?
The object of outsourcing is maintenance of the UNRA network. It includes road related assets and items that are to be maintained within the road reserve / up to right-of-way limits. Activities include rehabilitation, routine and periodic maintenance activities, improvement and emergency works. The UNRA network is Uganda’s classified national roads network. It includes (inter)national trunk roads (original network) and feeder roads (mostly additional network, previously part of DUCAR). Together with the remaining DUCAR network, it forms Uganda’s public road network. It includes roads with different functional classes. Design standards and service level standards are directed by the functional class and traffic volumes of different vehicle types in different types of terrain. Trunk roads are typically paved. Feeder roads are typically unpaved. The original network is mostly in fair condition. The additional network is mostly in poor condition.

6.1.2 Empirical findings

In this part the following empirical sub-question is answered: what are the specific characteristic to take into account, following from an empirical analysis?

The orientation (chapter II) has described the road network, the agenda outline and the environmental and cultural aspects. An appropriate framework for PBC is also seen to require insight in the local industry issues, management issues and legal issues. A case study thereby seemed an appropriate strategy to uncover what stands in the way of / interferes with meeting realistic standards. These constraints are the specific characteristics that follow from the empirical analysis. They follow from findings that tell the story of (1) the everyday business through force-account and FIDIC / FIDIC-inspired input contracts and (2) the on-going OPRC pilot. The *problem mess* (Van Aken et al., 2012) is represented in the form of cause and effect whereby OPRC intervention areas are highlighted (figure 6.1). The cause and effect diagram compiles information from the problem definition (after CrossRoads, 2013, World Bank 2014a, 2014b) and the findings, whereby three critical themes seem to cause that Uganda faces difficulties to make road infrastructure meet realistic standards: (1) insufficient maintenance (and other activities), (2) low-quality interventions and (3) an underdeveloped local construction industry. Four critical consequences follow from the problem definition: (1) safety issues, (2) reduced asset value, (3) restrained market access and (4) increased vehicle-operating costs.

These critical themes create the outline of figure 6.1. On the left side of figure 6.1 the findings are listed. On the right side of figure 6.1 the key effects already introduced in chapter I are positioned. The area in the middle on the left side of the problem is the interpretation from the empirical analysis. Areas positively impacted by the OPRC pilot so far have been highlighted (orange) in figure 6.1. OPRC intervention areas are described next.

**OPRC intervention areas**

Figure 6.1 includes multiple performance improvement areas. The overview illustrates that a structural intervention will likely depend on more than a delivery model (like OPRC) alone. Gericke et al. (2014a; 2014b) suggested that the delivery model could however serve as an ‘asset management enabler’ too. OPRC is for example understood to require various asset management practices / preconditions to make it work. Some of these of practices / preconditions may also yield better results in the everyday business using input contracts; for example a more appropriate and secured long-term allocation of resources to maintenance.

Key interventions so far are a shared and updated asset inventory, securing long term funding for maintenance activities and emphasis on supervision. The findings show that a
considerable investment is made in the resources necessary to introduce OPRC in Uganda. OPRC includes institutional support (training and knowledge transfer) and provides learning possibilities for local consultants from international expertise. This makes that the areas of underfunded maintenance, deficiencies in planning / design and deficiencies in delivery are positively impacted. One of the key effects, safety issues, has not been made orange for the reason that overloading measures have not yet been implemented. Another critical theme where the OPRC pilot falls short is an underdeveloped local construction industry. The authorities experience difficulties to outsource activities to local service providers and particularly for (routine) maintenance activities this is seen as problematic.

Figure 6.1. Cause and effect diagram compiling information from the problem definition (after CrossRoads, 2013, World Bank, 2014a, 2014b) and the findings whereby OPRC intervention areas are highlighted (orange).

The cause and effect diagram can be used to evaluate other PBC-strategies than OPRC. It allows evaluating to what extent the targeted framework deals with the multidisciplinary design, engineering and management challenge. The next part continues with the specific characteristics to take into account following from a theoretical analysis.

6.1.3 Theoretical implications

In this part the following sub-question will be answered: what are the specific characteristics to take into account, following from a theoretical analysis?

Four theoretical perspectives have been included in the theoretical analysis: (1) transaction cost economics (TCE), (2) agency theory (AT), (3) performance measurement and (4) formal / informal institutions. The perspectives have been used to highlight what is happening / what different viewpoint on what is happening they provide. To do so, each perspective brings
forward a key problem, respectively (1) uncertainty, (2) information asymmetry, (3) measurement complications and (4) mismatch between formal and informal institutions (the technical-economic key problems are after Schoenmaker, 2011; also see chapter III). The findings from the field are compared along with the aspects brought forward from the theoretical perspectives, resulting in a statement about a preferable way to deal with the key problem. Although the (complex) environment eventually did not seem to correspond well to the conceptual framework, the key problems that are drawn from the perspectives nevertheless seem relevant.

**TCE: a preferable way to deal with the key problem**
The rationale of TCE is that decision makers choose whatever governance structure minimizes the total transaction costs. Transaction costs however only do not seem to explain OPRC namely because of the monitoring requirements / expenses for a single road covering a larger (remote) geographical area. In this thesis the insight is taken over that the focus should not only be on transaction costs, but also on transaction benefits. Findings show for example that knowledge transfer is an important aspect of the OPRC pilot.

Uncertainty is taken as a key problem to evaluate the transaction arrangement. Uncertainty seems a more relevant element of TCE to do so. The outline of road infrastructure policy in Uganda illustrates the role of government agencies becoming confined to planning, policy and regulation. The role of the private sector is increased. This requires a different degree of outsourcing. Moving right along the input-output-outcome dimension, the risk allocation changes and the contractor hypothetically gains more freedom to decide on the what, when and/or how. A preference seems to remain however to prescribe the what, when and/or how of some of the maintenance activities in line with behavioral and environmental uncertainty and the limited local capabilities. The resulting hybrid nature of the piloted PBMC is actually already captured in the World Bank OPRC guidelines (World Bank, 2009). A hybrid arrangement seems to remain a preferable way to deal with uncertainty.

**AT: a preferable way to deal with the key problem**
Information asymmetry is taken as a key problem to evaluate the contractual agreement. Compared to the everyday business, with OPRC the road agency limits the problem of information asymmetry by steering on results. Information asymmetry still exists, but the impact of its consequences is limited. Like mentioned in the previous part on TCE, also the ex-post flexibility / interaction is limited. Shifting in terms of Stankevich (2009, p. 3) from ‘micromanager’ to ‘strategic manager, regulator and auditor’ in line with the new philosophy (also see chapter I), the performance measures that have in these early stages been specified with meticulous detail may become more abstract or diverging from well-defined to ill-defined, resulting in a situation of more ex-post flexibility and requiring more interaction and participation and thereby a more hybrid form of contract (Schoenmaker, 2011).

**Performance measurement: a preferable way to deal with the key problem**
Monitoring by supervising consultants in the everyday business is characterized by visual inspection and interaction to ‘measure’ service provider performance. This interaction can be about learning and compromising too: learning because small local contractors may have no formal education, internships etc. so they learn from doing in the field and compromising because of financial constraints make it unrealistic to be very demanding. OPRC introduces a complex performance measurement system that is primarily oriented on payment reduction. It has a limited variety of indicators and limits interaction. Interaction however is believed to be an important characteristic of performance measurement (De Bruijn, 2006; Schoenmaker, 2011). As Stankevich et al. (2009) point out to match the complexity of a PBC to the local construction industry, it seems to make sense to start with a simple
measurement system. Overall the importance of the four preconditions remains (Schoenmaker, 2011, pp. 95-100): (1) variety within the system, (2) dynamics within the system, (3) limiting the impact of (individual) performance indicators and (4) interaction between asset manager and service provider ex-ante and ex-post.

**Formal and informal institutions: a preferable way to deal with the key problem**

Both formal and informal institutions influence a contract (Dequech, 2001). This can be illustrated by making a distinction of a contract into legal aspects (formality) and social aspects (shared expectations). A legal only contract for example disregards ‘the necessity of some non-contractible relations, involving norms and social rules. In other words, legal contracts are inherently incomplete’ (Kugonza, 2010). Manning and Westreicher (pp. 114-146) advise to ‘be aware of the political realities that back up the institutional framework’. Ugandan political reality demonstrates the key problem of a mismatch between formal and informal institutions on top level. This seems due an underlying competing informal institution. Following the way formal and institutions interact based on the work by Helmk and Levitsky (2003, p. 12) the underlying competing informal institution could have been an accommodating informal institution if formal institutions were effective. A preferable way to deal with the key problem would then be to (1) design effective formal institutions and (2) take account of the informal institutions (Helmke & Levitsky, 2003).

### 6.1.4 Limitations of the study

The research has its limitations. One of the limitations is for example that the relative importance of various indicated causes of inadequate road infrastructure is not further investigated within the scope of this thesis. Further the research does not work with dependent, independent or control variables to check the various causes. Like explained in the methodological approach, the research is a rather open-ended inquiry (Edmonson and McManus, 2007) in relation to the limited amount of preceding research and it did not approach the field with hypothesis or predefined variables, rather with questions. Regarding the case study a longer track record of the OPRC pilot in Uganda could have allowed for improved verdict on an appropriate PBC framework. Further, the scale of the OPRC pilot is limited in proportion to the scale of the everyday business. In future study the research area will possibly be more mature and a longer track record of OPRC will possibly be obtainable.

### 6.1.5 Overall conclusion

This part synthesizes the findings which give an answer on the problem definition; what could an integrated approach for outsourcing maintenance of road infrastructure in Uganda look like, taking into account the country’s specific characteristics?

The integrated approach is about a way of dealing with outsourcing maintenance of a road network instead of a single road whereby the target has been constrained to PBC. This means choosing an appropriate PBC-framework in line with an appropriate outsourcing degree.

