
# Improvement of the Governance and Management of Icelandic Public Projects

By

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# Preface and Acknowledgements

Initially, the discipline of project management was developed to improve scheduling accuracy and cost control in endeavours that where unique and time constrained. Modern project management not only includes the traditional planning techniques intended to ensure operational effectiveness but also tools to ensure strategic effectiveness. Project management is today used to ensure the quality of governance and as a field of science is has been enriched by elements from other management disciplines. There is evidence that the evaluation of good project management practises has largely bypassed Iceland in the context of public projects. This thesis describes some of the shortcomings and fundamental causes and is meant to contribute positively to the ongoing discussion of reforms.

I am deeply grateful to many people, far too many to be able to list them all. Firstly I would like to thank my main supervisor *Dr. Brian Atkin*. I learned a lot from him and his no nonsense approach. Also *Dr. Páll Jensson* who entered the picture later a supervisor but was instrumental to close the project.

This has been a long process. In fact so long that it has outlasted three Deans of the *School of Science and Engineering.* They were all supportive and I would like to express my thanks to *Dr. Bjarki Brynjarsson* who initially pushed me into this affair, *Dr. Gunnar Guðni Tómasson,* who revoke a sleeping process and *Dr. Guðrún Arnbjörg Sævarsdóttir* for her kind support on the last meters. It is by far not default to be handed this opportunity.

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*Helgi Vignir Bragason* contributed to Study IV, Prerequisites and decision-making procedures on an Icelandic public project compared against Norwegian standards

*Eyrún Ösp Eyþórsdóttir* contributed to Study V, Reference class forecasting in Icelandic transport infrastructure projects.

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First and foremost I would like to thank my family. *You* are the greatest, greatest and I love you dearly.

Reykjavik, January 2015

Þórður Víkingur Friðgeirsson

# Úrdráttur

Viðfangsefni þessarar ritgerðar er hagnýting verkefnastjórnunar, og skyldra fagsviða, til að tryggja hagkvæmni og skilvirkni opinberra verkefna á Íslandi. Fjallað er um hvernig verkefnastjórnun og stjórnsýsla (governance) hafa þróast saman á alþjóðavettvangi til að tryggja hagsmuni almennings vegna opinberra fjárfestingaverkefna. Hin alþjóðlega þróun er borin saman við það fyrirkomulag sem í lög hefur verið leitt og almennt tíðkast á Íslandi.

Ritgerðin er borin uppi af fimm lauslega tengdum rannsóknaverkefnum. Fyrst er greint frá hvernig staðið er að hagkvæmniathugunum (feasibility studies) vegna opinberra verkefna borið saman við bestu aðferðir (best practice) eins og þær eru skilgreindar á alþjóðavettvangi. Í annan stað er hið opinbera regluverk (formal governance framework), sem styður við stjórnun opinberra verkefna á Íslandi, borið saman við starfshætti í Bretlandi og Noregi, annars vegar, og alþjóðleg viðmið hins vegar (Project Management Body of Knowledge - PMBOK®). Þá er ætluð (self perceived) áhættuafstaða (risk attitude) þingmanna borin saman við ætlaða áhættuafstöðu stjórnenda í einkageiranum. Í fjórða lagi er gerð tilviksrannsókn á Vaðlaheiðargöngum og spurt hvort ætla megi að verkefnið hefði hlotið framgang Í Noregi hefðu gögnin, sem virðast hafa verið ein forsenda ríkisábyrgðar á framkvæmdinni, verið lögð fram þar í svipuðum tilgangi? Loks voru gögn frá Vegagerðinni notuð til að byggja upp forspárlíkan og spurt hvort að nýleg forspáraðferð (reference class forecasting) geti dregið úr líkum á framúrkeyrslu kostnaðar?

Niðurstöðurnar, sem birtar eru í ritgerðinni, benda til að verulegt svigrúm sé til staðar til að styrkja íslenska stjórnsýslu hvað varðar undirbúning og stjórnun opinberra verkefna. Íslenskt regluverk og vinnubrögð standa umtalsvert að baki því sem búast mætti við í þróuðu ríki.

Loks eru lagðar fram tillögur um hvernig má nýta tækifærið til umbóta, sem varpað er ljósi er á í ritgerðinni, og hvernig mætti færa til betri vegar stjórnun og stjórnsýslu þar sem þess er þörf.

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**Abbreviations**

APM: Association for Project Management

B/C: benefit/cost ratio

CEO: chief executive officer

CPM: critical path method

CSF: critical success factor

EEA: European Economic Area

EU: expected utility

EV: earned value analysis

GCCA: Governmental Construction Control Agency

GDP: gross domestic product

ICERA: Icelandic Road Administration

IMF: International Monetary Fund

IPMA: International Project Management Association

IRR: internal rate of return

KPI: key performance indicator

NPM: New Public Management

NPV: net present value

OECD: Organisation for Economic Co-operation and Development

OGC: Office of Government Commerce

OPM3: Project Management Maturity Model

PERT: program evaluation and review technique

PFS: Prerequisite feasibility study

PMBOK: Project Management Body of Knowledge®

PMI: Project Management Institute

PPC: Public procedure policy on conception, planning and implementation of public projects

QA: quality assurance

RCF: reference class forecasting

SIC: Report of the Special Investigation Commission

SMART: Simple multi-attribute technique

SWOT: Strengt/Weaknesses and Opportunites/Threats

TCE: transaction cost economics

WBS: work breakdown structure

# 1 Introduction

The Republic of Iceland is in many ways an interesting place to study management, governance and related disciplines. Iceland is one of the most sparsely populated countries in Europe with a population of only 330,000. It is a constitutional republic with a multi-party system. The head of state is the President. Executive power is exercised by the government. Iceland is arguably the world's oldest parliamentary democracy, with the parliament, the *Althingi*, established in 930. Legislative power is vested in both the parliament and the President. The judiciary is independent of the executive and the legislature (Government Offices of Iceland, 2014). Since the country's full sovereignty in 1944, a close relationship has been developed with the Scandinavian countries. Before declaring independence Iceland was a part of Denmark and the country's legislation is still largely based on the Danish legal arrangement. Iceland has also been a party to the *European Economic Area* (EEA) since 1994 and Europe is by far its largest trading partner[1]. In spite of the small population, Iceland is a prosperous country with a GDP of 45,000 USD per capita (Hagstofan, 2013). The export economy is currently based on three major pillars: fisheries, heavy industries (mainly aluminium production) and tourism. Iceland is a resourceful country with healthy fish stocks, hydro- and geothermal energy, huge water reservoirs and the island's unique landscape attracts tourists and is a popular scene for films and advertising. What makes Iceland so accessible for applied research on management is the compactness of its small population. Compared to large nations with deep and broad hierarchies and long communication channels, information and people are easily accessible in Iceland.

## 1.1 The fourth pillar

In the years from 2003 to 2008, Iceland was moving towards the fourth economic pillar, namely financial services and international banking, following the privatization of the banking sector. In the wake of the fall of the Lehman Brothers investment bank in 2008, the Icelandic financial system collapsed in the beginning of October in the same year. All the major financial institutions defaulted. Almost overnight, this resourceful republic was threatened with going the same way as the ruined financial system. The Prime Minister, Geir Haarde, addressed his shocked nation in a broadcast speech[2] on 6th October 2008: *"There [was] a very real danger, fellow citizens, that the Icelandic economy, in the worst case, could be sucked with the banks into the whirlpool and the result could have been national bankruptcy*" (Haarde, 2008). National bankruptcy was prevented by the intervention of the International Monetary Fund (IMF), which arranged a string of currency loans to ensure that Iceland could honour its minimal obligations and restructure the financial system.

The aftermath has been difficult for Iceland and the Icelandic people will suffer from the consequences of the financial collapse for a long time. In 2007, the country's debt as ratio of GDP was 43.7%. In 2013, this ratio had increased to 109% (Hagstofan, 2014). A special force major bill was imposed on 6th October 2008 permitting the government to intervene almost at will to react to the collapse in the attempt to *"adapt the banking system to Icelandic circumstances and rebuild the trust of foreign operators in Icelandic banking and financial operations"* (Haarde, 2008). One of the many consequences is that still today (January 2015) major foreign investments are locked within a

[1] In 2013, 79% of Iceland´s export value and 61% of imports came from countries within the European Union (Hagstofan 2013).

[2] This speech is sometimes referred to as the "God save Iceland "speech as the Prime Minister closed with those words.

financial embargo as Iceland does not possess the currency to pay out to those who had invested in Icelandic securities. We will not elaborate further on the many dire economic consequences, but instead focus mainly on the aftermath in the context of governance and management disciplines.

## 1.2 The interest for reforms

The Icelandic public felt let down both by the politicians and the people controlling the financial sector. This led to public uproar in the aftermath of the meltdown of the financial system. Iceland, normally a peaceful country, changed into an unstable and aggressive environment. People protested and attacked the House of Parliament (Althingi) in unprecedented anger and frustration (Sveinsson, 2013). On top of the financial crisis, Iceland had to deal with a political crisis as the government was basically forced to resign in the wake of the public's outrage. Mistrust of politicians was almost complete. Even today, politicians score very low with the Icelandic public (Hardarson, 2014). When matters settled down in Iceland the reform process began with action taken to bring justice the people allegedly responsible for the situation and an attempt to understand how things could have gone so terribly wrong in a developed country. A number of people from the financial sector were accused, brought to trial and some have been convicted of financial crimes (see, for example, Financial Times, (2013)). Perhaps the single, most dramatic activity was when the (then) Prime Minister of Iceland was brought before a *Supreme Court* and found guilty of complacency (Landsdomur, 2011). The Prime Minister was the first individual in the history of the Republic of Iceland to be brought to justice in this way and so his conviction can be considered to be an extremely rare event. Trials of bankers and other stakeholders are ongoing at the time of writing and will last for years.

Many Icelanders saw the crisis as a chance to reform and improve. A noticeable event has been the writing of a new constitution (Althingi, 2010) by activating the Icelandic public via a management process (crowd sourcing) where over one thousand individuals worked in groups on the constitutional principles (Stjornlagarad, 2010). The process culminated in a national referendum on the context of the new constitution prior to submitting the approved draft to the legislative authority.[3]

Reforms cannot happen without understanding the problem and the newly-elected parliament[4] showed its willingness to bring forward knowledge of what went wrong by arranging detailed research on the most critical aspects. The most comprehensive work is the nine volumes of the *Report of the Special Investigation Commission* (Hreinsson et al., 2010). This report, SIC, was requested to clarify and explain the rise and fall of the Icelandic banking system prior to its collapse. In short, the SIC report is a cry for improvement on how decisions are made and on the management integrity of the governmental system. Two other substantial reports have been published on behalf of the Icelandic parliament: the investigation of a public finance fund (RNA, 2013) and the savings deposit system (RNA, 2014). Both reports are extremely critical of public governance. In addition, reports of investigations regarding some important companies have been published (see, for example, the report on a public energy company (OR, 2012) and the report on a financial institution (SPKef, 2013)).

[3] The new constitution process later came to a halt when a new government came to power after the 2013 parliamentary election.

[4] This refers to the parliament elected in January 2009.

The aforementioned investigative reports make clear that there was a failure of governance in the lead up to the crisis. There is even evidence that informalities and the flexibility that comes with a soft governance system were openly discussed, for example by the President, as an asset not a liability (Nordal, 2014). Surprisingly little is known of the state of Icelandic governance outside the analysis of the financial system failure. It is, however, worth naming the work of Kristinsson (1999, 2001 and 2013) and Kristmundsson (2003), although these studies primarily cover weaknesses in the political hierarchy and not management issues, for example, if the governance functions were effective and efficient. Nordal (2014) investigated accountability, responsibility and the decision-making of various stakeholders based on the interplay described in the SIC report. The main conclusion was that, from an ethical standpoint, a clear procedure of accountability and clear functional awareness is needed to promote public institutions. Vaiman et al. (2011) investigated corruption as a potential contributor to the collapse and concluded that a weak business culture prevented the government from acting appropriately on questionable business practices. Studies exist therefore on ethics, social reforms, political rationality, lack of accountability and policy shaping. No major studies of the technical function of the Icelandic governance on corporate level can be detected from literature searches and certainly none that covers reforms on the managerial level following the economic collapse in 2008.

## 1.3 The wider context

Principles and processes may well differ from country to country but it is reasonable to assume that a detailed conceptual framework will reduce the risk of corrupt, unrealistic and overoptimistic forecasts when public capital is invested. The official procedural guidelines on how to manage and control public capital projects are important source documents as they set the standards for decision makers, planners, consultants and other stakeholders involved in the lifecycle of a public project. Countries that have similar governance ideology to Iceland usually emphasize the use of best practice to ensure quality assurance. Norway and the UK can be given as examples of countries that define how the process connecting the market and the government is supposed to work in favour of the public (Klakegg et al, 2008). Norway and the UK were selected for comparison for particular reasons. Iceland is by far the smallest of the three with a population just exceeding 300,000. Norway is a Scandinavian country with a governmental and legislative background almost identical to Iceland and a population of 5 million. The United Kingdom has a population of 63 million. The UK is also the second largest importer of Icelandic products (Hagstofan, 2013) and British influence on Icelandic business life and attitudes is significant. Williams et al. (2009) and Klakegg et al. (2008) investigated public governance principles in Norway and the UK and found both clear similarities and differences between them (see Chapter 4.3.2). In Iceland, the will of the government regarding the arrangement of public projects is stated in the words of the (then) Finance Minister when he proposed new legislation in 2001: *"[the] objective of this legislation [was] to ensure optimal use of capital invested in public projects"* [5] (Haarde, 2001).

One of the interesting attributions to the general management disciplines is the psychological/cognitive factor. Behavioural sciences add an important dimension to understanding problems in managing the project lifecycle. In particular, cognitive biases can influence decision-making and therefore have the potential to impact the value for money that the public, as taxpayer, receives from investment in a capital project. Cognitive biases can result in what are called *planning*

[5] Translation by author

*fallacies* and should be taken account of in decision-making (Kahneman and Tversky, 1974). Another factor is embedded in the system where the decision maker's self-interests and agenda do not conform to the interests of the whole. It might be interesting to see if, for example, risk awareness among parliamentarians and the risk of public projects align six years after the financial collapse.