The orientation included the road network and cultural aspects among the context. Overall the orientation outlines that an appropriate PBC-strategy could advance on the rehabilitation required before maintenance and an interactive community-based approach. The object of outsourcing (part 6.1.1.) includes maintenance of paved and unpaved roads with different functional classes and conditions. This can be challenging, although for PBC it seems an advantage that overall rehabilitation is required to bring the required function up to pre-
defined standards / a maintainable condition first (Gericke et al., 2014). Build and collapse this way changes to rehabilitate and maintain. Multiple activities under the same contract and public procedures are understood to reduce corruption and increase transparency. With the pilot project considerable resources are allocated to managing and monitoring a single facility in a larger (rural) area. Alternatively the resources are allocated to managing and monitoring multiple facilities in the same area at the same time for greater efficiency. Involving roadside communities allows including both road users and workforce in the approach. Further, cultural dimensions have indicated that Ugandans seek to fulfill a useful role in their local communities. Ugandans are understood to have a short-term orientation, while at the same time some future orientation is supposedly included following from securing a continuous income, community commitment and remaining with one organization for most of the working life. For a management style the dimensions suggest involvement in decision-making, more direction and clear procedures together with disciplinary actions. This seems to match a strategy that uses straightforward requirements and an interactive community-based approach that links reward to performance and assures long-term funding.

Further insight in local industry issues, management issues and legal issues uncovers what stands in the way of / interferes with meeting realistic standards. These constraints are the characteristics that have followed from the empirical analysis. Overall the analysis outlines that an appropriate PBC-strategy requires not only including performance improvement areas related to the critical themes of insufficient maintenance and low-quality inventions but also to the critical theme of an underdeveloped local construction industry. The problem mess (Van Aken et al., 2012) following from the case study on the everyday business and OPRC has been represented in the form of cause and effect whereby OPRC intervention areas are highlighted. Key interventions so far are a shared and updated asset inventory, secured long-term funding for maintenance activities and emphasis on supervision. OPRC includes institutional support and provides learning possibilities for local consultants from international expertise. Areas that seem positively impacted so far include the critical themes of insufficient maintenance and low-quality interventions. The critical theme where OPRC seems to fall short is an underdeveloped local construction industry. The authorities experience difficulties to outsource activities to local service providers and particularly for (routine) maintenance activities this seems problematic. The local construction industry faces even more challenges to take part if they have to deal with a larger role in the maintenance process (beyond work scheduling and/or work execution) now the role of authorities becomes confined. At the same time the authorities seem to require strengthening too. This could provide opportunities for international service providers to help out with analysis, data management, work identification, planning / design, prioritization and measurement / inspection and to outsource suitable activities to local service providers.

The theoretical perspectives have provided a viewpoint on the outsourcing relation. Overall the theoretical analysis outlines that an appropriate PBC-strategy seems bound to a hybrid arrangement / contract whereby the rigidity of the pilot contract makes place for more interaction / participation. The OPRC pilot uses a hybrid arrangement and from a TCE perspective this also seems a preferable way to deal with uncertainty. Next, information asymmetry is taken as a key problem to evaluate the contract from an AT perspective. Compared to the everyday business, with OPRC information asymmetry is limited by steering on results. It still exists, but the impact of its consequences seems limited. Ex-post flexibility and interaction are limited too, while eventually more abstract performance measures in line with the changing role of the authority could result in a situation of more ex-post flexibility and requiring more interaction / participation and a more hybrid form of
contract (Schoenmaker, 2011). Further, OPRC introduces a more complex (highly detailed), static and unvaried performance measurement system that is primarily oriented on payment reduction whereas literature points out the importance of variety and dynamics within the system together with interaction and limiting the impact of individual measures (De Bruijn, 2006; Schoenmaker, 2011). Finally, both formal and informal institutions are perceived to influence a contract (Dequech, 2001). Thereby designing effective formal institutions and taking account of informal institutions (Helme & Levitsky, 2003) is understood as a preferable way to deal with a mismatch between formal and informal institutions.

In short, an appropriate PBC-strategy could advance on overall rehabilitation required before maintenance and an interactive community-based approach. The strategy not only seems to require including the identified performance improvement areas related to the critical themes of insufficient maintenance and low-quality inventions but also those related to the critical theme of an underdeveloped local construction industry. Further an appropriate framework seems bound to a hybrid arrangement / contract whereby the rigidity of the pilot contract makes place for more interaction / participation. The strategy could advance on existing (functioning) systems where possible, such as the HDM4 decision support system for road development and management already used today.

6.2 Recommendations

This part presents the recommendations of this thesis. The recommendations result from the insight through this research. First, the recommendations for an appropriate PBC-framework are listed. Next, the recommendations to the international community are listed. Finally, the recommendations for further research are listed.

Recommendations for an appropriate PBC-framework

In short, for an appropriate PBC-framework it seems sensible to:

- Involve the local construction industry / roadside communities in what could reasonably be expected and enable the local construction industry to participate;
- Switch from build and collapse to rehabilitate and maintain: start introducing PBMC on rehabilitated sections of the network;
- Outsource multiple activities under the same contract: fewer transactions and public procedures could reduce corruption and increase transparency;
- Use simple performance measures and an interactive (community-based) approach;
- Include the critical themes that seem to cause that Uganda faces difficulties to make road infrastructure meet realistic standards;
- Use international expertise / service providers to bridge the gap in the maintenance process between local authorities and local contractors: this could help out with management activities as well as provide support and additional skills;
- Outsource suitable activities to local service providers;
- Allocate managerial resources such as used under OPRC to manage and monitor a single facility in a larger (rural) area to multiple facilities in that area;
- Keep using existing (functioning) facilities where possible; for example HDM4 to determine affordable service level standards and evaluate economic rationale.
- Keep working with a combination of payment principles (hybrid structure) like in the pilot contract but leaving more flexibility and creating interaction.

Recommendations to the international community

In short, for the international community it seems sensible to:
- **Review the OPRC concept.** This research highlights multiple advancements (in line with the above), such as early involvement of the construction industry in what could reasonably be expected; use of simple performance measures and more interaction instead of the rigidity and inflexibility of the concept; and matching PBC-complexity with local capabilities, like already pointed out by Stankevich et al. (2009).

- **Overall review the development approach from a New Institutional Economics (NIE) viewpoint.** The research uses findings and ideas from related (and within the scope of the research limited) theoretical perspectives that are linked to what is seen as NIE. The (complex) environment eventually did not seem to correspond well however to the conceptual framework, although the key problems that are drawn from the perspectives nevertheless seemed relevant. Namely the rationale of transaction cost economics did not seem to explain the OPRC concept.

**Recommendations for further research**

This research draws from earlier work but at the same time the problem definition illustrates a rather open-ended inquiry in line with what is already researched: relatively little. Numerous areas can be pointed out for further research. Limited research exists for example on the cultural aspects of the environment. Limited research exists on OPRC: there could be a case study involving other pilot projects (in Sub-Saharan Africa). Limited research seems to exist on the New Institutional Economics and developing countries (also see recommendations to the international community): in line with what was encountered during this research, there could be more research on what aspects are more relevant and what aspects are less relevant for a certain environment.
References


UNRA. (2012). Preparation of the Third Phase of the Road Sector Development Programme (RSDP3). Kampala: UNRA.

URF. (2014). One Year Road Maintenance Plan and Annual Road Expenditure Programme for the FY 2014/15. Kampala: URF.


Appendices

Appendix A: North Eastern Road-Corridor Asset Management Project

Figure A1. North Eastern Road-Corridor Asset Management Project (World Bank, 2014b)
Appendix B: National major roads work programme FY 2013/2014

Figure B1. National major roads works programme FY 2013/2014 (UNRA, 2014)
## Appendix C: Field visit Uganda

### Table C1. Observations

<table>
<thead>
<tr>
<th>Subject</th>
<th>Place and date</th>
<th>Organizations involved</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site visits Northern / North Eastern Road Corridor (Kenya – South Sudan)</td>
<td>Various locations, Uganda, September 2014</td>
<td>UNRA, COWI, Roughton, World Bank</td>
<td>Moderate participation</td>
</tr>
<tr>
<td>NERAMP team meeting preparations</td>
<td>COWI / UNRA head offices, Kampala, Uganda, September 2014</td>
<td>UNRA, COWI</td>
<td>Passive / Moderate participation</td>
</tr>
<tr>
<td>NERAMP team meeting: final design report</td>
<td>UNRA head offices, Kampala, Uganda, September 2014</td>
<td>UNRA, COWI, Roughton, World Bank</td>
<td>Passive / Moderate participation</td>
</tr>
<tr>
<td>NERAMP team meeting: site investigation report</td>
<td>UNRA head offices, Kampala, Uganda, September 2014</td>
<td>UNRA, COWI, Roughton, World Bank</td>
<td>Passive / Moderate participation</td>
</tr>
<tr>
<td>NERAMP team meeting: risk matrix, allocation</td>
<td>UNRA head offices, Kampala, Uganda, September 2014</td>
<td>UNRA, COWI, Roughton, World Bank</td>
<td>Passive / Moderate participation</td>
</tr>
<tr>
<td>NERAMP team meeting: bidding documentation</td>
<td>UNRA head offices, Kampala, Uganda, September 2014</td>
<td>UNRA, COWI, Roughton, World Bank</td>
<td>Passive / Moderate participation</td>
</tr>
<tr>
<td>NERAMP team meeting: review of procurement plan</td>
<td>UNRA head offices, Kampala, Uganda, September 2014</td>
<td>UNRA, COWI, Roughton, World Bank</td>
<td>Passive / moderate participation</td>
</tr>
</tbody>
</table>

### Table C2. Interviews and expert contacts on location

<table>
<thead>
<tr>
<th>Place and date</th>
<th>Function</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kampala, Uganda, September 2014</td>
<td>Chief Project Manager</td>
<td>COWI</td>
</tr>
<tr>
<td>Kampala, Uganda, September 2014</td>
<td>Market Director</td>
<td>COWI</td>
</tr>
<tr>
<td>Kampala, Uganda, September 2014</td>
<td>Civil Engineering Consultant</td>
<td>COWI</td>
</tr>
<tr>
<td>Kampala, Uganda, September 2014</td>
<td>Senior Highway Engineer / Task Team Leader</td>
<td>World Bank</td>
</tr>
<tr>
<td>Kampala, Uganda, September 2014</td>
<td>Senior Highway Engineer</td>
<td>World Bank</td>
</tr>
<tr>
<td>Kampala, Uganda, September 2014</td>
<td>Management Consultant / UNRA Team Leader</td>
<td>Roughton International</td>
</tr>
<tr>
<td>Kampala, Uganda, October 2014</td>
<td>UNRA Team Leader</td>
<td>Roughton International</td>
</tr>
<tr>
<td>Kampala, Uganda, September 2014</td>
<td>Director of Planning</td>
<td>UNRA</td>
</tr>
<tr>
<td>Kampala, Uganda, September 2014</td>
<td>Road Asset Management Engineer</td>
<td>UNRA</td>
</tr>
<tr>
<td>Kampala, Uganda, September 2014</td>
<td>UNRA District Station Chief</td>
<td>UNRA</td>
</tr>
<tr>
<td>Kampala, Uganda, September 2014</td>
<td>Ag. Executive Director</td>
<td>UNRA</td>
</tr>
<tr>
<td>Kampala, Uganda, October 2014</td>
<td>Director of Operations</td>
<td>UNRA</td>
</tr>
<tr>
<td>Kampala, Uganda, October 2014</td>
<td>Monitoring &amp; Evaluation Manager</td>
<td>UNRA</td>
</tr>
<tr>
<td>Kampala, Uganda, October 2014</td>
<td>Director of Procurement</td>
<td>UNRA</td>
</tr>
<tr>
<td>Kampala, Uganda, October 2014</td>
<td>Procurement Officer</td>
<td>UNRA</td>
</tr>
<tr>
<td>Kampala, Uganda, October 2014</td>
<td>Contracts Committee Secretary</td>
<td>UNRA</td>
</tr>
<tr>
<td>Kampala, Uganda, October 2014</td>
<td>Manager Human Resources / Training</td>
<td>UNRA</td>
</tr>
<tr>
<td>Kampala, Uganda, October 2014</td>
<td>Manager Planning and Programming</td>
<td>Uganda Road Fund</td>
</tr>
<tr>
<td>Kampala, Uganda, October 2014</td>
<td>Road Maintenance Engineer</td>
<td>Uganda Road Fund</td>
</tr>
<tr>
<td>Kampala, Uganda, October 2014</td>
<td>Traffic &amp; Transport Planning Manager</td>
<td>KCCA</td>
</tr>
</tbody>
</table>
### Appendix D: Process steps model of the maintenance process

**Table D1. Process steps model of the maintenance process (Schoenmaker and Verlaan, 2013)**

<table>
<thead>
<tr>
<th>Process step</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goals, objectives</td>
<td>Produce, implement, review and update the requirements, aims and objectives of the (regional) road agency</td>
</tr>
<tr>
<td>Develop organizational goals and objectives</td>
<td>Translate the objectives into SMART objectives that describe the requirements of the network and the requirements of the supporting processes</td>
</tr>
<tr>
<td>Performance requirements</td>
<td>Provide an accurate record of the condition and performance of the assets, recommend and undertake surveys to support analysis and work identification</td>
</tr>
<tr>
<td>Determine the requirements</td>
<td>Establish and maintain an accurate and up to date asset inventory and associated condition and performance data to support use of this data by the other processes</td>
</tr>
<tr>
<td>Measurement, inspection</td>
<td>Analyse data and intelligence gather and documented to identify trends, faults, intervention levels that are in conflict of future conflict with the requirement</td>
</tr>
<tr>
<td>Measure and inspect the assets</td>
<td>Produce effective solutions that satisfy the identified needs to keep the assets in line with the requirements</td>
</tr>
<tr>
<td>Data management</td>
<td>Deliver maintenance plans and preliminary designs of the solutions</td>
</tr>
<tr>
<td>Manage the data</td>
<td>Weigh the proposed interventions on preset criteria, the available budgets and impact on requirements. If necessary propose changes in requirement if available budgets do not cover the identified needs</td>
</tr>
<tr>
<td>Analysis</td>
<td>Prepare for construction to ensure the delivery is to predetermined cost and time</td>
</tr>
<tr>
<td>Identify the needs</td>
<td>Efficiently deliver the maintenance work and deliver input for the data management systems</td>
</tr>
</tbody>
</table>
Appendix E: Agency roles and responsibilities

Table E1. Roles and responsibilities (URF, 2014)

<table>
<thead>
<tr>
<th>Agency</th>
<th>Roles and responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Works and Transport (MoWT)</td>
<td>Provide governance to URF by nominating a representative on the board; Coordinating DUCAR agencies in the process of development of Annual Road Maintenance Programs (ARMP); Facilitate and guide in the development of plans; Monitoring and evaluation of DUCAR agencies; Setting standards, policy guidelines; Manage and operate the regional mechanical workshops; Set service delivery standards in the city including road safety; Construction and maintenance of roads; install and maintain street lights; Monitor the delivery of transport services within its jurisdiction.</td>
</tr>
<tr>
<td>Ministry of Local Government (MoLG)</td>
<td>Provide governance to URF by nominating a representative on the Board; To ensure that adequate capacity exists in DUCAR agencies to safely, efficiently and effectively utilize URF funds; Coordinate the DUCAR in development of works plans; Development and maintenance of District and Town council roads; Bottleneck removal on CARs; Development and maintenance of municipality road networks; Improving the condition of the additional circa 10,000km of roads upgraded from district to national status; Off-carriageway works that includes vegetation control, verge/drainage peep and shoulder repairs, mechanized routine maintenance, grading and spot re-graveling for unpaved roads and surface repair of defects, potholes, graveling, cracks and edge damage (paved).</td>
</tr>
<tr>
<td>Uganda National Roads Authority (UNRA)</td>
<td>Development and maintenance of the expanded national road network; Improving the condition of the additional circa 10,000km of road upgraded from district to national status; Off-carriageway works that includes vegetation control, verge/drainage peep and shoulder repairs, mechanized routine maintenance, grading and spot re-graveling for unpaved roads and surface repair of defects, potholes, graveling, cracks and edge damage (paved); Axle load control, road safety on high volume roads; Manage ferries / ships and maintenance of landing sites.</td>
</tr>
<tr>
<td>Kampala Capital City Authority (KCCA)</td>
<td>Set service delivery standards in the city including road safety; Construction and maintenance of roads: install and maintain street lights: Monitor the delivery of transport services within its jurisdiction.</td>
</tr>
<tr>
<td>DUCAR Agencies</td>
<td>Development and maintenance of District and Town council roads; Bottleneck removal on CARs; Development and maintenance of municipality road networks; Improving the condition of the additional circa 10,000km of roads upgraded from district to national status; Off-carriageway works that includes vegetation control, verge/drainage peep and shoulder repairs, mechanized routine maintenance, grading and spot re-graveling for unpaved roads and surface repair of defects, potholes, graveling, cracks and edge damage (paved).</td>
</tr>
<tr>
<td>District Road Committees</td>
<td>District Roads Committees, which are expected to provide overall oversight in the preparation of plans for district, urban and community access roads in liaison with Ministry of Works and Transport (MoWT)</td>
</tr>
</tbody>
</table>
Appendix F: Road maintenance plan preparation flowchart

Figure F1. URF plan preparation flowchart (based on URF, 2014)
Appendix G: Poverty incidence and population density

Figure G1. Poverty incidence in % (AICD, 2009)

Figure G2. Population density per square km (AICD, 2009)
Appendix H: Pilot contract performance measures

The World Bank OPRC sample specifications define three groups of performance measures: (1) management performance measures, (2) road user service and comfort measures and (3) durability performance measures (World Bank, 2009). COWI (2014a) has further divided these into the following work type groups:

- Management performance measures (M)
- Road user service and comfort measures (C)
- Durability measures (D)
- Road safety furniture (F)
- Drainage (W)
- Structures (S)
- Earthworks, embankments and cuttings (E)
- Vegetation control (V)

Table H1. Management Performance Measures (COWI, 2014a)

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Service level</th>
<th>Measurement / detection</th>
<th>Tolerance permitted</th>
<th>Unit Rate for Non-compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>Programme of Performance</td>
<td>Requirements will be detailed in the Technical Specifications</td>
<td>Revision and Approval of the Project Manager and/or Road Authority</td>
<td>Before the Start Date and no later than 28 days after signing the Contract.</td>
<td>USD 200 for each day of delay</td>
</tr>
<tr>
<td>M2</td>
<td>Quality Assurance Plan (QAP)</td>
<td>Requirements will be detailed in the Technical Specifications. The QAP shall also integrate the Contractor’s Health &amp; Safety Management Plan, Emergency &amp; Incident Response Plan and Traffic Management Plan.</td>
<td>Revision and Approval of the Project Manager and/or Road Authority</td>
<td>Within 42 days of the Start Date.</td>
<td>USD 200 for each day of delay</td>
</tr>
<tr>
<td>M3</td>
<td>Draft Design Report</td>
<td>Submission and approval before the total time period indicated for the design stage. Details are specified in the Technical Specifications but the report includes the work plan and design for topography, hydrology, hydraulic, structures, pavement, traffic, geology, geometry, geotechnical and proposed rehabilitation works</td>
<td>Revision and Approval of the Project Manager and/or Road Authority</td>
<td>Within six months of Start Date.</td>
<td>USD 500 for each day of delay</td>
</tr>
<tr>
<td>M4</td>
<td>Final Design Report</td>
<td>Submission and approval of the Final Design Report</td>
<td>Revision and Approval of the Project Manager</td>
<td>Within 1 month of receiving comments to Draft Design</td>
<td>USD 500 for each day of delay</td>
</tr>
</tbody>
</table>
including all drawings.
Submission and approval of Monthly Progress Reports summarizing activities carried out, progress of work, constraints and difficulties, updated work plan, traffic management, health and safety management, environmental & social management.

Monthly Progress Reports

Submission and approval of Monthly Progress Reports summarizing activities carried out, progress of work, constraints and difficulties, updated work plan, traffic management, health and safety management, environmental & social management.

Revision and Approval of the Project Manager and/or Road Authority

Within the first 8 calendar days of each contract month

None

Annual Inventory Reports

Submission and approval of annual Inventory Report. This report includes traffic counts, axle load surveys, roughness and FWD measurements and intervention records.

Revision and Approval of the Project Manager and/or Road Authority

Baseline Asset Database: Within two months of Start Date. Annual Inventory Reports: Within 5 days of start of Month 11, 23, 35, 47, etc.

USD 300 for each day of delay

Baseline Asset Database: Within two months of Start Date. Annual Inventory Reports: Within 5 days of start of Month 11, 23, 35, 47, etc.

USD 300 for each day of delay

Design Report Year 8

Residual pavement design life. Residual pavement design life determined by ELMOD at beginning of contract year 8 shall be 12 years.

Revision and Approval of the Project Manager and/or Road Authority

As included in Program of Performance.