The SIC report focuses primarily on the interface between the financial system and the government and offers explanations and clarifications on how and why things went so wrong. However, it is worth mentioning that in one of the appendices to the SIC report, some of the social and psychological factors that arguably impacted public governance and which led to reckless behaviour are discussed and put into the context of what is generally known as cognitive biases. It is stated that politicians and other stakeholders were victims of planning fallacies and misconceptions that ultimately led to moral hazards and flawed governance (Thorisdottir, 2009:277-280).

## 1.4 Statement of the problem

In light of the framework described in the beginning of this chapter, we can state that there is a demand for reforms in Iceland. A big effort has been made to understand the political and attitude based causes that led to the financial crisis that precipitated the collapse of the Icelandic economy in October 2008 and which led to a serious political and economic crisis. The root causes point towards flawed governance and mismanagement. However, little is known about the quality of governance in other parts of the Icelandic public system. In this study, we chose to focus on public projects as a research topic. The reason is primarily that projects are more transparent than functions. Functions are ongoing activities, while projects have a defined lifecycle, a plan and budget that make them more accessible for research. We also know that public projects are frequently criticized publicly on various grounds. It can therefore be assumed that the institutional problem described in volume 8 of the SIC report as *"(...) extensive, embedded and systematic"* (Hreinsson et al., 2010:243) also impacts the governance of public projects.

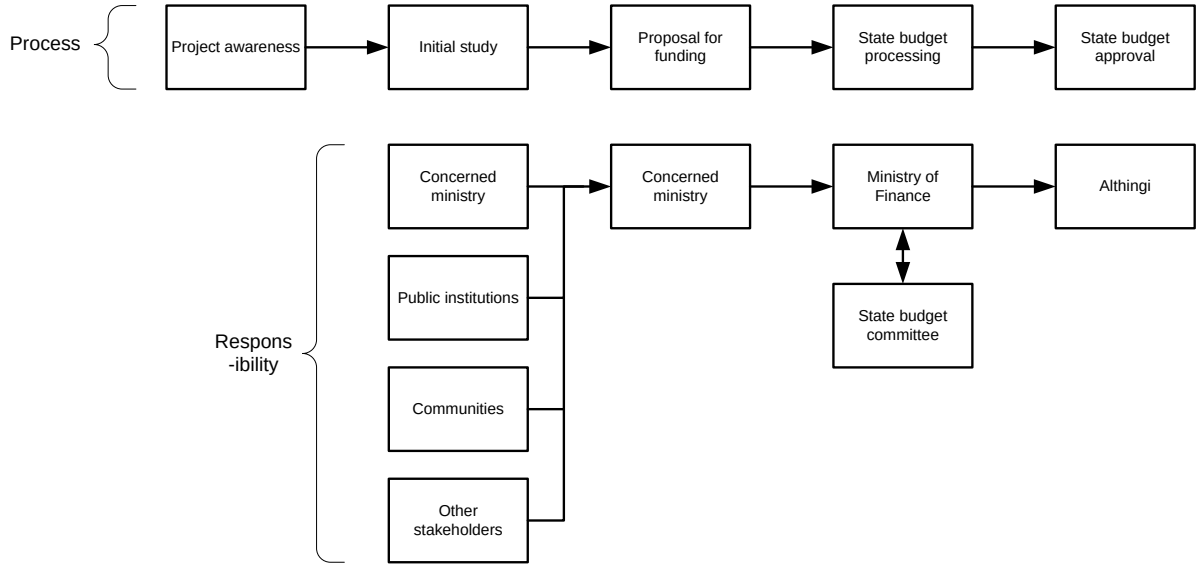
## 1.5 The path from awareness to project

Since the financial collapse in 2008, there have been relatively few major public projects in Iceland. Exceptions include a concert and conference centre in Reykjavik, a ferry harbour on the south coast of Iceland, a conception phase of a new national hospital in Reykjavik and some two roadtunnel projects on the north coast. These projects have been openly criticized before and after their execution. Criticism includes cost overruns (Blondal, 2013), operational dysfunction (Siglingastofnun, 2011), overly optimistic cost projections, ignoring past experience (Olafsdottir, 2012) and risks outweighing public interests (Gretarsdottir, 2012). This criticism is arguably rooted in the allegation that public projects in Iceland have abnormal problems as a rule rather than as an exception. Large projects that have been finished and delivered just before and post the financial collapse do suggest a problem. One project had a 300% cost overrun (Iceland National Office, 2012), another 170% (Visir, 2010). It is difficult to find a large infrastructure project not suffering from cost overrun. The exemption is a ferry harbour that seems to have been on budget and on schedule but has, instead, suffered from operational problems and higher operational costs than projected (Gretarsson and Sigurdsson, 2013).

According to Icelandic law, public projects begin with a project idea or awareness of a project proposal. The idea is then subject to some initial study, usually within the respective ministry. Once the pre-study has been completed, the executive prepares a proposal for funding and, if the project

is considered feasible, it enters the state budget as a liability. This process is shown in figure 1. Beyond this stage, accountability for the project is anchored in the Ministry of Finance or other concerned ministry. As a rule, accountability is transferred to a public institution or a public agency via a contract at this stage (Althingi, 2001: article 6).

**Figure 1. The path from awareness to approval for public projects in Iceland.**




The legislation outlines the government's goals regarding the conception, planning and execution of public projects. The law notes that the Minister of Finance will issue further guidelines for planning and other procedural work in connection with projects. The official guideline on the methods and procedures to apply in this case is the *Public Procedure Policy on Conception, Planning and Implementation of Public Projects* (PPC) for the pre-study, planning and execution of public projects in Iceland (Ministry of Finance, 2002). The PPC is used by the Government Construction Contracting Agency (GCCA), which is named in the legislature as the control agency. It can therefore be said that the government's strategy on how to conceive and manage a public project is outlined in law and the PPC.

### 1.5.1 Is there a problem?

Earlier work examined project close out reports from the GCCA (Fridgeirsson, 2009). The agency has the aim of being *"pioneering in [the] management of public construction projects"* (GCCA, 2015) and has, among other duties, the responsibility for controlling public projects. The close out reports revealed that more than 70% of completed projects had cost overruns. This provided the motivation to undertake further research on the scale and nature of the problem covered by this thesis.

## 1.6 Aim and objectives

The aim of this research is to investigate the position and quality of the procedural and methodological framework for Icelandic public projects compared with international developments and best practice.

### 1.6.1 Research objectives

The objectives are as follows.

1. Ascertain if the method for determining the feasibility of a proposed public project in Iceland is consistent with best practice.
2. Evaluate the procedural/methodological framework concerning the arrangement of public projects and compare it with international standards and legislation found in other countries.
3. Determine if cost overruns are, indeed, a problem for public projects and, if so, identify the reasons.
4. Investigate if the technique of reference class forecasting can improve cost forecasting by examining practices in an example public agency.

### 1.6.2 Research questions

The objectives have been pursued in a number of ways, but primarily through interrelated studies.

**Study I: The Feasibility of Public Projects in Iceland**. Do the arrangements for a feasibility study on public projects in Iceland align with current best practice?

**Study II: Benchmarking study of Icelandic and international planning and decision procedures on projects.** Are Icelandic sets of standards regarding the conception, planning and management of public projects comparable with Norwegian, UK and other international standards?

**Study III: Does the perceived risk attitude among Icelandic decision makers correlate with the reality of cost overruns?** As cost overruns are frequent in public projects, are parliamentarians aware of their behaviour when facing different probable cost overruns for projects?

**Study IV: Prerequisites and decision-making procedures on an Icelandic public project compared with Norwegian standards.** Is the due diligence process in Iceland concerning the conception of an individual project comparable with Norwegian standards?

**Study V: Reference class forecasting in Icelandic transport infrastructure projects**. Can reference class forecasting improve forecasting accuracy?

### 1.6.3 Hypothesis

Persistent cost overruns in Icelandic public projects can be traced to the lack of governance in the form of inadequate sets of standards, limited risk awareness among decision makers and limited compliance with best practice in project management.

### 1.6.4 Limitations

The scope of the research is limited to understanding if cost overruns and other problems troubling public projects in Iceland can be explained by lack of project governance and standards to frame and define the project concept. Other researchers and investigators have studied how Icelandic governance failed in the lead up to the financial crisis and the moral hazard that arose as a result of soft and informal governance (see for example, (Nordal, 2014) and (Kristinsson, 2013)).

The research is limited to the realms of project management governance as defined by Müller (2012), international sets of standards and best practice. It does not deal with transaction cost economics (TCE) or political science. This study is not concerned with individual mistakes or personal wrongdoings, but deals with the framework applied in Icelandic public projects as stated in the legislation supporting the arrangement of public projects.

## 1.7 Structure of thesis

The outline of the thesis is centred round interlinked research studies and questions in order to develop an understanding of the need and potential for improvement. This thesis builds progressively on an understanding of the causes of the problems identified earlier and which have set the objectives for the research.

**Chapter 1** discussed the background to the research and its purpose. The reader was reminded how the financial collapse in late October 2008 triggered demands for improvement and how the government reacted. The problem with which the research is concerned was outlined and supporting evidence of cost overruns was produced.

**Chapter 2** addresses the research methodology. The research is of an applied nature, where a number of research methods are used and these are adopted.

**Chapter 3** discusses the theoretical framework of the thesis. The reader receives information regarding the development of the main academic disciplines. The basic concepts of governance, project management and risk management are introduced and account is taken of how these disciplines have evolved and been enhanced by new ideas, frameworks and concepts.

**Chapter 4** is devoted to the empirical studies forming the backbone of this thesis. Five studies are described and the main findings are presented.

**Chapter 5** addresses the main findings of the research and discusses the question of how the governance of public projects can be improved. The chapter concludes with findings drawn from all the studies, which are combined into a holistic view of a resolution to the problem. The objectives and research questions are revisited and elaborated. Finally, suggestions for further research are presented.

# 2 Research methodology

## 2.1 Introduction

The research area for public projects from the viewpoint of managerial issues is a multidisciplinary challenge. There is a need for knowledge to verify the current state in Iceland and how it correlates with international practices, developments and trends. A range of topics has to be understood by applying elements from the natural and social/behavioural sciences. The design of the research covers inductive and deductive approaches. The ontological approach is closer to realism than relativism, meaning that a relatively large part of the research is qualitative rather than quantitative. The epistemology approach is both empirical and rational. In the thesis, a descriptive approach is used to establish reality and then to compare it with normative theory to determine if there might be a gap that would indicate problems. The methodological approach calls for pluralism in methods with some features from the natural sciences and others from social/behavioural sciences in an attempt to bring together the most appropriate from two worlds. This ultimately adds up to choosing between qualitative or quantitative methods. Critical realism has been adopted as the basis for the research strategy.

## 2.2 Research traditions

The position in ontology and epistemology has to be viewed in the light of the subject of the research being interdisciplinary. To understand the undercurrent impacting the public project lifecycle, a range of elements have to be applied using knowledge from both the natural and social/behavioural sciences. This approach is generally termed multi-strategy research design or mixed methods and has become popular (Robson, 2011:29). Earlier, Gibbons et al. (1994) suggested that traditional discipline-based approaches will be replaced by the interdisciplinary production of knowledge. In this research, the intention is to explain perspectives from different disciplines and mould them into a holistic portrait.

Ontology describes the assumptions we hold about the physical world and epistemology is the study of the nature of knowledge and thought (Jonassen, 1991). Ontology is the starting point for research after which one's epistemological and methodological positions follows Grix (2002). The two main positions are objectivism and constructivism (Jonassen, 1991). The former position assumes that certain phenomena have a meaning and existence independent of the people associated with the domain in question. A project and/or organization are, for example, made of structure such as roles, procedures and processes with which individuals must conform. The opposite is the constructivism position. In this perspective, an organization is constantly worked on by the people within the organization and is, therefore, subject to continual reshaping.

This brings us to the search for "truth". Objectivism seeks for the one correct answer while the constructivism position might argue that there is no truth but rather options to be considered. These theories of thinking and learning are therefore generally considered as extremes. Most theorists take positions somewhere in the middle of the continuum (Jonassen, 1991:57). Flyvbjerg (2001:139) claims there is a "pragmatic truth" dependent on acceptance or what we agree is the truth.

The main directions in epistemology are positivism, relativism and realism. Positivism was for years the standard philosophical view on natural science (Robson, 2011:20). The standard view is that the

purpose of science is to develop universal causal laws. Knowledge should mostly be gained from observation and quantitative data. Hypotheses are tested against scientific propositions based on facts.

Relativism is an offspring of the movement known as postmodernism (Robson, 2011). Relativism is based on the assumption that the topic under investigation is dependent upon some other aspect or element. Relativism seeks the general truth and rejects the idea that "truths" about the social world can be established by using natural science methods (Robson, 2011:16-17). The reasons are people and the central characteristics of humans. People, unlike objects, have ideas about the world and attach meanings and interpretation to events. It is believed that our cognitive biases prevent us from observing something objectively. There are therefore no absolute truths only particular frames of reference.

This leads us to the third direction namely realism. This is also named the pragmatism approach (Robson, 2011) and is almost "anti-philosophical" as it advocates getting on with the research rather than philosophising about ontology and epistemology. Some of the main features of realism are that there are no unquestionable foundations for science. Science should not place itself in an ivory tower, but allow theories to be created to explain the real world in a rational manner. The focus is on causes, mechanisms and structure not events and/or consequences (Robson, 2011).

Realism is an attractive choice for this research as it can provide a model of scientific explanations free of problems encountered in the positivist and relativist realms. In this research, no claims are made in regard to the "one and only truth" but rather elements of improvement that should raise awareness of the true state of nature. There is a problem that will not go away unless dealt with. The approach used in the research and reflected in this thesis is well suited to what is called *critical realism*. This holds that human behaviour can be plausibly constructed as causes. A causal mechanism, e.g. procedures, processes and knowledge base, can impact the attitude and behaviour of people. Agents in the system can be identified and the interplay between stakeholders can be investigated for compatibility.