USD 400 for each day of delay

USD 400 for each day of delay

Handover Report

The report will summarise any unresolved issues, complete set of road data, defects & liabilities, sensitive issues, etc.

Revision and Approval of the Project Manager and/or Road Authority

Submission within 8 days of the Completion Date.

USD 300 for each day of delay

USD 300 for each day of delay

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Service level</th>
<th>Measurement / detection</th>
<th>Time for repair</th>
<th>Payment Reduction for non-compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Road usability</td>
<td>Open and free from interruptions at all times for motorised traffic (light and/or heavy vehicles) anywhere along the road</td>
<td>Visual inspection</td>
<td>0 days</td>
<td>15%</td>
</tr>
<tr>
<td>C2</td>
<td>Potholes</td>
<td>Permitted maximum diameter of any single pothole: 15cm Permitted maximum number of accumulated potholes with an equivalent diameter greater than 100 mm in any continuous 1,000m section: 4 nos.</td>
<td>Visual inspection Ruler/Measurement Tape</td>
<td>7 days</td>
<td>10%</td>
</tr>
<tr>
<td>C3</td>
<td>Depressions</td>
<td>Depressions are not 3m straightedge</td>
<td>3m straightedge</td>
<td>56 days</td>
<td>15%</td>
</tr>
</tbody>
</table>
and shoving permitted

**C4** Patching

(i) shall be square or rectangular;
(ii) be constructed with 2-3mm over-height compared to adjacent asphalt surface;
(iii) shall be made using materials similar to those used for the surrounding pavement; and
(iv) shall not have cracks wider than 3 mm.

Visual inspection (for detection of shape and material used)
Ruler (to check if patch is level with surrounding pavement)
Small transparent ruler (for cracks)

28 days 10%

**C5** Cracking in pavement

There shall not be any cracks more than 3 mm wide.

Crack widths measured with small transparent ruler.

28 days 10%

**C6** Multiple cracks in the pavement (Fine cracks with a width less than 3mm)

For any 50m section of the pavement, the cracked area cannot be more than ten (10) percent of the pavement surface.

Visual inspection
Ruler/Measurement Tape

28 days 10%

**C7** Cleanliness of the pavement surface and shoulders

The road surface must always be clean and free of soil, debris, trash and other objects.

Visual inspection

Safety related: 4 hours
Other: 7 days

5%

**C8** Rutting

No ruts > 30 mm for existing pavement and maximum 20 mm for new pavement. Rutting > 10 mm shall not be present in more than 10% of any of the road section.

Measured with 3m long straight edge placed perpendicularly across lane; rut depth measured as space between straight edge and lowest point of rut, using a wedge with scale in mm.

56 days 20%

**C9** Ravelling

Ravelled areas must not exist.

Visual inspection

56 days 10%

**C10** Loose pavement edges

There shall not be loose pavement edges, or pieces of pavement breaking off at the edges.

Visual inspection

56 days 20%

**C11** Edge Step

Difference in height at edge of pavement shall not be more than 50mm.

Measured with ruler, with scale in mm

56 days 20%

**C12** Roughness: Maximum IRI for any one-km section of existing pavement

Maximum average IRI for any one-km of existing pavement shall be less than 4.0 m/km.

Measured with calibrated equipment (Bump Integrator)

90 days 10%

**C13** Roughness: Average roughness for entire road with

Maximum average IRI for any Lot with existing pavement shall be less than

Measured with calibrated equipment (Bump Integrator)

90 days 3%
Table H3. Durability measures (COWI, 2014a)

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Service level</th>
<th>Measurement / detection</th>
<th>Time for repair</th>
<th>Payment Reduction for non-compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Pavement deflection</td>
<td>Average of 95percentile centre deflection over any 1,000 m section &lt; 0.75mm</td>
<td>FWD</td>
<td>180 days</td>
<td>20%</td>
</tr>
<tr>
<td>D2</td>
<td>Pavement width</td>
<td>Pavement width must be at least as wide as specified in the Technical Specifications.</td>
<td>Manual measurement using a metallic measuring tape</td>
<td>0 days</td>
<td>5%</td>
</tr>
</tbody>
</table>

Table H4. Signaling and Road Safety furniture (COWI, 2014a)

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Service level</th>
<th>Measurement / detection</th>
<th>Time for repair</th>
<th>Payment Reduction for non-compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Information signs</td>
<td>Sign has to be present, complete, clean, legible, and structurally sound</td>
<td>Visual inspection</td>
<td>Dirty Signs shall be cleaned within 3 days. Absent or defect signs must be replaced 14 days</td>
<td>3%</td>
</tr>
<tr>
<td>F2</td>
<td>Warning signs</td>
<td>Sign has to be present, complete, clean, legible and structurally sound; and clearly visible at night.</td>
<td>Visual inspection</td>
<td>Dirty Signs shall be cleaned within 3 days. Absent or defect signs must be replaced 14 days</td>
<td>8%</td>
</tr>
<tr>
<td>F3</td>
<td>Traffic ruling signs</td>
<td>Sign has to be present, complete, clean, legible and structurally sound; and clearly visible at night.</td>
<td>Visual inspection</td>
<td>Dirty Signs shall be cleaned within 3 days. Absent or defect signs must be replaced 14 days</td>
<td>8%</td>
</tr>
<tr>
<td>F4</td>
<td>Horizontal demarcation: and/or pavement paint</td>
<td>Present, legible and firmly attached to pavement. Micro spheres must be firm and visible.</td>
<td>Visual inspection</td>
<td>90 days</td>
<td>8%</td>
</tr>
<tr>
<td>F5</td>
<td>Kilometre posts</td>
<td>Present, complete,</td>
<td>Visual inspection</td>
<td>90 days</td>
<td>3%</td>
</tr>
</tbody>
</table>
and guidance posts clean, legible and structurally sound; surface painted or otherwise covered.

F6 Guardrails Present, clean, without any significant damage and without corrosion. All bolts shall be tightened. Visual inspection 14 days 8%

Table H5. Drainage (COWI, 2014)

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Service level</th>
<th>Measurement / detection</th>
<th>Time for repair</th>
<th>Payment Reduction for non-compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td>Ditches and vertical drains with lining</td>
<td>Refer Technical Specifications but all drainage structures shall generally be clean and functional</td>
<td>Visual inspection</td>
<td>7 days</td>
<td>10%</td>
</tr>
<tr>
<td>W2</td>
<td>Ditches and vertical drains without lining</td>
<td>Refer Technical Specifications but all drainage structures shall generally be clean and functional</td>
<td>Visual inspection</td>
<td>7 days</td>
<td>10%</td>
</tr>
<tr>
<td>W3</td>
<td>Collectors</td>
<td>Refer Technical Specifications but all drainage structures shall generally be clean and functional</td>
<td>Visual inspection</td>
<td>7 days</td>
<td>10%</td>
</tr>
<tr>
<td>W4</td>
<td>Culverts and similar</td>
<td>Refer Technical Specifications but all drainage structures shall generally be clean and functional</td>
<td>Visual inspection</td>
<td>7 days</td>
<td>10%</td>
</tr>
</tbody>
</table>

Table H6. Structures (COWI, 2014a)

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Service level</th>
<th>Measurement / detection</th>
<th>Time for repair</th>
<th>Payment Reduction for non-compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Steel/Metal Structures</td>
<td>Guardrails must be present and not deformed. All metal parts of overall structure shall be painted or otherwise protected and free of corrosion, Drainage system in good condition and fully functional.</td>
<td>Visual inspection</td>
<td>7 days</td>
<td>5%</td>
</tr>
<tr>
<td>S2</td>
<td>Concrete Structures incl. retention walls, etc.</td>
<td>Guardrails must be present and painted. Beams and all other structural parts must be in good condition and fully functional.</td>
<td>Visual inspection</td>
<td>7 days</td>
<td>5%</td>
</tr>
</tbody>
</table>
conditions and fully functional. Drainage system in good condition and fully functional.

S3  Expansion joints  Clean and in good condition  Visual inspection  7 days  5%
S4  Riverbeds  Free water flow, measures against scour  Visual inspection  14 days  5%

Table H7. Embankments and Cuttings (COWI, 2014a)

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Service level</th>
<th>Measurement / detection</th>
<th>Time for repair</th>
<th>Payment Reduction for non-compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Without deformations and erosions</td>
<td>Visual inspection</td>
<td>21 days</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>Removal of slides</td>
<td>Slides onto the road, shoulder or drains shall be removed</td>
<td>Visual inspection</td>
<td>6 hours when affecting traffic safety</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>Slopes in cuts</td>
<td>Without deformations and erosions</td>
<td>Visual inspection</td>
<td>Fallen slope material must be removed</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Quantities below 50 m³: from pavement within 4 hours after detection; From shoulders within 48 hours after detection. Between 50 m³ and 200 m³: from pavement within 24 hours after detection, from shoulders within 96 hours after detection</td>
<td></td>
</tr>
</tbody>
</table>

Table H8. Vegetation Control (COWI, 2014a)

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Service level</th>
<th>Measurement / detection</th>
<th>Time for repair</th>
<th>Payment Reduction for non-compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grassing Urban Areas</td>
<td>Vegetation between 25mm and 100mm</td>
<td>Visual inspection and ruler</td>
<td>14 days</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>Grassing Non-urban Areas</td>
<td>Vegetation between 25mm and 300mm</td>
<td>Visual inspection and ruler</td>
<td>14 days</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>Vegetation Control around safety structures</td>
<td>Vegetation less than 200mm</td>
<td>Visual inspection and ruler</td>
<td>14 days</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>Vegetation Free Zone</td>
<td>No vegetation</td>
<td>Visual</td>
<td>14 days</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>Vegetation control in Vegetation Free Zone</td>
<td>No encroachment</td>
<td>Visual and tape measurement</td>
<td>14 days</td>
<td>8%</td>
</tr>
</tbody>
</table>
Appendix I: Pilot contract interdependence of activities

This appendix aims to illustrate the interdependence of these activities in the pilot project and the importance of the tool (HDM4) that is already extensively used in the everyday business for service level determination. It thereby illustrates the activities that belong to the first 8 steps of those 26 (COWI, 2014a): (1) define project road limits, (2) complete an inventory of project road assets, (3) undertake surveys and investigations to determine condition of the assets including traffic volume and loading, pavement roughness and strength, drainage structure condition and capacity etc., (4) assess inventory records and conditions data, (5) determine necessary rehabilitation and improvement works to bring the road up to par by separate contract or making it part of the OPRC contract, (6) define the scope of services, (7) define the level of service (condition) to be achieved and maintained, (8) develop an approach for performing inspections and method of measurement for verification of compliance with specifies service levels.

Figure I.1. NERAMP interdependence of activities (based on COWI, 2014a)
# Appendix J: Key findings from engineering audits

**Table J1. Key findings from engineering audits per road contract (OAG, 2010, 2013, 2014)**

<table>
<thead>
<tr>
<th>No</th>
<th>Road Project</th>
<th>Contractor</th>
<th>Key findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kampala-Jinja Road (Black spots improvements)</td>
<td>Multiplex/Omega Joint Venture</td>
<td>Delays in completion as a result of inexperienced contractors; Liquidated damages not charged for the delays; Contract awarded without drawings; Nugatory expenditure of UGX 57.6 million; A number of defects noticeable on the Road; Asphalt laid at Namanve less than the required thickness; Entebbe-Kampala Sections not worked on yet the amount spent was to cover both Jinja-Kampala and Kampala and Entebbe.</td>
</tr>
<tr>
<td>2</td>
<td>Jinja-Bugiri Road (Rehabilitation, 72.8km)</td>
<td>RCC - Reynolds Construction Company/Sonitra Ltd.</td>
<td>Kerbstone along the Jinja Section are low in height; Lettering on sign posts not readable; Road safety (Kakira junction) not catered for; Some defects noted (to be rectified by contractor); Double surface dressing of shoulders; Access roads and junction not done to standards; Average cost per km is high.</td>
</tr>
<tr>
<td>3</td>
<td>Kampala-Gayaza Road (Upgrading and strengthening, 44km)</td>
<td>Energo Project Miskogradnja</td>
<td>Delayed works; Inadequate provision for crossing culverts; Unrealistic increment in sub-base material valued at UGX 1.3 billion; Culvert concrete failures in some sections; Unit cost are high;</td>
</tr>
<tr>
<td>4</td>
<td>Kawempe-Luwero Road (Rehabilitation/ resealing, 66km)</td>
<td>Energo Project Niskogradnja</td>
<td>Delayed works; Defects noticeable to be rectified by contractor; Measured road length differed from the contracted length by 8.2 km; Unexplained increments in quantities valued at over UGX 4.8 billion.</td>
</tr>
<tr>
<td>5</td>
<td>Luweero-Kafu Road (Rehabilitation/ resealing, 100km)</td>
<td>Energo Project Niskogradnja</td>
<td>Delays in commencement of works leading to change in road design and costs; Contract variations of over 16 billion (U) more than 100% of the contract amount; Delayed execution of works; 3 vehicles fully paid for were not procured by contractor; Defects in some sections; Measured length is 105 km as opposed to 106 km indicated by the consultant; Unexplained increments in materials, quantities of over UGX 2 billion.</td>
</tr>
<tr>
<td>6</td>
<td>Fort Portal-Kyenjojo Road (Widening and resealing, 10km)</td>
<td>Zimwe Enterprises, Hardwares and Construction</td>
<td>Slow progress of works; Initial works carried out without a supervising consultant; Approved staff for the road works not on site; Defects need to be rectified by contractor; Contractor thin on the ground; Weak base in some road sections; UNRA hesitant to invoke termination clause despite slow progress.</td>
</tr>
<tr>
<td>7</td>
<td>Fort portal-Hima Road (Strengthening, 55km)</td>
<td>China Chungqing International Construction Corporation (CICO)</td>
<td>Road failures at various road sections; Contractor granted time extension and compensated despite delays attributed to him; Weak Road base in various sections; Contractor found rectifying the defects at night without required supervision.</td>
</tr>
<tr>
<td>8</td>
<td>Hima-Kasese-Kikorongo Road and SBI International Holdings</td>
<td></td>
<td>Longitudinal cracks visible on the road, a sign of road failure. Sub-base analysis indicated high clay</td>
</tr>
<tr>
<td>Project Name</td>
<td>Contractor</td>
<td>Issues/Concerns</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>Kasasa-Kilembe Road (Strengthening)</td>
<td></td>
<td>Defects (aggregate stripping) noticeable in some sections.</td>
<td></td>
</tr>
<tr>
<td>9 Olwiyo-Pakwach Road (Upgrading to paved standard, 62.5km)</td>
<td>China Changqing International Construction Corporation</td>
<td>Defects noticeable in some sections (potholes, extensive rutting); Crushed stone base less than the designed specifications; Wrongly positioned road signage; Some sections showed extensive road failure; Accidents common in particular sections of the Road (possible poor road design); Poor design of the drainage system at some sections.</td>
<td></td>
</tr>
<tr>
<td>10 Kiboga-Hoima Road (Upgrading, 77km)</td>
<td>Stirling International (UK)/Stirling Civil Engineering Ltd.</td>
<td>Contract duration increased excessively by 117% leading to increase in costs; Works not completed after 9 years: 3 consultancy firms hired at different times to design bridge/culverts at Kafu River: Weak asphalt found at some sections of the road: Measured Road length of 75.34 km against stated length of 77 km: Unprotected road edges fast eroding especially in trading centers.</td>
<td></td>
</tr>
<tr>
<td>11 Nanduget-Aksim (Periodic maintenance, 74km)</td>
<td>J.W. Opolot Construction Ltd.</td>
<td>Drainage not planned for: Weak sub-grade was found in some sections: Measured length of 71.2 km against stated length of 74 Km: Compaction of gravel done without enough moisture: Slow progress of Works.</td>
<td></td>
</tr>
<tr>
<td>12 Kamuli-Bukungu Road (Periodic maintenance, 66.3km)</td>
<td>Kark Technical Services Ltd.</td>
<td>Consultancy contract procured when the works were 60% complete; Slow progress of works due to frequent breakdown of contractor’s plant: Measured length of 66.3km against stated length of 68km; Poor workmanship noticed in laying crossing culverts: Inadequate provisions for drainage along stretches on hills.</td>
<td></td>
</tr>
<tr>
<td>13 Kotido-Kanawa-Abim Road (Periodic maintenance, 70km)</td>
<td>Excel Construction Ltd.</td>
<td>Wrong drawings were provided in the contracts; BoQs provided for 75mm of gravel thickness, which was considered to be too small for this road; Some culverts were not properly aligned, others damaged or lacked headwalls: Culverts outlet drains were blocked by residents; Some sections showed rutting road edge severely eroded by storm water.</td>
<td></td>
</tr>
<tr>
<td>14 Pabbo-Atiak-Nimule Road (Urgent repairs, 67.6km)</td>
<td>Mulowooza &amp; Brothers Ltd.</td>
<td>Gravel in some sections is of less thickness than required: Measured length of 67.6km against stated length of 70km; Defects noticed on a number of culverts: Severe erosion noticed along some headwall surrounding due to poor compaction: Cost per km is considered high.</td>
<td></td>
</tr>
<tr>
<td>15 Isingiro-Rakai/Mbarara Border Road (Periodic maintenance, 52.7km)</td>
<td>Assured Engineering Services Ltd.</td>
<td>Supervision Consultancy procured when works were 85% complete; Weak wearing course noticed in some sections; Measured length of 52.7 km against stated length of 54.15 km: A number of culverts had cracked (poor quality); Long stretches in low lying areas did not have adequate provisions for drainage; Compaction was being done without enough moisture in the gravel.</td>
<td></td>
</tr>
<tr>
<td>16 Soroti-Dokolo Road</td>
<td>China Road and Bridge</td>
<td>Delay in award of contract (10 months) due to lack of funds</td>
<td></td>
</tr>
<tr>
<td>Project Name</td>
<td>Contractor</td>
<td>Major Issues</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>(Upgrading, 62.6km)</td>
<td>Corporation of standard rates for materials; Used outdated general conditions of contract; Wrong application of variation of prices (VoP) formula (indices) escalated the contract price by over UGX 18 billion (26%); Uganda Bureau of Statistics (UBOS) was not consulted on the right formula (indices) to use; Late decisions made on road shoulders, increasing the cost by UGX 1.07 billion; Contractor works more than the programmed working hours a day; Supervision arrangements for these hours not clear; Contractor key staff on the site were all different from the approved as per contract. High percentage of foreign staff (25%) without proper justification; Extra hours put in by the contractors staff paid under day-works resulting into overpayment of UGX 30 million; No work items were included in the contract to protect road edges in populated areas; Lack of sufficient mitre drains; Substantial upward variation of quantities for some activities by up to 25%; Excavation of unsuitable material to spoil higher than BoQs quantity (the materials could have been treated and reused); No measurement engineer on site after the death of one in July 2009; Severe erosion of embankments at many locations; Cost escalation of over UGX 33 billion; Average cost per km is high.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dokolo-Lira Road (Upgrading, 60.4km)</td>
<td>China Road and Bridge Corporation</td>
<td>Delayed award of contract (13 months) due to lack of standard rates for materials and unplanned funding gap; Used outdated general conditions of contract; Wrong application of variation of prices (VoP) formula (indices) resulting into price adjusting of UGX 11 billion (13%); Contractor does not have own material testing laboratory; Excavation to spoil of material up to 450mm. Material could have been treated and reused; Cement stabilized sub base showed unnecessary high and costly CBR values of up to 260%; Safety of road users and workers neglected by the contractor; Environmental issues not addressed by the contractor; Quantities of some activities have been varied by up to 25% with no negotiations with the contractor to lower the rates; Cost escalation of more than UGX 25 billion; Cost per km of UGX 1.6 billion is considered high.</td>
<td></td>
</tr>
<tr>
<td>Matugga-Semuto-Kapeeka Road (Demonstration of innovative technologies, 41.1km)</td>
<td>China Chongqing International Construction Corporation</td>