## 2.3 Research design

The research design must reflect and cover the research questions. Each research question is dealt with by an independent study. Altogether the studies form a holistic view of the parameters contributing to cost overruns and other problems in public projects. The studies are the product of a more than seven-year period starting in 2007 when the Ministry of Finance was approached[6] and convinced enough to participate in a research program called *Improvement of the Public Project Lifecycle*. The scope of the research had to be radically altered following the financial collapse in 2008. Initially, the idea was to investigate public projects in an attempt to build a database that could serve as a risk management instrument in a country of prosperity and optimism. This changed to include elements of behavioural science and psychology to investigate governance and the response to criticism following the financial collapse and the political turmoil that ensued. This is placed in the context of development in project management and risk management in the international arena (see, for example, Winch and Maytoena (2012)).

[6] The then Minister of Finance, Arni Mathiesen, declared the determination of his office to assist if needed.

## 2.4 Research methods

The studies required the application of both quantitative and qualitative methods. The approach demanded significant document search and document analysis of records and cases accessible in archives and databases. In some cases quantitative surveys were applicable and, in others, direct structured interviews were more appropriate.

### 2.4.1 Interviews

Interviews work well in combination with a multi-method approach as in this research. There are many types of interview in research, from fully structured with fixed wording in a preset order to unstructured interviews with only some general area of interest whereafter the interviewer lets the conversation develop within the area. The interview techniques applied in this study was based on a fully structured interview supported by detailed questionnaire. The focus group was homogeneous as all participants were parliamentarians and members of groups with identical objectives. All interviews were one-on-one in the office of the participant.

### 2.4.2 Case studies

Case studies are widely used to investigate a particular contemporary phenomenon like a public project. It allows the use of multiple sources of evidence to understand the context being investigated (Robson, 2010:136). Case studies require a method for defining what will be investigated and rely on the collection of empirical evidence. The case usually occurs in a specific social and physical setting. A case study in this work was used to investigate the conception of the Vadlaheidar tunnel project based upon documentary analysis. The information obtained from the case study was essential to understanding the controversies surrounding the project; first, to connect with the evidence presented by several expert reports and, second, to enable a comparison with the equivalent Norwegian standards. A case study approach was also used to investigate compliance with best practice for a selection of six public projects.

### 2.4.3 Surveys

Surveys are arguably the most common method of research and are common in social/behavioural science. Surveys can be designed in a variety of ways and question formats. However, surveys work best if the questions are standardized (Robson, 2010). The survey design in this study is fixed. The sampling frame is critical and many of the most famous survey blunders are prone to statistical biases when the sample is not representative of the population. In this research, the first 70-100 companies in three sectors of industry in a published business archive were selected plus all the Icelandic parliamentarians. This is therefore a systematic or convenience sampling. A survey was used only once in the course of the research. The design was a self-completing questionnaire with structured response options.

### 2.4.4 Document analysis

The methodological approach is based on document analysis or, more specifically, comparative content analysis. As a part of documentary research, it has advantages over other methods – insofar as it is unobtrusive and non-reactive – and is a viable technique for making reliable, replicable and valid inferences (Robson, 2011). Documents can also be used for triangulation and for longitudinal studies. In this research, text based documents were systematically searched and analysed in an

attempt to find evidence of content in reports, administrative records, data archives, media articles and public protocols such as law text, directives and written procedures.

Documents in the public domain such as legislation, reports and articles in newspapers and magazines can be considered as important sources since they present official views and concepts. Documents were screened and put into context with the respective research questions and then rated on a numerical scale.

### 2.4.5 Quantitative data analysis

Empirical databases from ICERA were used to obtain information regarding actual costs and planned costs. To correct for inflation and economic fluctuation, indexes from Iceland Statistics (Hagstofan) were used. The quantitative data were used to form reference classes and to develop statistical distributions used to determine financial uplifts.

### 2.4.6 Literature reviews

Literature reviews were used to build the theoretical framework. In particular, they were used to cover the necessary knowledge areas and clarify concepts and ideas. These are also used to obtain the historical and logical relationships between governance, projects and risks and how the associated knowledge has evolved.

### 2.4.7 Overview of studies

Table 1 provides an overview of methods used in the following five studies forming the basis of this thesis.

- Study I: The Feasibility of Public Projects in Iceland.
- Study II: Benchmarking study of Icelandic and international planning and decision procedures on projects.
- Study III: Does the perceived risk attitude among Icelandic decision makers correlate with the reality of cost overruns?
- Study IV: Prerequisites and decision-making procedures on an Icelandic public project compared with Norwegian standards.
- Study V: Reference class forecasting in Icelandic transport infrastructure projects.

**Table 1. Overview of methods used in each study.**

| **Method** | Study 1 | Study 2 | Study 3 | Study 4 | Study 5 |
|---|---|---|---|---|---|
| Literature study | x | x | | x | |
| Document analysis | x | x | | x | |
| Surveys | | x | x | | |
| Case studies | x | | | x | |
| Data analysis | | x | x | | x |
| Theoretical analysis | x | x | x | | |
| Triangulation | x | x | x | x | |
| Interviews | | x | | | x |

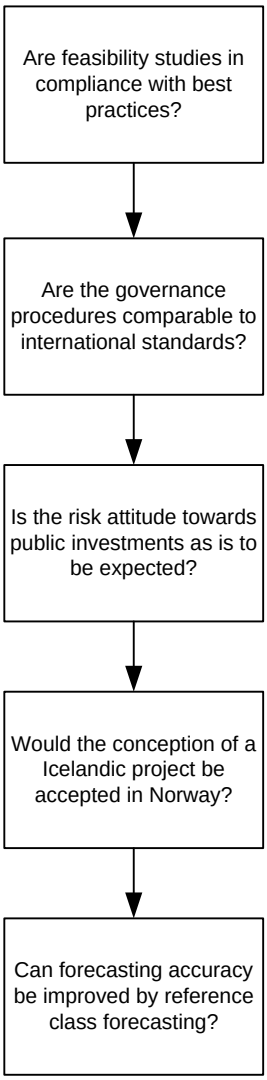
### 2.4.8 The order of research

The thesis reflects the following order. First, we examine the alignment of feasibility studies in Icelandic public projects with best practice as stated in Shen et al (2010) and Yun and Caldas (2009). The investigation of the feasibility of a public project is one of the few mandatory requirements stated in the Icelandic legislation concerning the arrangement of public projects. This study presents information about the gap between actual practice and best practice. The main research method was document analysis. Second, we investigated the formal governance framework within project management in Iceland. This was compared with mandated requirements in the UK and Norway and against the PMI's Project Management Body of Knowledge® (PMBOK®). This study provides overview of the gap between the set of mandated requirements in Iceland and those in the UK and Norway. The research method was primarily document analysis. Structured interviews were also conducted with 15 parliamentarians as part of this study. The results were not used in any publication, although presented in the thesis, and do contribute to the conclusions. Third, we investigated how parliamentarians perceived their attitude towards risk. A survey was designed as a self-completion questionnaire where the parliamentarians and three benchmark groups reflected on their attitude to a risky investment project. This is quantitative research, where the results would be expected to indicate the state of realism among public decision makers compared to decision makers within the private sector. Fourth, we attempted to determine if a large Icelandic infrastructure project would have been promoted had it been introduced in Norway and had undergone Norwegian due diligence. The information sources were the evidence presented at the go/no-go decision stage compared to Norwegian minimum requirements. This research was designed as a mixed study, where the Icelandic project was analysed as a case study. The results from the analysis were compared to a list of criteria obtained by documentary analysis. The fifth and the last study is a quantitative analysis of

empirical data which was used to establish an improved forecasting method for a public organization.

In a nutshell, the research design involved, first, determining if a particular method of due diligence was applied to Icelandic projects. If the study exposed a gap between the Icelandic practice and best practice that gave sufficient reason to investigate the governance framework in Iceland and to determine how it compares internationally. This led to the third study aimed at investigating if the perceived risk attitude of Icelandic parliamentarians correlates with what seems to be the reality in terms of cost overruns on Icelandic public projects. Last, we investigated if one of the proposed remedies for overoptimistic forecasting could be applied with some expectation of success within the public organization responsible for the majority of infrastructure projects in Iceland.

**Figure 2. The sequential flow of the thesis.**



## 2.5 Conclusion

This research is an applied research addressing managerial issues in context of public projects. The problems presented by the research required different research methods as the study is positioned in the domain of realism as a research tradition.

The selection of mixed methods made it possible to investigate media material, design and planning documents, legislation and directives and theoretical papers to serve the aim and objectives of the research.

# 3 Theoretical framework

## 3.1 Introduction

The theoretical framework of project management and risk management acknowledges the evolution of these disciplines towards the behavioural sciences. The importance of projects as a management form is highy significant (Morris, 2012) and the managerial development of projects has expanded the project lifecycle to include strategic issues (see, for example, Jugdev and Müller (2005) and Ingason and Jonasson (2009)). The relationship between project management and risk management is evident in the role of cognitive biases in decision-making and project conception (Winch and Mayotena, 2012). The context of this research is the governance of public projects from the standpoint of the risk of cost overruns due to mismanagement.

It is appropriate to examine the view of the World Bank on governance and mismanagement of projects.

*"The Bank´s experience has also shown that when programs and projects appear technically sound but fail to deliver results, the reasons are sometimes attributable to weak institutions, lack of adequate legal framework, damaging discretionary interventions, uncertain and variable policy frameworks and a closed decision-making process which increases risk of corruption and waste (...) good governance is central to creating and sustaining an environment which fosters strong and equitable environment to sound economic policies"* (World Bank. 1991:i-ii).

With respect to public projects, the role of government is essential in providing rules to ensure that the market works efficiently. In the first place, it is a matter of providing rules and, second, to make corrective interventions if the market fails (McLean, 1987: 19-21). The theoretical framework discussed in this chapter is the wedding of *governance* and the disciplines of *project management* and *risk management* in the context of public projects.

## 3.2 Governance

The motivation for governance is to optimize the cost for society to create value for the citizens. However, this comes with a problem if not accounted for. The problem is rooted in the agents that distribute the money collected from taxation and other state revenues. If they cannot be held accountable for their actions, uncertainty and risk within the system will increase. Thus, accountability, publicly-known rules and transparency are key elements of concern (World Bank, 1991).

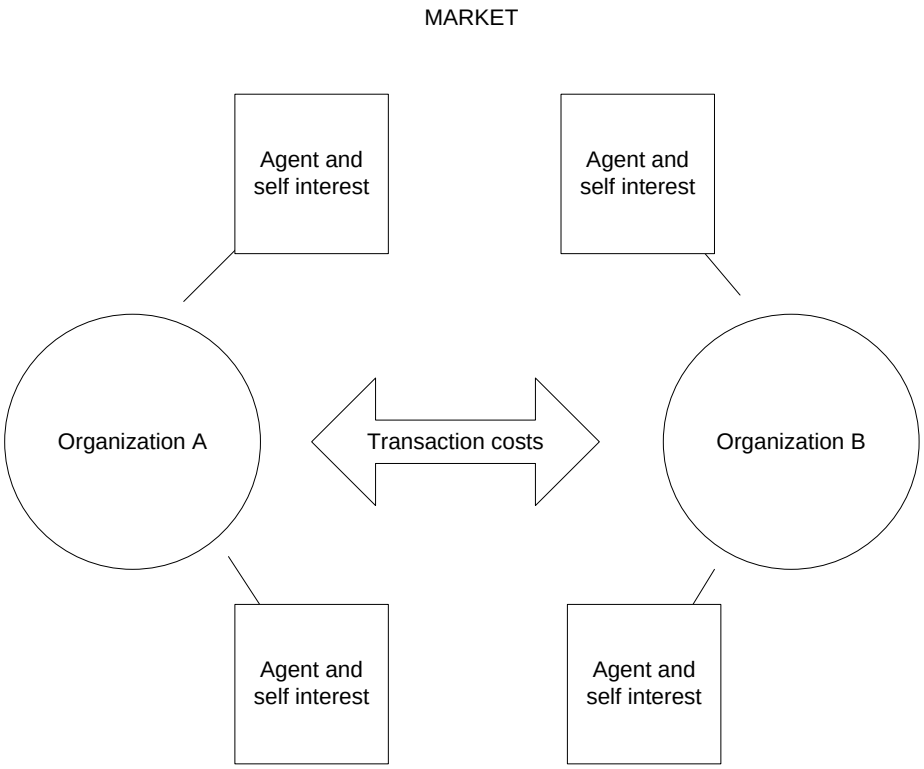
It is well documented in the aforementioned investigation reports (see for example Chapter 1.2.) and other articles (see Kristinsson (2013) and Nordal (2014)) that public governance failed in the lead up to the Icelandic crisis. It is worth revisiting the definition of governance. The OECD (2005:16) define public governanceas *"the formal and informal arrangements that determine how public decisions are made and how public actions are carried out, from the perspective of maintaining a country's constitutional values in the face of changing problems, actors and environments"*.

The criticism in Iceland had primarily been directed towards the interface between politicians and investment bankers, inefficient work procedures, mismanagement and the lack of surveillance and control mechanisms to guard public interests, resulting in inefficiency and moral hazard (see, for

example,  Nordal (2014) and, Kristinsson (2013)). In this research and hence this thesis, the research focus is mostly lower in the governance hierarchy, namely on the corporate governance level.

OECD has defined corporate governance *as "a set of relationships between a company's management, its board, its shareholders and other stakeholders. Corporate governance also provides the structure through which the objectives of the company are set, and the means of attaining those objectives and monitoring performance are determined*" (OECD, 2004:11). The challenges of governance are, for example, explained by *agency theory*. This theory explains the relationship between principals (e.g. shareholders and tax-payers) and agents (e.g. executives, decision makers and parliamentarians) in business. Agency theory is concerned with resolving problems that can exist in agency relationships. The two problems that agency theory addresses are: (1) the problems that arise when the desires or goals of the principal and agent are in conflict, and the principal is unable to verify what the agent is actually doing; and (2) the problems that arise when the principal and agent have different attitudes towards risk. Because of different risk attitude, the principal and agent might each be inclined to have different views on decisions to be made and the actions to take (see, for example, Müller (2012) and Eisenhardt (1989)).

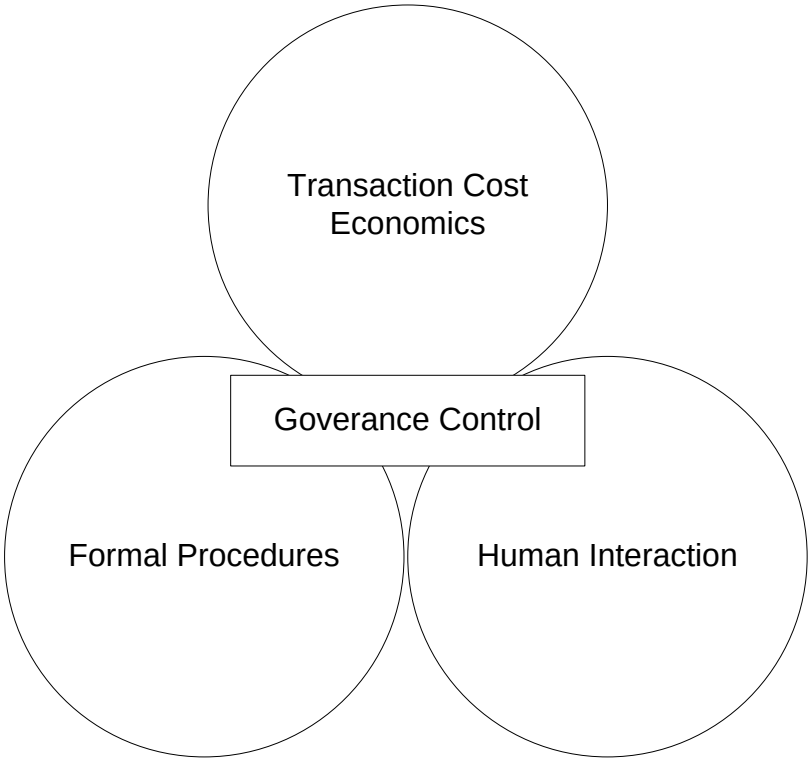
**Figure 3. The primary role of governance in optimizing transaction costs.**




Governance is aimed at transferring resources as frictionlessly as possible in the value chain. Porter (1985) defines a value chain as a chain of activities that a firm operating in a specific industry performs in order to deliver a valuable product or service for the market. The placement of governance in the value chain is theoretically called optimizing the transaction cost when goods and services exchange stages in a process as figure 3 illustrates. The term was introduced by Commons (1931), but the best known theoretical framework is arguably developed by Coase (1937) in his seminal work *Nature of the Firm*, when explaining the interface between the market and the

organization. One of the alleged problems might be that individuals in the value chain have only partially overlapping goals. Taxpayers would arguably claim that their financial contribution to society should be invested as wisely as possible. The politician would probably claim the same view, but might act differently. His/her self-interest might lie in ensuring re-election by promoting projects to attract voters in his/her constituency but with little importance for the whole. This is sometimes referred to as *strategic misrepresentation*. Jones and Euske (1991:437) defined this phenomenon in the public domain thus: *"[strategic] misrepresentation is the planned, systematic distortion or misstatement of fact, lying, in response to incentives in the budget process"*.

**Figure 4. Governance control system from the viewpoint of transaction cost economics, procedures and human interactions.**



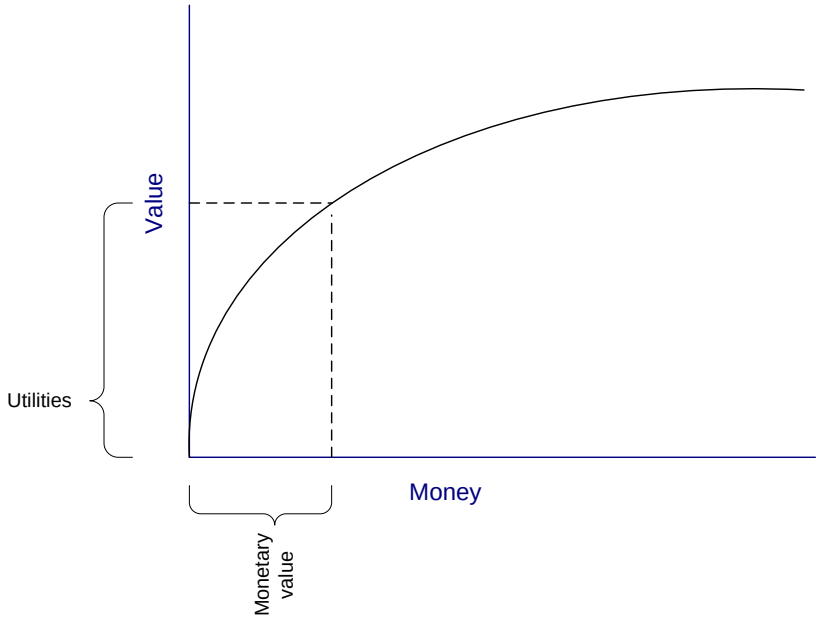

Governance must therefore be based on trust and control. Barnard (1968:42-43) describes the problem as *"a formal system of cooperation [that] requires an objective, a purpose, an aim (...) it is important to note the complete distinction between the aim of a cooperative effort and that of an individual"*.

### 3.2.1 The development of governance

Governance thus requires procedures and sets of standards or, simply, a certain degree of bureaucracy defining how stakeholders are supposed to act. Conformity is necessary so all stakeholders understand the requirements and how performance is to be measured. An interesting addition to this was introduced by Ouchi (1978) through the use of behavioural science to implement controls in organizations. Governance is therefore not only economic transactions within an effective market and procedural structure, but also understanding social behaviour (see figure 4) which moves us to what is called a cognitive approach.

The expected utility theory (EU) is derived from the work of Von Neumann and Morgenstern (1944). The fundamental principle is that the rational decision maker can clearly distinguish between options by combining the probability of an event and the impact of the outcome. Risk attitude is usually described by the shape of the person's utility function derived from how the person chooses between options (Weber et al., 2002). The terms of being risk averse, risk neutral and risk seeking refer to the curvature of the expected utility function (see figure 5).

**Figure 5. A utility function (convex curve) indicating a risk averse decision maker (a concave curve would indicate a risk tolerant decison maker).**




The expected utility theory is a useful normative approach, but there is a catch. The problem is the decision maker's inability to make accurate assumptions from probabilistic data and rank the options. This has for example been verified by Schoemaker (1982) and, not the least, by Kahneman and Tversky (1974; 1979). With ingeniously arranged tests, Kahneman and Tversky demonstrated several cases where people violated the expected utility assumptions. They argued that people apply mental rules, *heuristics*, to simplify the complex task of assessing probabilities and predicting values. Decisions are made on the basis of how easily events are brought to mind rather than utilizing statistical evidence; in other words, what is typical rather than the law of small numbers or statistical independence of events and how the data are then interpreted. Although useful in practice, heuristics can lead to judgmental errors as Kahneman and Tversky (1974; 1979) noted in their work on judgment and uncertainty. According to Gilovich et al. (2002) and Kahneman et al. (1982), even when decision makers know the situation they make inferential errors. The research indicated four fundamental heuristics that impact our ability to validate data and scenarios. These heuristics are called *representativeness*, *availability*, *anchoring* and *framing*. To use examples of how these heuristics work in practice, we could say that: (1) *representativeness* describes the tendency to ignore the statistics of small samples; (2) *availability* describes how we base probability estimates on recent events rather than empirical sources; (3) *anchoring* describes how our first estimate anchors our future estimate as we will base our forecasting deviation on the original estimate rather than

new information; and (4) *framing* describes how the presentation of information can impact our judgment stronger than the context of the information (Winch and Maytorena, 2012).

It also seems that even though people realize that their earlier prediction was highly optimistic, they are convinced that their present assumption is realistic (Buehler et al., 1994). Cognitive bias and the pattern of deviation in judgment that occurs in particular situations can lead to *planning fallacies*, resulting in overoptimistic forecasting which increases transaction costs in the value chain.

These theories can contribute to more efficient transactions in governance as they explain the human mind in an easily understood way that leads to the problem of cost overruns and other well-known problems in projects.

Cost underestimation, benefit overestimation and general forecasting errors are recognized problems in projects. Flyvbjerg et al. (2009) offers two explanations which he calls *deception* and *delusion*. Delusion, or *optimism bias* as this phenomenon is also named, is the situation when decisions are based on belief rather than rational calculations. The decision maker primarily remembers success not problems. Problems and risks are considered unique and will not recur in the new project. The decision maker does not see the holistic picture, but instead selects positive and favourable arguments in spite of empirical evidence pointing in a different direction. A number of tests verify this condition (see, for example, Lovallo and Kahneman, 1994: Buehler et al., 1994; Buehler et al., 1997; Newby-Clark et al., 2002).

### 3.2.2 Governance and NPM

Klijn (2012) has established an interesting connection between governance and what is called *New Public Management* (NPM). The latter was a response to the assumption that politicians are inherently venal and likely to abuse their authority to enrich themselves and their friends leading to high-cost, low quality products (Hood, 1995). One of the doctrines for ensuring public interest via NPM is the use of an elaborate structure of procedural rules designed to guarantee integrity, transparency and professional service to the public. This makes sense as it is impossible to manage without reference to a conceptual set of rules to form a governance framework. Only what we know can be managed and controlled.

Bevir et al. (2003) referred to NPM as a focus on management over policy. They emphasised the necessity of performance appraisal and efficiency as a consequence of fiscal pressures, determination to redraw the boundaries of the state, increased international regulation due to trends in geopolitics, public expectations of government performance, international management fashion and improvements in information technology. In a similar vein, Bovaird and Löffler (2003:316) noted that NPM *"is about ensuring that the outcomes are right"* and, furthermore, that one of two criteria for *"good governance"* is *"implementation by all stakeholders of a set of principles and processes by means of which appropriate public policies will be designed and put into practice"*. This indicated strong bonds to how OECD defines governance as noted earlier.

Over the last two decades, a change can be seen in the received doctrines of public accountability and administration (Winch, 2010). The rise of governance and NPM has also influenced project management as a discipline. Some notable signs of this advancement are the dramatic, manifold increase in the number of accredited project managers, the establishment of international institutes

serving project management and the creation of bodies of knowledge describing in detail the project management theoretical framework (Hodgson and Muzion, 2012:113).

## 3.3 Project management

Project management is traditionally defined as a product of the Cold War (Kerzner 2009:39). The so-called superpowers competed in an arms race to build weapons and other armaments. Large projects were planned and deployed in the USA to design bombers, ballistic missiles, submarines and weapons system. The problem was project forecasting which often proved to be inaccurate. Cost overruns in excess of 200-300% were not uncommon. The projects were often a complex interplay of a number of stakeholders: the military, government, public institutes, contractors and sub-contractors. The management of projects was, on the other hand, informal and on a case by case approach. In this period (≈1960), the idea of the organization was still based largely on the ideas related to Max Weber who found bureaucracy to be an ideal form for managing companies and the assumption that it defined the best way of doing things (Mommsen, 1992). The theory was founded on four pillars: division of labour, functional processes, structure and control (Van der Merwe, 2002). The focus was on increased production by applying two sets of organizational theories: first system theory, inspired by the work of the biologist Ludwig von Bertalanaffy (Kerzner, 2009); and, second, behavioural theory connecting organizations' success and well-being and job satisfaction of the employees (Kerzner, 2009).

Large projects with a lifecycle lasting many years and interdisciplinary and cross-functional activities were originally managed by functional managers and by a vertical management structure. This arrangement has obvious drawbacks in the context of forecasting and decision processing. The vertical structure of an organization is not suited to a holistic view of the project lifecycle. Forecasters lack the overview, accountability is unclear when the project shifts into a new phase, communication is cumbersome and numerous other reasons can be argued to make projects hard to manage within a functional management framework. It came therefore perhaps as a natural choice to implement ideas from the military in the form of a single point of contact for the project's interests. This was the invention of the project manager, a person mandated to take care of all activities related to the project.

### 3.3.1 From projects to governance

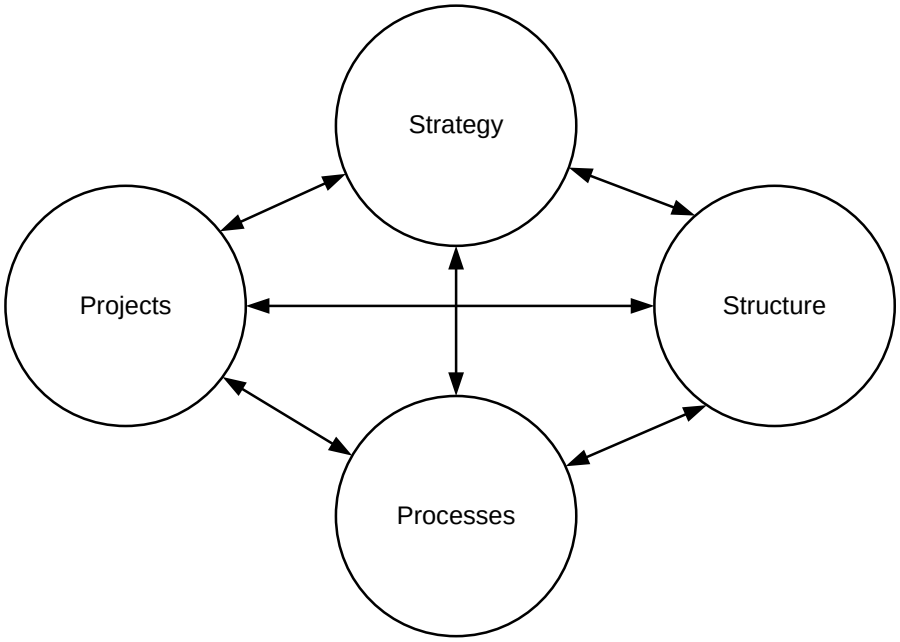
Project management was therefore initially introduced to create an interface between the diverse functions and activities needed to carry out military research and manufacturing projects. Methods were standardized out of necessity for conformity between the many contractors and sub-contractors working on the projects and for the government. This included defining the project lifecycle, planning methods and control procedures. The success criteria were called the *iron triangle* (Atkinson, 1999) and this definition of project success is still found in many textbooks on project management. The exact time when project management was born as a management form is debatable. Kerzner (2009:494) states that in 1958, there was a move away from simple concepts such as Gantt charts and work breakdown structures (WBS) towards more scientifically-based techniques as the critical path method (CPM), program evaluation and review technique (PERT) and earned value analysis (EV).