<td>Used outdated general conditions of contract; Slow progress by the contractor noted; Large quantities of cut to spoil material (more than 350% increase of the BoQ provision leading to extra cost of UGX 6.2 billion); No application and spread rates of materials were mentioned in the BoQ: Two types of modified base were referred to in the BoQ: Key approved contractor’s staff not on site.</td>
<td></td>
</tr>
<tr>
<td>Ntungamo-Kabale-Katuna (Backlog maintenance, routine mechanized, 84.5km)</td>
<td>Spencon-Stirling JV (Uganda)</td>
<td>Delay in award of contract (15 months); Wrong formula for price adjustments (using prices instead of indices); Contractor not accounting for the 20% advance payments; Traffic management not well handled.</td>
<td></td>
</tr>
</tbody>
</table>
| 105 | Late submission of progress reports by consultants:  
Experimenting Cold Slurry Seal material on the road earmarked for reconstruction:  
Road Section from Kabale to Katuna looked good enough:  
Isolated pothole repair could keep the road until the reconstruction. |
|---|---|
| 20 | Masaka-Kyotera Road, Nyendo-Villa Maria Road (Backlog maintenance, 48.7km) | Dott Services Ltd. (Uganda) | Contract expired with no extension granted:  
Very slow progress:  
Claim for price increase submitted (increase in costs);  
Concern over misuse of project vehicles:  
Fresh potholes developing at the edges of the patched ones:  
The rates of application for the Slurry Seal Material not stated in the BoQ (contract). |
| 21 | Moroto-Lokitanyala Road (Periodic maintenance, 44km) | Kirk Technical Services Ltd. | Supervision consultants procured when the work had already progressed. Not on-ground:  
Multiple culvert failures were noticeable:  
Average cost of UGX 54.01 million per km is considered high. |
| 22 | Fort Portal-Kamwenge Road (Periodic maintenance, 77km) | Kato Investments Ltd. | Poor jointing of culverts:  
Inadequate provisions for drainage along the hilly sections. |
| 23 | Kampala-Mbarara Road (Reconstruction of priority areas, 63.1km) | Reynolds Construction Company (Nigeria) Ltd. | Contracts for works and consultancy denominated in EUR instead of UGX (functional currency):  
Payment made for materials which was not on the list of materials at the site:  
Laboratory equipment fully paid for by GoU will revert to the contractor:  
Physical progress of 16% against time taken of 40.8%:  
Environmental concerns not adequately catered for. |
| 24 | Moyo-Obongi Road (Periodic maintenance, 56km) | Universal engineering (Uganda) Ltd. | Provisions for mitre drains excessively high:  
No strip maps were available:  
Work activities not included in the BoQ all being proposed (lack of proper planning):  
Contractor was found dumping heavy clay material late in the evening without the knowledge of the consultant:  
Consultant thin on the ground (being represented by a junior person):  
Average cost per km of UGX 54.67 million is considered high. |
| 25 | Arua-Manibe-Wandi, Manibe-Koboko and Koboko-Oraba Road (Periodic maintenance, 79km) | Zzimwe enterprises, Hardwares and Construction Ltd. | Very slow progress due to contractor management problems (abandoned works):  
Late procurement for supervision consultants:  
Sections worked on were deteriorating while the sections unattended were becoming impassable;  
UNRA hesitant to invoke termination clause in the contract. |
| 26 | Nansana-Busunju Road (Shoulder & pothole repair, 48km) | Nicontra Ltd. | Inappropriate drawings provided for the contract:  
Test results for Kayunga-Kalagi Road included in the second progressive report (doubtful results):  
Some individual items in the BoQ varied by up to 476.5%;  
Some cases of poor workmanship noted:  
Some primed sections left for long time leading to deterioration:  
Completed sections showing a number of defects:  
Supervision consultant procured when the works were 48% complete:  
Very slow physical progress of 48% against time progress of 109%;  
Low quality progress reports. |
<p>| 27 | Masaka-Bukakata- | Multiplex Ltd. | Inappropriate drawings provided in the contract; |</p>
<table>
<thead>
<tr>
<th>Project Description</th>
<th>Contractor/Consultant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kakyanga-Lambu Road (Periodic maintenance, 43km)</td>
<td></td>
</tr>
<tr>
<td>Small Culverts used (could be a future maintenance problem);</td>
<td></td>
</tr>
<tr>
<td>Specifications for paved roads included in the contract;</td>
<td></td>
</tr>
<tr>
<td>Snags list shows sections with less than the required thickness of gravel; work activity fully paid for;</td>
<td></td>
</tr>
<tr>
<td>Average cost per km of UGX 50.2 million is considered high.</td>
<td></td>
</tr>
<tr>
<td>28 Busunju-Kiboga Road (Upgrading, 67km)</td>
<td>Stirling International Civil Engineering Ltd.</td>
</tr>
<tr>
<td>Delayed completion;</td>
<td></td>
</tr>
<tr>
<td>Road edges being eroded especially at sections in populated areas;</td>
<td></td>
</tr>
<tr>
<td>Most of the road signs vandalized/stolen;</td>
<td></td>
</tr>
<tr>
<td>Blocked side drain by residents (inadequate access provisions were provided);</td>
<td></td>
</tr>
<tr>
<td>Supervising Consultants changed three times.</td>
<td></td>
</tr>
<tr>
<td>29 Hoima-Kiziranfumbi-Kabale Road (Emergency repairs, 51.2km)</td>
<td>Dott Services Ltd.</td>
</tr>
<tr>
<td>Contradicting test results noted;</td>
<td></td>
</tr>
<tr>
<td>No drawings were included in the contract;</td>
<td></td>
</tr>
<tr>
<td>Average cost per km of UGX 96.88 million is considered high.</td>
<td></td>
</tr>
<tr>
<td>30 Busega-Mityana Road (Spot repairs, 27km)</td>
<td>Spencon Services Ltd.</td>
</tr>
<tr>
<td>No drawings were included in the contract, built drawings were also not available;</td>
<td></td>
</tr>
<tr>
<td>Some pay items in the BoQ were raised up to 150% but not properly documented;</td>
<td></td>
</tr>
<tr>
<td>Completion Certificate issued when the snags on the road had not been attended to;</td>
<td></td>
</tr>
<tr>
<td>Average cost per Km (spot repairs) of shs.152.8m is high;</td>
<td></td>
</tr>
<tr>
<td>Road had been earmarked for reconstruction (in progress);</td>
<td></td>
</tr>
<tr>
<td>Spot repairs should have been scaled down to avoid waste.</td>
<td></td>
</tr>
<tr>
<td>31 Malaba and Busia parking Yards (Urgent repairs)</td>
<td>BCR General Ltd.</td>
</tr>
<tr>
<td>Contract period expired when 84% of works were complete, no extension of time was</td>
<td></td>
</tr>
<tr>
<td>granted:</td>
<td></td>
</tr>
<tr>
<td>Contractor’s staff changed without approval:</td>
<td></td>
</tr>
<tr>
<td>Cost per cubic meter of concrete of UGX 680,000 considered high.</td>
<td></td>
</tr>
<tr>
<td>32 Ngetta-Lira Border Road (Periodic maintenance, 64km)</td>
<td>Mulowooz &amp; Brothers Ltd.</td>
</tr>
<tr>
<td>Contract period expired when works were 63% complete;</td>
<td></td>
</tr>
<tr>
<td>Approved contractor’s staff not found on site;</td>
<td></td>
</tr>
<tr>
<td>Some works not done according to specifications;</td>
<td></td>
</tr>
<tr>
<td>Drainage failure noted;</td>
<td></td>
</tr>
<tr>
<td>Average cost per km of UGX 42.17 million is considered high.</td>
<td></td>
</tr>
<tr>
<td>33 Nyakahita-Rushere-Rwakitur Road (Gravelling, grading and drainage improvement, 45km)</td>
<td>BCR General Ltd.</td>
</tr>
<tr>
<td>No progress reports available;</td>
<td></td>
</tr>
<tr>
<td>Average cost per cubic meter of concrete at UGX 680,000 for headwalls is considered high.</td>
<td></td>
</tr>
<tr>
<td>34 Kafu-Masindi Road (Upgrading, 43.27km)</td>
<td>General Nile Company for Road and Bridges / Dott Services Ltd. Joint Venture</td>
</tr>
<tr>
<td>Contract delayed and extended for 23 months;</td>
<td></td>
</tr>
<tr>
<td>UGX 16.676 billion approved and paid in respect of the contractor’s claim for an</td>
<td></td>
</tr>
<tr>
<td>extended stay;</td>
<td></td>
</tr>
<tr>
<td>Final average cost per km of UGX 1.12 billion is considered high;</td>
<td></td>
</tr>
<tr>
<td>Unit cost application rate for crushed stone base was raised leading to increase in</td>
<td></td>
</tr>
<tr>
<td>contract sum by UGX 2.5 billion;</td>
<td></td>
</tr>
<tr>
<td>Unit rate for stone pitching more than doubled from UGX 27,000 to UGX 54,210;</td>
<td></td>
</tr>
<tr>
<td>Application rates for first seal and surfacing dressing were also revised, increasing</td>
<td></td>
</tr>
<tr>
<td>the cost by UGX 4 billion;</td>
<td></td>
</tr>
<tr>
<td>Bitumen variations of UGX 147 million;</td>
<td></td>
</tr>
<tr>
<td>Dangerous drainage systems in Masindi town;</td>
<td></td>
</tr>
<tr>
<td>20mm size aggregates were applied on top instead of the specified 10mm size</td>
<td></td>
</tr>
<tr>
<td>aggregates.</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Road Name 1</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>35</td>
<td>Bumbobi-Bubulo-Bududa Road</td>
</tr>
<tr>
<td>36</td>
<td>Soroti-Kumi Road</td>
</tr>
<tr>
<td>37</td>
<td>Lokapel-Nabilatuk Road</td>
</tr>
<tr>
<td>38</td>
<td>Lira-Kitgum Border</td>
</tr>
<tr>
<td>39</td>
<td>Mpigi-Kanoni Road</td>
</tr>
<tr>
<td>40</td>
<td>Myanzi-Kassanda-Bukuya-Zanyino Road</td>
</tr>
<tr>
<td>41</td>
<td>Kyapa-Kasensero Road</td>
</tr>
<tr>
<td>42</td>
<td>Fort-Portal-Bundibugyo Road</td>
</tr>
<tr>
<td>43</td>
<td>Tororo-Mbale Road; Mbale-Kumi Road; Kaputh-Kabong Road and Kabong-Kapedo Road</td>
</tr>
</tbody>
</table>
Appendix K: Semi-structured interviews, themes to be explored

Following on the conceptual project design and the theoretical perspectives, a number of questions in the themes (see below) to be explored through semi-structured interviews are after the *Organizational Profile Interview Guides* by World Bank (2002) that are part of an assessment toolkit provided by World Bank for research on formal and informal institutions. Questions about the degree of outsourcing are after Schoenmaker (2011).

<table>
<thead>
<tr>
<th>Semi-structured interviews, themes to be explored</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
</tr>
<tr>
<td>Description of the organization</td>
</tr>
<tr>
<td>Position of the organization within larger organization</td>
</tr>
<tr>
<td>Services provided by the organization</td>
</tr>
<tr>
<td>The road maintenance budget / turnover compared to the total budget / total turnover</td>
</tr>
<tr>
<td>What is the procurement strategy for maintenance / subcontracting?</td>
</tr>
<tr>
<td>Since when are you contracting / contracting out maintenance in a performance-based way?</td>
</tr>
<tr>
<td>On what scale is maintenance contracted out? (Financial, regional etc.)</td>
</tr>
<tr>
<td><strong>Origins and development</strong></td>
</tr>
<tr>
<td>How was your organization created? Who was most responsible for its creation (government mandate, community decision, suggestion by development partner etc.)?</td>
</tr>
<tr>
<td>What kind of activities has the organization been involved in?</td>
</tr>
<tr>
<td>In what ways has the organization changed its structures and purpose? What is the main purpose of your organization today?</td>
</tr>
<tr>
<td><strong>Membership</strong></td>
</tr>
<tr>
<td>Can you tell about the people at your organization? How do they become involved? Are all people in the community involved? If not, why are some members if the community not involved?</td>
</tr>
<tr>
<td>What kind of activities has the organization been involved in?</td>
</tr>
<tr>
<td>In what ways has the organization changed its structures and purpose? What is the main purpose of your organization today?</td>
</tr>
<tr>
<td>As the organization developed, what sort of help has it received? Has it received advice and/or funding from (non) government entities? How did you get this support? Who initiated it? How was the support given? What benefits and limitations has the organization derived from this support?</td>
</tr>
<tr>
<td><strong>Institutional capacity</strong></td>
</tr>
<tr>
<td>How would you characterize the quality of leadership of this organization, in terms of..</td>
</tr>
<tr>
<td>- stability?</td>
</tr>
<tr>
<td>- number of leaders / availability?</td>
</tr>
<tr>
<td>- diversity / heterogeneity of leadership?</td>
</tr>
<tr>
<td>- quality and skills of leaders?</td>
</tr>
<tr>
<td>- relationships of leaders to staff and to the community?</td>
</tr>
<tr>
<td>How would you characterize the quality of participation in this organization, in terms of..</td>
</tr>
<tr>
<td>- attendance at meetings, both internal to the organization and externally with other organizations?</td>
</tr>
<tr>
<td>- participation in decision-making within the organization?</td>
</tr>
<tr>
<td>- dissemination of relevant information prior to the decision?</td>
</tr>
<tr>
<td>- informal opportunities to discuss the decision?</td>
</tr>
<tr>
<td>- consultation processes with base organizations or with the community?</td>
</tr>
<tr>
<td>- broad debate, including opposition positions, and honesty?</td>
</tr>
<tr>
<td>- dissemination of the results of the decision-making process?</td>
</tr>
<tr>
<td>- whether any groups within the community feel excluded from the organization?</td>
</tr>
<tr>
<td>- the level of participation of more prosperous families (elites) in the organization?</td>
</tr>
</tbody>
</table>
How would you characterize the organizational culture of this organization, in terms of:
- the existence and level of knowledge of the procedures and policies?
- whether the procedures and policies are carried out?
- whether there are problems with nonattendance at meetings, theft of property or supplies?
- conflict resolution mechanisms, both within the community and within the organization?
- the nature of conflicts between the organization and community members?

How would you characterize the organizational capacity of this organization, in terms of:
- carrying out specialized activities (new types of contracts etc.)
- supervising and contracting consultants?
- preparing financial reports for banks, development partners and government?
- reacting to changing circumstances (change in government for example)?
- developing specific plans for the future (instead of reacting to opportunities as they present themselves)?
- reflecting on and learning from previous experiences?

Institutional linkages

How would you characterize your organization’s relationship with other organizations? When do you feel the need to establish collaboration / links with them?

Have you attempted to organize or work with other organizations to achieve a mutually beneficial goal? What kind of activities? Is this a common strategy for organizations here?

Could you describe your relationship with the government? Have you had experience in trying to get government assistance? What was your experience? Which level of government do you find most cooperative (local, district, national)?

(Is your organization linked to any government program?) Which government program(s) is your organization involved with? Why those particular programs? What sort of role does your organization play in the program? Are there certain characteristics of these programs that make it easier for your organization to work with the programs?

Do you feel sufficiently informed about government programs and activities? What are your sources of information?

Have you attempted to give inputs to the government? What were the circumstances? What have been the results?

What is your view about building informal relationships with decision makers in the government entity?

How do you make a deal with the service provider / client?

To what extent do you rely on formal and / or informal contracts in business transactions?
What role do professional associations and standards play? What role do local government associations play?

What is your opinion on the effect of various trainings on how the procurement chain is managed?

**Institutions and decision-making**

What are the most common contracts entered with contractors?

What is the view on a contractor that wins a contract in another district?

Who are normally responsible for contract supervision and monitoring?

How are contracts enforced administratively, legally or socially?

What benefits would a party derive by sticking to informal contracts?

**Institutions and dispute resolutions**

What is your view on enforcing contracts between client and service provider?

Have you experienced contracting disputes?

What are main reasons for violation of contractual terms or transaction disputes?

How many dispute cases have you experienced over the past number of years?

What do you usually do when disputes arise? What methods have you used to settle these disputes?

**Interplay of formal and informal institutions**

What is your opinion on the effectiveness of formal institutions at the central government compared to the effectiveness at the local government level?

- To what extent is formal political supervision done at the central government?
- To what extent is technical supervision undertaken at the central government levels?

What is your opinion on the effectiveness of informal institutions at the central government compared to the effectiveness at the local government level?

- To what extent is political supervision undertaken at local government level?
- To what extent is technical supervision undertaken at the local government level?

**Specific object of contract assignment**

Description of road maintenance work in terms of...

- categorization of maintenance activities (rehabilitation, reactive/unplanned (corrective, emergency and improvement, proactive / planned (preventive and predictive), other activities)
- object characteristics (cost, specifications, technology, lifetime, complexity etc.)
- disciplines involved
- outsourcing
- methodology

What is the duration of the contract?

What is the relation with other area’s and other contracts?

**Performance-based contracting: specifications and measurement**

What are the requirements / specification in terms of...

- functional performance; technical performance, technical specifications?
- aesthetics; norms etc.
- organization, working process?

What are the sanctions and incentives?

What is the pricing schedule?

Who drafted the specifications? How much of this is centralized within the organization?

**Performance-based contracting: behavior and performance**

How are requirements that are hard to measure dealt with?

What is done when requirements have not been met?

To what behavior do the performance indicators, sanctions and measurements lead? (Desired, undesired)
<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the observed changes in behavior during the contract phases?</td>
</tr>
<tr>
<td>What are the changes in performance indicators during the contract phases? How are the changes formulated?</td>
</tr>
<tr>
<td>How are changes in specifications (functional and technical) dealt with?</td>
</tr>
<tr>
<td>How are behavior and culture measured within the contract?</td>
</tr>
<tr>
<td>What initiatives have been undertaken to develop inter-contract relationships?</td>
</tr>
<tr>
<td>Has there been a tangible link between level of performance delivery and relationships between client and service provider?</td>
</tr>
<tr>
<td>Has there been a tangible link between level of performance delivery and selection criteria?</td>
</tr>
</tbody>
</table>

**Unforeseen contingencies**

- Barriers in developing and maintaining contractual relationships
- Changes to scope / service levels due to unforeseen events
- Changes in the environment / disrupting forces that influenced the contract relationship

**Preferred institutions**

- Why may one type of institution (formal or informal) be more effective in decisions to award road maintenance contracts? Considering the structures, procedures, behavior and conventions that emerged: which was more important, at what stage and why?
- Which types of institutions are actually preferred for enforcement of formal contracts for road maintenance? Why?

**End of interview**

- Complete picture?
- Other comments regarding outsourcing maintenance of road infrastructure
- Others to interview
- Access to relevant documents
## Appendix L: Typical Service Levels for unpaved roads

**Table L1. Typical service levels for unpaved roads (World Bank, 2009, p. 182)**

<table>
<thead>
<tr>
<th>Service level standard</th>
<th>Fair</th>
<th>Good</th>
<th>Very Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical traffic volumes (Vehicles/day)</td>
<td>Less than 50</td>
<td>50 - 150</td>
<td>150 - plus</td>
</tr>
<tr>
<td>Average operational traffic speed (km/h)</td>
<td>40</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>Surface degradation – maximum diameter of any single degradation</td>
<td>45cm</td>
<td>35cm</td>
<td>25cm</td>
</tr>
<tr>
<td>Surface degradation – maximum number greater than nominated diameter in any 100m</td>
<td>20/30cm</td>
<td>1/25cm</td>
<td>2/25cm</td>
</tr>
<tr>
<td>Cleanliness of pavement surface and shoulders response time for safety related matters</td>
<td>24hrs</td>
<td>10hrs</td>
<td>6hrs</td>
</tr>
<tr>
<td>Cleanliness of pavement surface and shoulders response time for all other matters</td>
<td>14 days</td>
<td>7 days</td>
<td>4 days</td>
</tr>
<tr>
<td>Road corrugation amplitude</td>
<td>4.5cm</td>
<td>3.5cm</td>
<td>2.5cm</td>
</tr>
<tr>
<td>Rut depth</td>
<td>10.0cm</td>
<td>7.0cm</td>
<td>5.0cm</td>
</tr>
</tbody>
</table>
### Table M1. Summary of EIA/EISA approval and licensing requirements (World Bank, 2013)