In the early days, industry failed to see value in project management. The emphasis was on productivity and project management simply added to administration costs. However, as executives in search of management techniques better suited to a changing environment discovered project management, interest grew steadily. Hammer and Champy (1993) further stimulated interest in ways

by which industry could modernize through their promotion of business process re-engineering. The core in the re-engineering approach is to align business strategy to customer satisfaction. Organizational structures were rapidly changed to match new strategies and processes, but there were obstacles that bear a strong resemblance to the present situation in Icelandic public projects, namely scarcity of accountability, knowledge base and a strategic process.

According to Van der Merwe (2002), the pillars of the organization are strategy, structure, processes and projects (see figure 6). Strategy is the chain of deciding what to do, setting objectives and goals, crafting a tactical plan to achieve the objectives, implementing the plan and controlling it. Strategy is to ensure the efficiency of the organization and/or project. Structure is the organizational hierarchy that helps to define the roles, authorities and the differentiation of tasks. Processes are the cross-functional steps required to produce some results. Structure and processes are to ensure the effectiveness of the organization. Projects are the temporary alignment of strategy, structure, processes and resources to create a unique product or service.

**Figure 6. The pillars of project management (Van der Merwe, 2002).**




The criticism of the lack of governance is interesting and can be examined against the measures of performance for a project, namely cost, time and quality, often referred to as the iron triangle as noted earlier (Atkinson, 1999). In this way, these measures might be considered as a means for judging project success, although this will depend on how success is defined for the project in question. The iron triangle is also used as a basis for measuring team performance on projects (Kandelousi and Abdollahi, 2011). The criteria for judging the success of a project have expanded to include strategic and tactical issues such as how effective the project will be post-execution. Jugdev and Müller (2005) identified, in chronological order, how the project management literature has evolved from being primarily concerned with the implementation of projects to include issues such as client expectations and strategic value. They claim that the 21$^{st}$ century is characterized by

strategic project management (Jugdev and Müller, 2005:23). Ingason and Jonasson (2009) mapped 18 categories of article keywords in 484 papers published in project management journals in the period from 2003 to 2008 and found strategic alignment to be one of the three dominant topics.

Projects are increasingly a part of a bigger picture that crosses processes and organizational units to manage core functions of a business and achieve success. Jugdev and Müller (2005:20) distinguished between project efficiency, being the effort to maximize output for a given level of input (resources), and project effectiveness being the achievement of the project's strategic goals and objectives.

### 3.3.2 Project management frameworks

NPM and emphasis on governance have impacted the international project management community. Part of this development is the issuing of detailed protocols in regard to project portfolios and project programs to connect strategy, tactics and operations. In the UK, the *Association for Project Management* (APM) has issued the *APM Body of Knowledge* – an up-to-date collection of topics that should be known to practitioners, academics and experts. However, APM body of knowledge is not a set of competencies or methods (APM, 2006). Detailed protocols in regard to projects and programs for coordinating strategy, tactics and operations via projects, programs and portfolios of projects can be found in the standards issued by the *Project Management Institute* (PMI). In particular, the PMI has issued standards on project portfolios (The *Project Portfolio Standard®*) which denote that a portfolio is a component collection of programs and projects to achieve strategic objectives (PMI, 2012). PMI also issues standards on project programs (*The Program Management Standard®*), providing guidance to manage multiple projects where the feasibility of a project is advertised as one of the keys to answer and verify the proposed direction (PMI, 2006:100). Furthermore, PMI issues standards on projects (*Project Management Body of Knowledge - PMBOK®*) (PMI, 2008). Although the Project Management Body of Knowledge® is mainly focused on the management techniques, tools and processes required for managing a project towards a successful outcome, the standard also emphasizes the role of projects in achieving a strategic plan and how projects, programs and portfolios interact (PMI, 2008: 8, 10). Both APM and PMI have grown rapidly on all fronts. In 1992, the number of members of APM was 5,000; in 2010, that number had increased to 17,500. In 2009, the number of members of PMI had rosen to more than 300,000 members in two decades (Hodgson and Muzio, 2012). The world's first project management association, *International Project Management Association* (IPMA) had, by the end of 2013, certified more than 194,000 certificants worldwide (IPMA, 2014).

This evolution has reinforced project management as a discipline with bodies of knowledge, accreditation bodies, professional associations and certification programs. This development is driven by the following:

- concerns for governance of projects in particular interest to improve accountability;
- emphasis on the strategic front end of projects;
- considerations of correct handling of options and alternatives; and
- interest in system dynamics for further interest in identifying how uncertainties can magnify interrelated events (Winch and Maytorena, 2012).

Flyvbjerg (2003) elaborate on cost overruns in the following way. As the evidence points towards cost overruns and late schedules why assume that all will go according to the plan? A more sensible approach would be to ask “what can go wrong?” indicating the importance of risk management in the context of project deployment.

### 3.3.3 Other developments in project management – Agile methods

*Agile-methods*, originally developed within the software industry, can, under certain conditions, be relevant in the management of a public project. *Scrum* is arguably the best known example in this category in Iceland. Instead of a detailed project lifecycle with focus on pre-defined objectives and plans, the emphasis is the project team and collaboration between project stakeholders. In this research, no evidence of the application of Agile-methods was found. However, it is worth mentioning that Agile-methods, such as Scrum, are gradually being modified and gaining success in other industries. The application of Agile-methods is, in particular, fruitful in situations where the objectives are clear but the solution not (Wysocki, 2014).

## 3.4 Risk management

When standard project management methods were defined, risk management was left out. It was around 1980 that the project management forum acknowledged formal risk procedures as part of the project management process (Morris, 2012). The first version of PMBOK® to include risk management as a knowledge area is from 1986 (Morris, 2012). The interest for the management of risk and uncertainty has gradually increased arguably due to the expansion of the project lifecycle to include strategic issues. Risk assessment should include both threats and opportunities thereby bringing consideration of opportunity, value and benefits to the table.

### 3.4.1 The concept of risk

Bernstein (1996) states the following.

*"The revolutionary idea that defines the boundary between modern times and the past is the mastery of risk: the notion that the future is more than whim of the gods and that men and women are not passive before nature (...) The transformation of attitude toward risk management unleashed by their achievement has channelled the human passion for games and wagering into economic growth, improved quality of life, and technological progress".*

Bernstein (1996) argues for risk and risk management being the metaphor for progress and evolution from the beginning of humanity. However, the scientific instruments were few and primitive in spite of the interest and awareness of their importance. Risk studies manifested as an academic field in the 18th century in England when the insurance business developed into a commercial business. Ship owners and mercantile traders insured the freight by paying the insurance company a premium. If the ship and the load were lost at sea the insured party was compensated for its loss (Bernstein, 1996).

### 3.4.2 The origin of a discipline

The giant leap in risk management is arguably in the year 1202 in form of the publication of *Liber Abaci* by Leonardo Pisano, better known as *Fibonaccy* (Bernstein, 1996). The publication introduces the wonders of the Hindu-Arabian numbering system opening a new world of possibilities for mathematicians. The next year hundreds saw great improvements to standardize methods aimed at calculate future events. Risk is obviously not what you know for certain but a metric regarding what you do not know for certain. Risk and uncertainty are therefore related as will be addressed later.

Risk management with formal methodological procedures originated in gambling where attitude toward risk is instrumental. The player constantly estimates his/her chances of winning or losing. The first scientific work on probabilities is *Liber de Ludo Alae* (The book on games of chance), which is reputed to have been written around 1564 (Hald, 2003) by the Italian mathematician and gambler Gerolamo Cardano[7]. The work of Cardano explained how to calculate the probabilities of particular outcomes in an outcome space of a fixed number of possible events, outcomes and combinations. Hundred years later two Frenchmen, Pierre Fermat and Blaise Pascal took the work of Cardano further and developed the foundation for modern probability calculations (Hald, 2003). The

[7] In this work the author primarly directs the focus on western knowledge evolution on risk. Remarkable studies on risk are found in other cultures some of them prior to the western studies.

probability of the occurrence of an event is the cornerstone of risk management. The classical approach to probability is what generally is called the objective or empirical probability:

$$P(A) = \text{number of events } A/\text{total number of events}$$

The probability of the event *A* occurring is the number of all possible events with the state of event, *A*, divided by the number of all events in the sample space. The axioms of probability will not be discussed in detail here as mathematical explanations fall outside the scope of this thesis.

The limitation of the classical approach to probability in the context of risk management is that the prediction of the outcome of a single event is based upon events that have already occurred, based on empirical evidence. However, risk is the uncertainty of events that have not yet materialized. Many possible events with different outcomes must be considered in the risk assessment, but the probability of occurrence varies. This is of immense importance in risk management. There are many possible outcomes in a forecast but each outcome is attached to a variance connected to the frequency of the outcome.

Abraham de Moivre provided risk analysts with perhaps the most important management tool of risk management. In *The Doctrine of Chances: or, a method of calculating the probabilities of events in play* (De Moivre, 1718), de Moivre introduces the first formula to determine the normal distribution curve. The normal distribution is a means for finding the probability of the occurrence of an error of a given size when that error is expressed in terms of the variability of the distribution as a unit, and was the first definition of the probility error calculation.

*Expected value* (or, where appropriate, *utility*) is the metric value of risk management. The highest (or lowest if the assessment is cost related) expected value of a risk assessment is the best option in a portfolio of options when all possible outcomes have been accounted for with weights (probabilities) indicating the chance of occurrence (uncertainty). A popular term today is to call possible outcomes *scenarios* which are basically the same topic.

### 3.4.3 The utility paradigm

A further fundamental contribution to risk management is generally credited to Daniel Bernoulli. As noted earlier, a decision maker must select the option accorded the highest (or lowest) expected value. Bernoulli observed that this is not always the case. People do not always behave as to maximize expected value. To demonstrate this principle, Bernoulli described a game known as the *St. Petersburg paradox* (Bernoulli, 1738).

To enter this game the player must pay an admittance fee. After the admittance fee has been accepted the game starts. A coin is tossed until the head comes up. The number of times, *n*, the tail side comes up before the head is used to calculate the return, *R*, by this function:

$$R(n) = 2^n$$

Bernoulli observed that the size of the sum was related to the wealth of the player. In a contemporary context, one Euro won by a wealthy player is less significant than one Euro to a poor man. Incremental positive amounts add incrementally less value as wealth is accumulated. This leads to the assumption that expected monetary values cannot be the only criterion in decision-making.

The attitude towards losses and gains must be considered and measured. This metric is called *utility* (plural *utilities*) and plays a major role in modern risk management.

Bernoulli concluded that the response to a change in wealth is inversely proportional to the initial wealth. The mathematical function for utility therefore frequently described as a logarithmic function with a financial value (certainty equivalent) attached to each utility. The shape of the curve describes the attitude to the risk. A function which grows with marginally lower monetary values for the attached utilities describes risk aversive attitude. The decision maker is not willing to risk more money than he gains in utilities. The opposite is to be risk seeking. A utility function describing a risk seeker would have marginally smaller utilities than monetary values (see also figure 5).

### 3.4.4 The utility of public projects

In small projects utility may not be significant. The decision makers may allow themselves to be neutral to risk or even take some financial risk. This cannot be the case in large public projects. First, the decision maker is not risking his/her private capital making it morally unjust not to make substantial adjustment for risk. Second, public projects are not always deployed for direct financial gains. Public projects are therefore difficult to measure with monetary metrics such as return on investment. Gains can instead be measured in expected utility presenting usefulness and satisfaction rather than expected value. However, the same basic methodology is applied.

The most significant use of risk analysis hitherto has been in military operations, insurance and finance. An important addition to the understanding of risk and human behaviour is the explanation of *regression to the mean* contributed by Francis Galton in the beginning of the last century (Galton, 1886). The first important work dealing strictly with risk and decision-making is *Risk, Uncertainty and Profit* (Knight, 1921). In his work Frank Knight makes a distinction between risk and uncertainty. Risk is a negative consequence. Uncertainty is not necessary negative. It is simply the cloud preventing us from seeing future events. Keynes (1936) published *General Theory of Employment, Interest and Money* an important milestone in understanding risk and uncertainty. Knight and Keynes primarily developed theories of economics in context of risk management in their pioneering work which largely falls outside the scope of this research.

The *expected utility theory* (EU), *game theory* and *decision theory* are directly relevant to the subject of this research in understanding how politicians and other stakeholders behave in terms of the conception of public projects and how decision models are constructed. Newman and Morgenstern (1944) developed EU when they published *Theory of Games and Economic Behaviour*. The Cold War provided a test bed for *Game Theory* with its equilibrium state. The general assumption is a zero sum game. One's gain is another's loss.

The decision maker builds a model by defining assumptions and options:

1. who are the decision makers?
2. what options are there?
3. what information do they possess?
4. what rules are valid?

EU theory assumes that decision makers are rational and make decisions to maximize own interests and can distinguish between two or more options. These are also drawbacks of EU theory. People are

not always rational and they do not always think about maximizing their own interests. Important improvements on the zero sum approach came from Nash, who introduced nonzero-games and Selten, who followed with sub-games[8] (Bernstein, 1996). It is also worth mentioning the work of Taleb (2007) on what he calls *black swan* events, i.e. extreme events with low probability and high impact. In fact, Taleb claims that the fundamentals of using probability distributions for estimating the impact of events on outcomes are idiosyncratic. This leads to what Taleb calls *ludic fallacy* for explaining the drawbacks of using the basic axioms of probability to estimate future uncertainty.

In spite of the limitations, EU theory is useful for understanding the games decision makers play in projects with objectives that are difficult to measure.

### 3.4.5 The introduction of risk management in projects

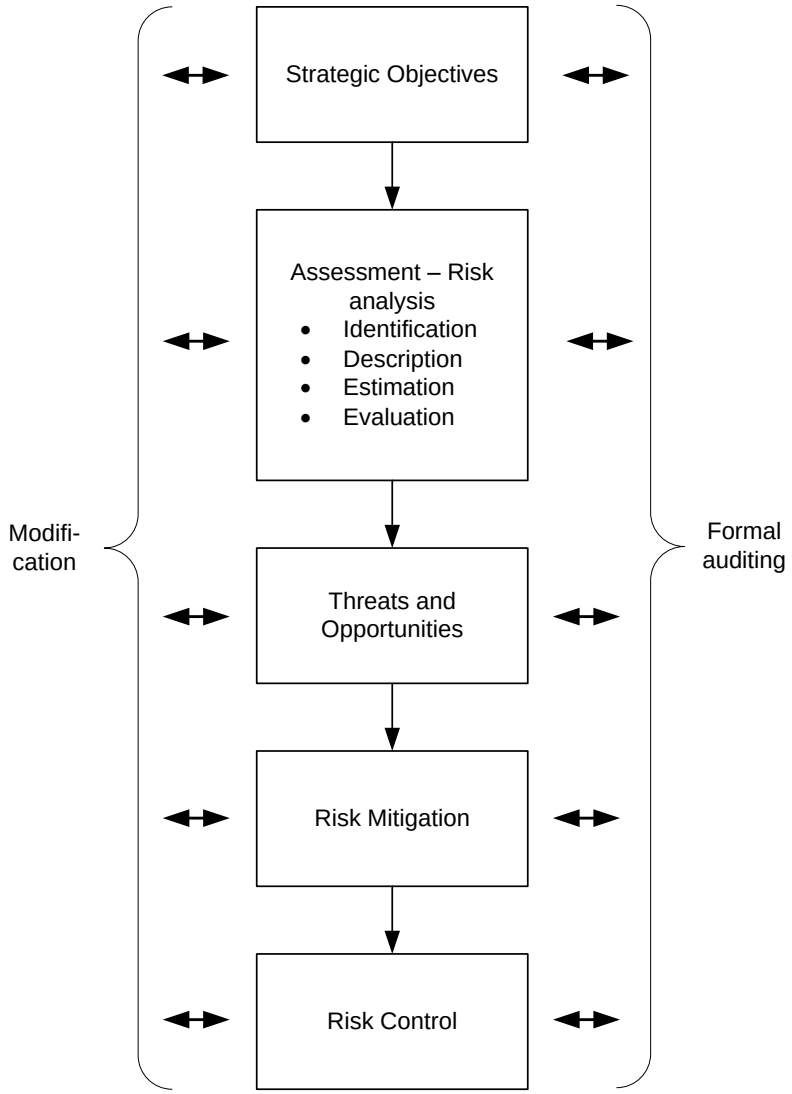
Risk management as a part of project management disciplines was introduced as a response to fierce competition that added pressure to the project lifecycle (Kerzner, 2009:742). Attempts to decentralize and increase flexibility limited the manoeuvring space of decision makers and planners. *"*Time to market*"* became essential and the need for preventive measures and methods to track, quantify and mitigate risk became important. In addition, there was an undercurrent that treated risk as a macro subject for the world. Anthony Giddens is said to have begun public lectures by posing the following question to his audience: *"What do the following have in common? Mad cow disease, the troubles at Lloyds Insurance, the Nick Leeson affair (at Barings Bank), genetically modified crops, global warming, the notion that red wine is good for you, anxieties about declining sperm counts?"* (Jarvis, 2009). The answer is that they are all about risk and how risk in diverse settings now dominates social, political and economic discourse if not the cultural mindset of late modern society itself. More specifically, the common thread in the above list relates to how technology and science is impacting our lives, creating risks and unintended consequences for the environment, our health and wellbeing.

Interest in risk management in the context of project management has increased as the contemporary project lifecycle also includes the decision stage where project strategy and tactics are laid out. The instruments of risk management are applied so the decision maker is more able to assess risk, quantify it and either mitigate the risk or manage it in a controlled way so it will not impact the decision, objectives and plans (see figure 7). Risk management and decision analysis have some similarities. There is, however, a distinction as decision analysis incorporates techniques from operation management e.g. decision trees and influence diagrams. There is also the difference that decision analysis is not specifically aimed at tracking and mitigating risk, but is used to decompose complicated problems into segments for analysis and a decision on the best course of action. In a way, it might be argued that decision analysis is a subset of risk management just as risk management is a subset of project management. It can also be argued that the order is opposite. However, in this case it is not important which comes first – the chicken or the egg. Together, these academic fields make a strong union to ensure professionalism in public projects.

[8] It is interesting how many Nobel laureates have studied Game Theory. *John G. Harsanyi*, *William Vickerey*, *James Mirrlees*, *George Akerlof*, *Michael Spence* and *Joseph Stiglitz* are all Nobel-prize winners and scholars of Game Theory.

This field of decision analysis was first introduced by Raiffa and Schlaifer (1961) and was originally mostly a mathematical discipline, but it has evolved into a useful method for industry and government. The core of the method is to help decision makers gain a greater understanding of the problems they face, both quantitatively and behaviourally, when selecting options under uncertainty.

**Figure 7. The Risk Management Process (adopted from Risk Management Standard (ISO/IEC (2002))).**




Certain types of project are notoriously prone to inaccurate cost forecasts. Flyvbjerg et al. (2002) reviewed 258 projects and found that nine out of ten suffered from a cost overrun (see also Chapter 4.6.1.). Jennings (2012:458) identifies three underlying factors contributing to the underestimation of cost for a large-scale project: the first is how risks and uncertainties are downgraded in the political and bureaucratic context; the second is the problem of decision-making under uncertainty leading to systematic biases; and, the third, are the complex technical challenges inherent in large-scale projects resulting in lack of management and administration.

### 3.4.6 The inclusion of the optimism bias and strategic misrepresentation in risk control

There is no simple explanation for under-performance in cost forecasting; however, at the most basic level, it can be grouped into three categories: technical, psychological and political (Flyvbjerg, 2006; 2011). Technical explanations cover inaccuracy in terms of project uncertainty, unreliable or out-dated data and the use of inappropriate forecasting models (Vanston and Vanston, 2004). These are often typical explanations, used by management, for under-performance against forecasts. However, if forecasting models and data are responsible for forecasting errors we would expect the difference between actual outcome and planned outcomes to be normally distributed. The differences should be either positive or negative numbers. This is not the case, because as stated earlier the difference is almost always in the direction of cost overrun (see, for example, Chapter 4.4.1. and Chapter 4.5.1.). The risk of cost overrun is therefore not a sole consequence of imperfect forecasting techniques. Psychological explanations describe inaccuracy in forecasting and the term is called *optimism bias*. Optimism bias is defined as *"the demonstrated systematic tendency for appraisers to be over-optimistic about key project parameters"* (HM Treasury, 2011). Circumstances are interpreted in favour of taking risks if the decision-maker is convinced that the rewards exceed the cost. In so doing, it provides decision-makers with an attractive argument to explain failed projects, i.e. they were taking reasonable risks. In other words, optimism bias occurs when planners fall into the trap that psychologists call the planning fallacy (Lovallo and Kahneman, 2003). Political explanations cover inaccuracy in terms of strategic misrepresentation, which occurs when forecasters and managers deliberately and strategically over-estimate the benefits and under-estimate the costs of a project in order to increase the probability of approval for funding (Flyvbjerg, 2005a; 2006).

Furthermore, planners might also see themselves in two distinct roles that are in contradiction with each other. On the one hand, planners are scientists who analyse data to provide the best solution for a problem. Conversely, planners are advocates who use data, models and methods to prove that a certain outcome is the best choice in a given situation. In the *AICP Code of Ethics and Professional Conduct* (APA, 2005a) one can see the conflict. The code states that planners must exercise independent professional judgment, but must also accept the decision of the client concerning the objectives and nature of a professional service (Wachs, 1989; 1990). The same paradox can be observed in the *Code of Ethics from the Icelandic Engineers Association* (VFI, 2011).

The situation when a planner is primarily focusing on the present project often results in extremely optimistic plans. This is called the *inside view* and the alternative is called the *outside view* (Lovallo and Kahneman, 2003). The outside view completely ignores the present project and instead examines past experiences on similar projects. The resulting forecast is usually much more accurate as the outside view bypasses cognitive and political biases such as over-optimism and strategic misrepresentation, and cuts directly to the outcomes (Lovallo and Kahneman, 2003). The outside view is also known as *reference class forecasting* (RCF).

RCF is a method for systematically taking an outside view when planning projects, by basing forecasts on the actual performance of comparable projects rather than focusing only on the project in hand. Originally, RCF was developed to compensate for the cognitive bias that Kahneman and Tversky (1974; 1979) discovered in their work on planning and decision-making under uncertainty. In short, their work demonstrated that human judgement is generally optimistic and over-confident with a tendency to under-estimate cost, completion times, and risk of planned actions, whilst over-

estimating benefits. RCF have since been used in number of countries to improve control and due diligence evaluation of project front-end preparation (Flyvbjerg, 2013).

The consequence of cognitive biases is unrealistic forecasts. Experts, e.g. statisticians, engineers or economists, and laypersons are systematically and predictably too optimistic about the time, costs and benefits of a decision. This planning fallacy (Kahneman and Tversky, 1979; Buehler et al., 1994) stems from agents taking an inside view focusing on the constituents of the specific planned action rather than on the outcomes of similar actions already completed (Kahneman and Lovallo, 2003). Thus, for example, the estimated costs put forward by cities competing to hold the Olympic Games have consistently been underestimated; yet, every four years these errors are repeated (Ansar et al., 2014). Biases, such as overconfidence or over reliance on heuristics (rules-of-thumb), underpin these errors. Second, optimistic judgments are often exacerbated by deception, i.e. strategic misrepresentation by project promoters (Wachs, 1989). Recent literature on infrastructure delivery finds strong evidence that misplaced political incentives and agency problems lead to flawed decision-making (Flyvbjerg et al.,2009).

The outside view involves three steps: (1) identify a reference class; (2) establish an empirical distribution for the selected reference class for the parameter that is being forecasted; and (3) compare the specific case with the reference class distribution. Ansar et al. (2014) took a further innovatory step by fitting multivariate multilevel models to the reference data to predict future outcomes. With debiased forecasts, managers can make empirically and statistically grounded, rather than optimistic judgments (Buehler et al., 1994; Gilovich et al., 2002).

RCF forecasting is not without limitations. For example RCF focuses on a generic risk inherent in a reference class rather than specific risk factors. Sovacool and Cooper (2013:63) point out that RCF may not indicate risks in rare projects with limited empirical data. Even if true this critic does not undermine the general usefulness of RCF as risk assessment on cost overruns or other project metrics.

### 3.4.7 Conclusion

In this chapter, the fundamentals of the theoretical framework of the thesis have been reviewed and discussed. The disciplines of project management and risk management have to a large extent grown together. Today, standards, bodies of knowledge, methods and training programs are available to support governance and reforms on the management level.

In particular, the paradigm of NPM has brought together important and practical knowledge making it possible to combine technical topics from the natural sciences with behavioural topics from the social sciences to form a strong union of rationality and consistency. There is ample evidence in the literature of theories, methods and techniques that can be utilized to guide project sponsors and other parties towards project outcomes that are more certain and less likely to overrun on cost.

# 4 Empirical studies

## 4.1 Introduction

The general approach taken in the research design was to focus on specific managerial topics and to perform an analysis to determine if there is a gap between the governance of public projects in Iceland and international standards and legislation found in other countries.

Five studies were conducted. The first, Study I, considers *The Feasibility of Public Projects in Iceland* and investigates how feasibility studies in six public projects align with current best practice. Study II is a *Benchmark study of Icelandic and international planning and decision procedures in projects* and investigates if the Icelandic set of standards regarding the conception, planning and management of public projects is comparable with Norwegian, UK and other international standards. Study III addresses a question: *Does the perceived risk attitude among Icelandic decision makers correlate with the reality of cost overruns?* This study attempts to understand if there is a match (or mismatch) between the perceived risk attitude among parliamentarians and frequent cost overruns in public projects. Study IV is concerned with *Prerequisites and decision-making procedures on an Icelandic public project compared with Norwegian standards*. It investigates the due diligence process in Iceland concerning the conception of the road tunnel project, Vadlaheidar-tunnel, and asks if it is comparable to Norwegian standards. The last, Study V, is *Reference class forecasting in Icelandic transport infrastructure projects*. This study uses data from the Icelandic Road Administration (ICERA) in an attempt to determine if RCF could contribute to more accurate cost forecasting.

The overarching purpose of these studies is to establish if there is a room for improvement in governance and the procedural/methodological approach to the management of the public project lifecycle in Iceland.

## 4.2 Study I: The Feasibility of Public Projects in Iceland

The awareness of the importance of project feasibility when facing a decision is well known. In a letter from Benjamin Franklin to his friend Joseph Priestley[9] written on 19th September 1772, Franklin elaborates on the difficulties of decision-making when facing many possible outcomes and options.

*To get over this, my Way is, to divide half a Sheet of Paper by a Line into two Columns, writing over the one Pro, and over the other Con. Then during three or four Days Consideration I put down under the different Heads short Hints of the different Motives that at different Times occur to me for or against the Measure. When I have thus got them all together in one View, I endeavour to estimate their respective Weights; and where I find two, one on each side, that seem equal, I strike them both out: If I find a Reason pro equal to some two Reasons con, I strike out the three. If I judge some two Reasons con equal to some three Reasons pro, I strike out the five; and thus proceeding I find at length where the Ballance lies; and if after a Day or two of farther Consideration nothing new that is of Importance occurs on either side, I come to a Determination accordingly.*

Franklin recommends systematic cataloguing of strengths and weaknesses in monetary values, weighted assessment and finally the net benefit compared to the alternative of doing nothing. This is in fact what is called cost-benefit analysis or in a wider context, determining the feasibility of a project.

### 4.2.1 Purpose

One of the few prerequisites in Icelandic legislation on the arrangement of public projects is the need to conduct a feasibility study. The following research question is addressed: *do the arrangements for a feasibility study on public projects in Iceland align with current best practice*?