<table>
<thead>
<tr>
<th>No</th>
<th>Regulatory clearances</th>
<th>Corresponding regulations</th>
<th>Approving authority</th>
<th>Typical time required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Project brief</td>
<td>EIA Regulations 1998 NEA CAP 153</td>
<td>NEMA</td>
<td>No more than 7 working days from submission to authority</td>
</tr>
<tr>
<td>2</td>
<td>EISA, ESMP and monitoring plan in the ESIS</td>
<td>EIA Regulations 1998 NEA CAP 153</td>
<td>NEMA</td>
<td>Within 180 days from submission to authority</td>
</tr>
<tr>
<td>3</td>
<td>Method Statement</td>
<td>MOWT General Specifications for Road and Bridge works 2005</td>
<td>UNRA</td>
<td>Continual</td>
</tr>
<tr>
<td>5</td>
<td>Restoration and decommissioning plans and tree planting schedule</td>
<td>NEA CAP 153 EIA Regulations 1998 MOWT General Specifications for Road and Bridge works 2005</td>
<td>UNRA</td>
<td>Continual</td>
</tr>
</tbody>
</table>
## Appendix N: Road station equipment inventory

*Table N1. Road station equipment inventory: Soroti Station*

<table>
<thead>
<tr>
<th>Reg. No.</th>
<th>Type</th>
<th>Year</th>
<th>Make</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>UG.0105W</td>
<td>Crane Truck</td>
<td>1987</td>
<td>Mitsubishi</td>
<td>Broken down (requires new crane assembly)</td>
</tr>
<tr>
<td>UG.1199W</td>
<td>Pick-up Single cabinet</td>
<td>2001</td>
<td>Nissan S/cabin</td>
<td>Broken down (due for disposal, uneconomical to repair)</td>
</tr>
<tr>
<td>UG.1086W</td>
<td>Pick-up Double cabin</td>
<td>2000</td>
<td>Mitsubishi D/cabin</td>
<td>Broken down (requires engine repair)</td>
</tr>
<tr>
<td>UG.1268W</td>
<td>Pick-up Double cabin</td>
<td>2003</td>
<td>Mitsubishi D/cabin</td>
<td>Broken down (requires engine replacement)</td>
</tr>
<tr>
<td>UG.0965W</td>
<td>Motor Grader</td>
<td>2000</td>
<td>Komatsu</td>
<td>Broken down (requires engine replacement)</td>
</tr>
<tr>
<td>CDP 0244</td>
<td>Pedestrian Roller</td>
<td>2003</td>
<td>Dynapac</td>
<td>Broken down (requires new hydraulics)</td>
</tr>
<tr>
<td>CDP 0123</td>
<td>Roller single drum</td>
<td>2000</td>
<td>Bomag</td>
<td>Broken down</td>
</tr>
<tr>
<td>UG.0102W</td>
<td>Tipper model FM515</td>
<td>1986</td>
<td>Mitsubishi</td>
<td>Grounded (uneconomical to repair)</td>
</tr>
<tr>
<td>UN.REG.</td>
<td>Diesel generator</td>
<td></td>
<td>Honda</td>
<td>Grounded</td>
</tr>
<tr>
<td>UG.1011W</td>
<td>Motorcycle CT 200</td>
<td>2000</td>
<td>Honda</td>
<td>Grounded</td>
</tr>
<tr>
<td>WBR/002</td>
<td>Pedestrian roller</td>
<td>2010</td>
<td>Weber</td>
<td>Nonoperational due to lack of service parts</td>
</tr>
<tr>
<td>UG.1010W</td>
<td>Motorcycle CT 200</td>
<td>2000</td>
<td>Honda</td>
<td>Grounded</td>
</tr>
<tr>
<td>UG.1017W</td>
<td>Motorcycle</td>
<td>2006</td>
<td>Honda</td>
<td>Broken down</td>
</tr>
<tr>
<td>UG.1040W</td>
<td>Motorcycle</td>
<td>2001</td>
<td>Suzuki</td>
<td>Grounded</td>
</tr>
<tr>
<td>3003109</td>
<td>Plate compactor</td>
<td>2011</td>
<td>Hatx</td>
<td>Nonoperational due to lack of service parts</td>
</tr>
<tr>
<td>UG.1145W</td>
<td>Grader</td>
<td>2006</td>
<td>Fiat-Hitachi</td>
<td>Nonoperational (requires tyres and fuel system)</td>
</tr>
</tbody>
</table>
Appendix O: OPRC performance measurement

Figure O1: Output based routine maintenance measurement process (redrawn from Rao, 2012)

Figure O2: Output based rehabilitation measurement process (redrawn from Rao, 2012)
<table>
<thead>
<tr>
<th>No.</th>
<th>Risk</th>
<th>Risk details</th>
<th>Risk responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Changes in laws and regulations</td>
<td>Due to the long period of contract, changes in laws and regulations are likely to affect the contract.</td>
<td>Employer</td>
</tr>
<tr>
<td>2</td>
<td>Force majeure as defined in GC 38.1</td>
<td>War, riot, terrorist acts, strike, epidemics, earthquake, cyclone, floods or other natural or physical disasters etc.</td>
<td>Employer</td>
</tr>
<tr>
<td>3</td>
<td>Damage causes by traffic accidents</td>
<td>Losses or damages of any kind arising out of traffic accidents on the Road, unless those traffic accidents have been caused directly by potholes or other major defects or shortcomings</td>
<td>Employer</td>
</tr>
<tr>
<td>4</td>
<td>Price adjustments</td>
<td>Prices are adjusted for fluctuations in accordance with clause 48 of the GC according to the cost induce of inputs as provided in the contract.</td>
<td>Shared</td>
</tr>
<tr>
<td>5</td>
<td>Changes in contract elements</td>
<td>Change orders may have significant impact on design and on contract that has already been made. Changes may cause the contractor to significantly change procedures</td>
<td>Employer</td>
</tr>
<tr>
<td>6</td>
<td>Exchange rate movement</td>
<td>The risk of exchange rate movement is covered by the contractor’s bid being in a mix of currencies so long as he is paid his hard currency percentage at a fixed exchange rate</td>
<td>Employer</td>
</tr>
<tr>
<td>7</td>
<td>Unforeseen natural phenomena</td>
<td>Damages cause by “unforeseen natural phenomena” and specified to be covered by emergency works</td>
<td>Shared</td>
</tr>
<tr>
<td>8</td>
<td>Normal storm damage</td>
<td>These storm damages entailing such items like culvert and side drain siltation and blockage, and scour at culvert outfalls. These are items which are seen as foreseeable</td>
<td>Contractor</td>
</tr>
<tr>
<td>9</td>
<td>Abnormal storm damage</td>
<td>These damages would require reinstatement of road sections or reconstruction of drainage structure as a result of natural phenomena with imponderable consequences</td>
<td>Employer</td>
</tr>
<tr>
<td>10</td>
<td>Retention</td>
<td>Retention is deducted for all rehabilitation and improvement works, but not for maintenance works according to Clause 51 of GC</td>
<td>Shared</td>
</tr>
<tr>
<td>11</td>
<td>Capital / improvement works by others</td>
<td>This would comprise activities such as a quarry being opened up and extra traffic coming onto the road as well as additional loading / overloading</td>
<td>Contractor</td>
</tr>
<tr>
<td>12</td>
<td>Work by utility operators within the right of way</td>
<td>If utility operators are working in the road right of way this should not inconvenience the contractor as there should have been proper planning between contractor and operator</td>
<td>Shared</td>
</tr>
<tr>
<td>13</td>
<td>Utilities relocation</td>
<td>Risk that result from improper mapping of existing utilities or infrastructure, which could hinder construction work</td>
<td>Employer</td>
</tr>
<tr>
<td>14</td>
<td>Environmental compliance</td>
<td>Section 1700 and 1800 of the GC together with Special Specifications including the Environmental and Social Management Framework set out rules to be followed</td>
<td>Contractor</td>
</tr>
<tr>
<td>15</td>
<td>Hazardous materials</td>
<td>Risks are realized in 2 main forms: risks of accidents during work, and risks of collateral damage inflicted by hazardous materials</td>
<td>Contractor</td>
</tr>
<tr>
<td>No.</td>
<td>Item</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Poor performance of design</td>
<td>Poor design performance may be caused by a lack of details, lack of proper risk analysis, failing to consider all requirements and specifications</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Poor assessment of timetable</td>
<td>Timetable assessment is made in order to manage expectations of project stakeholders. Financial assumptions are based upon these assessments.</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Poor assessment of cost</td>
<td>Poor assessment of cost could be caused by lack of information during the tender, unrealistic prediction of market behavior.</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Poor performance of construction</td>
<td>Poor performance of construction which occurs due to poor design, improper supervision during the works, misusing construction materials etc.</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Poor performance of maintenance</td>
<td>Risks that could be realized in the materials used by the contractor, the frequency of maintenance works, level of service etc.</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Accuracy and completeness of information</td>
<td>The contractor uses inaccurate information received from the employer without verifying their validity or doing its proper study</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Land acquisition / clearances required for improvement works</td>
<td>There may be a need to acquire land for improvement works and for camp site outside the right of way of the roads included in the contract</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Expropriations / ground delivery / new development by GoU</td>
<td>Smooth process of expropriation and ground delivery is crucial for project flow</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Statutory improvements</td>
<td>Lack or delays in achieving proper building permits could occur due to internal project management risks or from external factors</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Building permits / licensing</td>
<td>Lack of delays in achieving proper building permits could occur due to internal project management risks or from external factors</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Government works delivery</td>
<td>Risks which result from delays in delivery of government works, such as surface preparation etc.</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>All required consents and approvals specified under the contract</td>
<td>Works done without consents and approvals of the employer</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Statutory improvements</td>
<td>Changes in the macro-economic environment affect the debt consideration made by the contractor</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Payment to authorities</td>
<td>Risks which will result from unforeseen payments and fees payable to authorities</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Tax changes</td>
<td>Tax changes are reflected in both income and expenses of the contractor. Significant changes in taxed could undermine contractor’s financial stability</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Unplanned routine maintenance activities</td>
<td>Routine maintenance and repair of crash and other damage, including graffiti, vandalism theft etc. by third parties</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Budget approval</td>
<td>Government budget approval affects the project go ahead decision, which affects all project stakeholders</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Liability for damages to services caused by operations</td>
<td>Damages not accounted for by the contractor</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Changes in traffic volumes</td>
<td>If traffic volumes increase significantly then the intended design by the contractor may not be sufficient. The monitoring of traffic is part of the self-control unit of the contractor</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Overloading (beyond the projected loading / threshold)</td>
<td>Overloading would be determined by the monitoring of the traffic by the self-control unit of the contractor. Presently, overload regulations are not properly enforced</td>
<td>Employer</td>
</tr>
</tbody>
</table>