The overall aim of this study is to identify opportunities for improvement of the public project lifecycle. We searched for these opportunities in the governance framework with an emphasis upon project management and related disciplines.

When the Icelandic law on public project procurement (no. 84/2001) received ascent in the Parliament in 2001 (Althingi, 2001), the Minister of Finance stated that *"[the] objective of this legislation [was] to ensure optimal use of capital invested in public projects"* (Haarde, 2001). The legislation outlines the government's goals regarding the conception, planning and execution of public projects. The law notes that the Minister of Finance will issue further guidelines for planning and other procedural work on projects.

The aforementioned law no. 84/2001 (Althingi, 2001) is four pages and approximately 1,700 words. No specific reference to best practice project management or procedures can be detected in the document. The content is mainly generic descriptions of terms such as cost plans, planning and construction, without clarification of what is considered a minimum requirement in terms of rigour or quality of deliverables. The official guideline on methods and procedures is the *Public Procedure Policy on Conception, Planning and Implementation of Public Projects* (Ministry of Finance, 2002), which covers of the following requirements.

[9] Joseph Priestley (1733-1804) was an English scientist. Among other achievements he is credited for the discovery of oxygen. The full letter can be found on http://www.procon.org/view.background-resource.php?resourceID=1474.

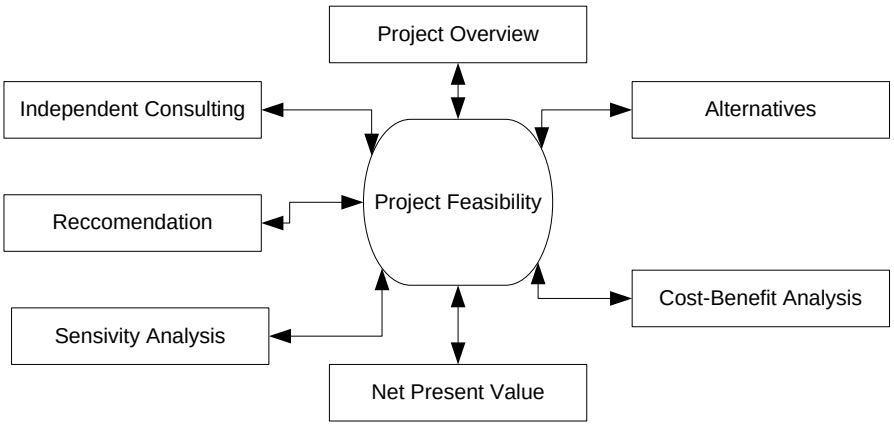
1. Project inception, including project argumentation, stakeholder analysis, feasibility study, appraisal of alternatives, estimate of initial investment cost and operation cost, comparison of alternatives and decision-making. At this stage, the initial scope is determined and the cost baseline and schedule are prepared with a detailed report on the decision.
2. Planning, which moves the project to the next stage, with further information on design, cost, materials and tender preparation.
3. Implementation, which describes how contracts are made, accountability and the project control mechanism.
4. Close-out evaluation and audit, with a study of the differences between planned results and actual results together with a close-out report.

The purpose of this study is to present the results of an investigation into the extent to which current understanding of industry practices covering the feasibility stage in a project's lifecycle aligns with notional best practice. It is to be noted that the requirement in the law is the Icelandic word "hagkvæmniathugun" which could also mean cost-benefit analysis. No English translation of the term was given by the Ministry so a standpoint had to be taken. A feasibility study and a cost-benefit analysis are related. The simple difference is that feasibility is a more generic approach including cost-benefit analysis (see, for example, PMI (2008)). In this study "hagkvæmniathugun" is interpreted as "feasibility study". This interpretation rhymes well with the words of Haarde (2001) and how PMI (2006) defines feasibility as instrumental in justifying the project in the context of time, budget and scope. The findings are discussed and conclusions drawn on the consequences of an observed misalignment between them.

### 4.2.2 Design

Prerequisite feasibility studies (PFS) based on a multi-criteria decision-making process to evaluate project viability for large capital investment is something that many countries demand (Yun and Caldas, 2009). The feasibility study is the first and most important step before undertaking project design and construction. The effectiveness of the feasibility study will affect directly the success of a project. Mistakes at this stage can permanently handicap the project's performance, even fatally (Shen et al, 2010:255). Feasibility analysis is the principal methodology for gaining comprehensive and transparent information on the implications of a proposal. This can be interpreted as a safety measure to ensure the strategic efficiency of the project. According to PMBOK (PMI, 2008), *"[the] feasibility of the new undertaking may be established through a process of evaluating alternatives. Clear descriptions of the project objectives are developed, including the reasons why a specific project is the best alternative to satisfy the requirements."*

**Figure 8. The outlines of a feasibility study adapted from Yun and Caldas (2009) and Shen et al. (2010).**




Yun and Caldas (2009) used data mining techniques to analyse decision variables in a PFS. According to their study, the feasibility analysis for an infrastructure project covers four processes: project overview, economic feasibility, political viability and total viability. The project overview explains the origin of the project, i.e. its background and objectives along with procedures to be used to achieve the defined objectives. Economic feasibility determines the project's investment potential along with its effects on the national economy. This is achieved by estimating the demand and calculating the economic and financial return on the investment such as benefit-cost ratio (B/C), net present value (NPV) and internal rate of return (IRR). Political viability is concerned with determining the importance of the project to all members of society. This is performed by evaluating factors such as the regional level of development, regional economic impact, attitudes towards the project, compliance with relevant governmental policies and environmental impact. Total viability is based upon the results of both the economic and political evaluations. The combined process helps in reaching a "go/no-go" decision, determining investment priority across infrastructure projects and indicating the optimal alternative (Yun and Caldas, 2009).

The practice of feasibility analysis differs according to the type of project. The difference can be seen in the factors and/or attributes that are considered when conducting the analysis. Shen et al. (2010) showed that feasibility analysis includes 18 economic, nine social and eight environmental performance attributes, where some attributes are common to all projects and others apply to individual projects only. This finding is largely in line with Yun and Caldas (2009); however, there is one distinct difference. Shen et al. (2010) do not specify benefit-cost ratio as a performance attribute in their feasibility analysis, neither do they give a reason for its exclusion. A possible explanation might be found in the statement that a benefit-cost ratio can sometimes confuse the selection process when the projects under consideration are of a different scale (Boardman et al., 2011). Furthermore, the benefit-cost ratio is sensitive to situations where negative values are subtracted from benefits or added to cost. For these reasons, Boardman et al. (2011) recommend that analysts avoid using benefit-cost ratios and rely instead on net benefits in order to rank options.

Notional best practice for conducting the feasibility analysis of public projects is based on six steps considered in and deduced from the literature: project overview, alternatives, benefits and cost, net present value (NPV), sensitivity analysis and making a recommendation plus the use of independant consulting (see figure 8). Despite each project having its own characteristics, there is enough

commonality at a generic level to permit the development of a unified framework for planning and controlling feasibility analysis.

The methodological approach is based upon document analysis or, more specifically, content analysis. As a part of documentary research, it has advantages over other methods – insofar as it is unobtrusive and non-reactive – and is a viable technique for making reliable, replicable and valid inferences (Robson, 2011). Documents can also be used for triangulation and for longitudinal studies, where the latter has a relevance to the longer-term study of the Icelandic case.

Official documents have provided data and insights for the analysis of official definitions and explanations of decisions-making in regard to public project procurement. A further aspect of this approach is that of critical analysis, which has involved scrutinising the assumptions underpinning decisions, taking account of other factors or issues that might possibly have been concealed. Primarily for this reason, it has involved moving beyond official documents to include a critical analysis of the institutional and social structures within which the documents have been produced.

The Icelandic national budget in any given year excludes a complete list of accepted construction projects despite being registered under initial capital expenditure along with investment in machinery, equipment, software etc. In addition, many projects are included in the total funding for various institutions making it difficult to see which projects have been approved. It was necessary, therefore, to seek information from the Icelandic Ministry of Finance about the distribution of resources down to the level of individual construction projects. A complication was that such information is not available at the Ministry of Finance, but is stored at the ministry concerned with the particular project. For this reason, it was decided to defer selecting construction projects from the Icelandic national budget and instead to select construction projects from several ministries. The sampling strategy was therefore in the nature of a convenience sample. No claims are therefore made as to the representativeness of the sample in a statistical sense.

The projects are a diverse set chosen to represent different project types (tunnel, harbour, concert hall, avalanche barrier, school and tourist service centre). In the event, six funded construction projects under the authority of three ministries were identified: Vadlaheidar-tunnel (Ministry of the Interior), Landeyjar-harbor (Ministry of the Interior), Harpa Concert hall and Conference Centre (Ministry of Education, Science and Culture), avalanche protection in Bolungarvik (Ministry for the Environment) and Snæfellsstofa Visitor Centre in Vatnajökull National Park (Ministry for the Environment).

The research is an unobtrusive study aimed at analysing a problem for further understanding and clarification. On a more detailed level, the research method represents a qualitative, structured content analysis of projects cases resulting in a quantitative appraisal. The sampling strategy may be more complicated in mixed methods research because sampling schemes must be designed for both the qualitative and quantitative research components of these studies. Onwuegbuzie and Collins (2007:288) suggest three to five cases as a minimum sample size for case study research, which supports the approach taken here.

The research design has focused on the content not the context, as the latter is defined by Law no.84/2001 (Althingi, 2001). Descriptive material, in the form of initial study reports for six projects, were analysed and scored on a three-point scale against requirements outlined in the literature

review. A three-point scale is suitable for measuring consistency or alignment using a range spanning from no-consistency to full consistency with the feasibility analysis process. The requirements covered project overview, comparison of alternatives, cost-benefit analysis, net present value (NPV), sensitivity analysis and making a recommendation.

Data abstraction from documents was undertaken in such a way that all were scrutinized with the resultant findings registered in a prepared format against each of 17 questions (see table 2).

**Table 2. Overview of the questions used in the document analysis.**

**Project overview**

| | |
|---|---|
| | **Project overview** |
| 1 | Has the origin of the project been explained? |
| 2 | Has the background of the project been described? |
| 3 | Have the project objectives been defined? |
| 4 | Has a needs analysis been carried out? |
| | **Alternatives** |
| 5 | How many alternative schemes/projects were considered? |
| 6 | Was the zero alternative included? |
| | **Cost-benefit** |
| 7 | Were benefits and beneficiaries identified? |
| 8 | Were costs identified? |
| 9 | Have the impacts been recorded as performance indicators? |
| 10 | Have the impacts been predicted quantitatively over the life of the project? |
| 11 | Have all impacts been monetized? |
| | **Net present value (NPV)** |
| 12 | Have the benefits and costs been discounted to obtain present values? |
| 13 | Has the net present value (NPV) been computed and compared for each alternative? |
| | **Sensitivity analysis** |
| 14 | Has sensitivity analysis been performed for each alternative? |
| | **Make a recommendation** |
| 15 | Has evaluation of alternatives been performed? |
| 16 | Has the selection of the most promising alternative been made? |
| | **Independent consultants** |
| 17 | Has an evaluation from independent, external consultants been performed? |

### 4.2.3 Results and interpretations

In assessing consistency with the literature review, each question was evaluated for its consistency with best practice as identified from the literature review. The 17 questions and six projects account for 102 occurrences (17 x 6) which were paired with the consistency scale. Thirty occurrences fall on a pair with full consistency, 28 on a pair with partial consistency and 44 with no consistency. A closer examination is shown in table 3 where the six selected projects are compared with notional best practice. No consistency varies from 18% to 65% with a mean of 43%. Full consistency varies from 12% to 59%, with a mean of 30%.

**Table 3. Consistency with best practice for six selected projects.**

| Project name: | Partial consistency | No consistency | Full consistency | Partial consistency | No consistency |
|---|---|---|---|---|---|
| **Vadlaheidi tunnel** | 3 | 9 | 29% | 18% | 53% |
| **Landeyja harbour** | 8 | 3 | 35% | 47% | 18% |
| **Harpa concert hall** | 2 | 5 | 59% | 12% | 29% |
| **School in Mosfell town** | 7 | 8 | 12% | 41% | 47% |
| **Avalance protection** | 5 | 8 | 24% | 29% | 47% |
| **Snaefells stofa** | 3 | 11 | 18% | 18% | 65% |
| | | **Mean:** | **30%** | **27%** | **43%** |

In this study, no attempt was made to evaluate if the categories or topics within each category were different in importance in terms of evaluating project feasibility. Table 4 shows the distribution of the scores and the normalized results due to different number of topics within each category. There were five topics in the category, benefits and cost, whilst in the category, independent consultants, there was one only.

The category project overview is the most consistent with best practice, but the general conclusion is a disappointing gap of 76% (see table 4) of the categories where there is only partial consistent with best practice.

**Table 4. Consistency of approach towards feasibility analysis for six selected projects (points and weighted percentages taken into the account the number of activities in each category).**

| Category | Normalized weight | Full consistency | Partial consistency | No consistency | Weighted Full consistency | Weighted Partial consistency | Weighted No consistency |
|---|---|---|---|---|---|---|---|
| **Project overview** | 0.24 | 15 | 1 | 8 | 63% | 4% | 33% |
| **Alternatives** | 0.12 | 3 | 2 | 7 | 25% | 17% | 58% |
| **Benefits and cost** | 0.29 | 7 | 16 | 7 | 23% | 53% | 23% |
| **Net present value (NPV)** | 0.12 | 1 | 2 | 9 | 8% | 17% | 75% |
| **Sensitivity analysis** | 0.06 | 0 | 2 | 4 | 0% | 33% | 67% |
| **Make a recommendation** | 0.12 | 2 | 5 | 5 | 17% | 42% | 42% |
| **Independent consultants** | 0.06 | 2 | 0 | 4 | 33% | 0% | 67% |
| | | | | **Mean** | **24%** | **24%** | **52%** |

All of the projects, apart from the school building, ran into problems. Even the Vadlaheidar-tunnel, which had not been started at the time of the study, has caused major debates. Harpa, the avalanche protection in Bolungarvik and Snaefellstofa had large cost overruns and the Landeyja harbour has

been inoperable for long periods following a string of unexpected problems. The results in table 3 and table 4 were tested for significance[10] verifying the statistical difference between full consistency and partial and no consistency results.

The study was limited to the examination of the initial study reports on the feasibility analysis of six public projects under the authority of three ministries. Yet, the results are a clear indication of a problem. It is therefore valid to ask if a different group of projects would have revealed greater consistency with best practice. This question cannot be answered with certainty, but in the light of the results presented above there is reason to believe that the analysis of other public projects would not produce significantly different results.

Moreover, there seem to be few practices that align with current best practice. To improve the position, it is important that the Minister of Finance issues detailed guidelines for conducting feasibility analysis in accordance with current best practice. The ministry could, for example, follow in the steps of the *Norwegian Ministry of Finance* which issues detailed guidelines on how to approach a cost-benefit analysis (Norwegian Ministry of Finance, 2012).

Limited transparency was found in the management of initial study reports and none of the three ministries contacted could directly provide initial study reports for proposed projects despite the fact that these reports should be preserved at the respective ministries. All of the reports had eventually to be collected at the relevant public agency. To improve this aspect, it is important to increase awareness of the availability of initial study reports within each ministry. The current state is not transparent.

The Icelandic national budget also gives very limited information on the financing of public projects and does not include a complete list of all accepted construction projects. Many projects are included in the total funding provided to various institutions, making it very difficult to see which projects have been approved. Moreover, the national budget accounts for each financial year, but not the total project cost if the construction period extends beyond one year. Minor improvements in the Icelandic national budget contents and arrangements would improve considerably the transparency of funding for public construction projects.

It would be interesting to see if other small countries with related legislative structures are also exposed to similar problems. This study not only revealed that current practice of feasibility studies in Iceland differs significantly from best practice but also shows weaknesses in how document control and archiving are managed. If we again turn towards Norway as a role model, the Norwegian Ministry of Finance finances a database of public projects called *Trailbase*. This enables data analysis and development of new knowledge to support better decision-making and project management (NTNU, 2014).

[10] Two-tail t-test, 95% significance (p=0,002).

## 4.3 Study II. Benchmark Study of Icelandic and International Planning and Decision Procedures in Projects

In Alice in Wonderland, by Lewis Carroll, the girl Alice has arrived at a crossroad in the forest and is bewildered and lost. She meets the Cheshire cat and asks him for advice on which direction to go.

> *"Would you tell me, please, which way I ought to go from here?"*
>
> *"That depends a good deal on where you want to get to," said the Cat.*
>
> *"I don't much care where –" said Alice.*
>
> *"Then it doesn't matter which way you go," said the Cat.*
>
> *"– so long as I get somewhere," Alice added as an explanation.*
>
> *"Oh, you're sure to do that," said the Cat, "if you only walk long enough."*
>
> Lewis Carroll, Alice in Wonderland (1865).

The conversation between Alice and the cat goes on a bit further but nothing makes sense in their dialog because they have apparently no reference to reality or common understanding of the problem. Besides being very funny the scene can be interpreted as input in management theory. If you do not know which way you are heading it matters little what path you choose. But then you get to "somewhere" and there is no certainty that "somewhere" is the desired or optimal destination.

### 4.3.1 Purpose

In recent decades a shift has been in the received doctrines of public accountability and administration. Effort to increase the quality of public governance is generally referred to as *New Public Management* (NPM) (see Chapter 3.2.). One of the doctrines to ensure public interest via NPM is the use of an elaborate structure of procedural rules designed to ensure integrity, transparency and professional service to the public. This makes sense as it is impossible to manage without reference to a conceptual set of rules to form a governance framework. Only what we know can be managed and controlled. Bevir et al. (2003) refer to NPM as a focus on management over policy with emphasis on performance appraisal and efficiency as a consequence of fiscal pressures, determination to redraw the boundaries of the state, increased international regulation due to trends in geopolitics, public expectations to government performance, international management fashion and improvements in information technology.

The development of project management as a discipline is sometimes referred to as the *"third wave"* (Morris et al., 2012). From the 1950s, project management has evolved from being foremost a scheduling tool to include a wide range of management disciplines, professional associations and bodies of knowledge (Morris, 2012). Söderlund (2012:41) identifies the current period as the *"Decision School"* referring to the importance of investigating the interplay among decision makers in projects from the perspective of psychology and political science. Jugdev and Müller (2005:23) name this period *"strategic project management"*, also emphasizing the role of the initial steps of a project.

Bovaird and Löffler (2003:316) stress that NPM "*is about ensuring that the outcomes are right"* and, furthermore, that one of two criteria for "good governance" is "*implementation by all stakeholders of a set of principles and processes by means of which appropriate public policies will be designed and put into practice"* (Bovaird and Löffer (2003:317).

OECD emphasizes the need for an effective governance framework to impact the *"overall economic performance"* (OECD, 2004:17). In Study I, we investigated six reports on feasibility studies and how the content compared with best practice as concluded in peer reviewed papers, see for example Yun and Caldas (2009), Shen et al (2010) and Boardman et al. (2011). The results indicate room for improvement as compliance was limited.

This study attempts to answer the following research question: are Icelandic set of standards regarding the conception, planning and management of public projects comparable with Norwegian, UK and other international standards? The argumentation for selecting these countries for comparision can be found in Chapter 1.3.

This is fitting as this does move us from a particular procedure to the methodological framework. Principles and processes might differ from country to country, but it is reasonable to assume that a detailed conceptual framework will reduce the risk of corrupt, unrealistic and over-optimistic projection when public capital is invested. It may be argued that, in the case of public projects, a solid procedural foundation is even more critical than for private projects because public capital is being invested. In spite of the NPM paradigm, public projects are frequently the victims of controversy and overruns (Flyvbjerg, 2011). Flyvbjerg et al. (2003) state that the main shortcomings in the appraisal of a large project are the lack of a mechanism to ensure accountability, a shortage of objective-driven performance specifications instead of technical objectives and the lack of explicit formulations of the regulatory regime (Flyvbjerg et al, 2003:110).

The purpose of this study is to investigate if there is a significant gap between governance practices in these countries and Iceland.

### 4.3.2 **Design**

We have earlier (see Chapter 4.2.1.) mentioned the intent of the Icelandic law on public project procurement (no. 84/2001). The legislation outlines the government's goals regarding public projects. The law notes that the Minister of Finance will issue further guidelines for planning and other procedural work on projects. The official guideline on the methods and procedures to apply in this case is the *Public Procedure Policy on Conception, Planning and Implementation of Public Projects* (PPC) for the pre-study, planning and execution of public projects in Iceland (Ministry of Finance, 2002). Norway and the UK also have a relatively new governance framework brought forward and enacted in the same period as that in Iceland.

The Norwegian Ministry of Finance requires a quality assurance procedure to ensure *"adequate quality at entry, compliance with agreed objectives, management and resolution of issues that may arise during the project, etc., and standards for quality review of key governance documents"* (Samset et al., 2006).

In the UK, HM Treasury has adopted the Green Book where the following phrasing can be found: *"[the] Government is committed to continuing improvement in the delivery of public services. A major part of this is ensuring that public funds are spent on activities that provide the greatest benefits to society, and that they are spent in the most efficient way"* (HM Treasury, 2011:v).

It is apparent from these quotations that the aforementioned governments' intentions are broadly similar, i.e. to ensure optimal use of public capital by introducing professionalism and integrity and is well in line with the NPM paradigm.

According to Icelandic law, public projects begin with a project idea or awareness of a project proposal. The idea is then subject to some initial studies, usually within the respective ministry. Once these pre-studies have been completed, the executive power prepares a proposal for funding and if the project is considered feasible it enters the state budget as a liability. This process is shown in figure 1 (Chapter 1.5.).

First, we analysed the written and publically-available documents describing how projects should be prepared initially in Iceland and Norway. The result was expected to reveal if there were differences in the strategic and tactical requirements in relation to the first stages in the project lifecycle in terms of assuring the quality of the decision-making and conception prior to project commencement.

Second, we analysed how the PPC in Iceland and the Green Book issued by HM Treasury in the UK address best practice project management as outlined in the PMI standard on project management practice (PMBOK®). The result was expected to reveal if there were differences between the operational requirements and methods used to ensure sound project planning and implementation in Iceland and the UK.

The content of the documents was compared to best practice as defined by PMI Organization Project Management Maturity Model (OPM3). A benchmark is sought in OPM3 with reference to what are termed key performance indicators (KPIs). A KPI is a criterion by which an organization can determine quantitatively or qualitatively whether or not an outcome is sufficient. OPM3 cross-references the PMBOK® standard (PMI, 2008:43) where eight management "knowledge areas" are defined: scope, time, cost, quality, human resources, communication, risk and procurement. These knowledge areas are attached to the following "process groups": initiating, planning, executing, monitoring and closing. This arrangement rhymes well with the PPC (Ministry of Finance, 2002). The PMBOK® maps knowledge areas and process groups to identify the methods applicable at each stage.

### 4.3.3 Data sources/gathering

The objectives of the research were to produce and analyse measurable outputs describing the consistency of the guidelines with best practice and an internal comparison of two guidelines from the Icelandic Ministry of Finance (PPC) and the HM Treasury (Green Book). This was done to analyse the degree to which the guidelines were likely to aid decision-makers in making well-founded decisions regarding the preparation and management of public projects.

The project management key performance indicators (KPI) in the PPC and the Green Book that were benchmarked against practices in PMBOK® are referred to in the following knowledge areas: project integration management, project scope management, project time management, project cost management and project risk management. These knowledge areas overlap and interact during the project lifecycle. Three knowledge areas, namely human resource management, communication management and quality management were intentionally left out of the analysis as they were considered to introduce a bias towards conventional project management disciplines under investigation in the research. They are not considered in the Green Book or the PPC and so the

absence of these knowledge areas is not considered to impact the results. Table 5 demonstrates the mapping of the selected knowledge areas and the process groups[11].

**Table 5. A mapping of selected knowledge areas and processes.**

| PMBOK® knowledge areas | Process groups | | | | |
|---|---|---|---|---|---|
| | Initiate | Plan | Execute | Control | Close |
| Project integration management | Project charter | Project plan | Execution | Work control, change control | Close phase or project |
| Project scope management | | Requirements, scope and WBS | | Verification and control | |
| Project time management | | Activities, sequence, resources, duration and schedule | | Schedule control | |
| Project cost management | | Cost estimate, budget | | Cost control | |
| Project risk management | | Risk identification, analysis and response | | Monitoring and risk control | |

The scale for consistency was from 0 to 3.

0 = no consistency

1 = limited consistency

2 = some consistency

3 = full consistency

[11] Knowledge areas are a set of processes that together accomplish proven project management function and a process is a set of interrelated activities to transform project input into an output. Processes are grouped into five categories (PMI, 2008).

**Table 6. Comparison of the Green Book and the PPC with PMBOK® knowledge areas.**

| PMBOK® knowledge areas | Green Book | Rating | PPC | Rating |
|---|---|---|---|---|
| Project integration management | Some consistency | 2 | Limited consistency | 1 |
| Project scope management | Full consistency | 3 | No consistency | 0 |
| Project time management | Full consistency | 3 | Some consistency | 2 |
| Project cost management | Full consistency | 3 | Some consistency | 2 |
| Project risk management | Full consistency | 3 | No consistency | 0 |
| | Overall | 93% | | 33% |

Document analysis reveals close to full consistency between PMBOK® and the Green Book as can be seen in table 6. The structure of the PMBOK® and the Green Book is similar, but the terminology referring to procedural arrangement is different. The terminology referring to methods and techniques is similar too.

The consistency between the PMBOK® and the PPC is mostly on the procedural level, i.e. general requirements. The methodology and techniques are not addressed significantly. Some methodological areas have been omitted and one knowledge area, project risk management, is missing. In addition, the word "risk" is not to be found in the body of the text of the PPC or Law no. 84/2001.

### 4.3.4 Results and interpretations

If we assume that detailed guidelines on the arrangement of projects are useful the result indicates huge room for improvement. Just by looking at the size of the respective documents tells a story. The Icelandic PPC guidelines are 3,700 words (11 pages), The Green Book is 43,000 words (114 pages), PMBOK® is 178,000 words (500 pages) and the Norwegian guidelines on cost-benefit analysis are 62,000 words (178 pages). We could take other examples to underline how sparse the Icelandic guidelines are. The Treasury Board of Canada issues a 100-page *Business Case Guide* for similar purposes and the Danish Transport Ministry issues guidelines and a spreadsheet model to clarify the viability of transport projects to name an example. These publications and other similar documents were issued in the beginning of the century and have proven to be highly influential (Morris, 2012). In Norway, the Ministry of Finance funds the Concept Research Program to support good governance. It can arguably be assumed that in a developed country one would expect to find a governance framework with this purpose even if it is named differently (Klakegg, 2010:101). We could also name the web-based guidelines provided by the OGC in the UK.

There is an interesting addition to this study. The data provide valuable information regarding the problem that the parliament is facing. In the original research design we interviewed 15 parliamentarians in three committees: budget, environment and transport, and industries. This

limitation was applied for two reasons: first, the relevance of these committees is instrumental with regard to public projects, e.g. funding decisions; and, second, transport projects and industrial projects that have been central to public debate in Iceland in recent years. Parliamentarians were assessed on three management disciplines which all seemed relevant to the foundation for making decisions and the basic conception of a public project, i.e. general decision-making, feasibility of a project and the risk management of a project.

Each management discipline was then segmented into the following management techniques with technical terms well known in contemporary project management: project scope, Delphi method, groupthink, weighted methods, SMART method, feasibility of a project, statistical forecasting distribution, NPV (Net Present Value), WBS (Work Breakdown Structure), utility methods, risk management, Monte Carlo simulation, critical path analysis, SWOT analysis, sunk cost effect, optimism bias, decision tree and sensitivity analysis.

In total, 25 parliamentarians work in these committees and 15 of them (60%) participated in the one-on-one interviews. Two of the 25 parliamentarians were in two of the three committees. The parliamentarians that did not participate in the survey could either not be reached during the survey period (12%) or were unable to participate (28%). The survey question was in all cases the same: *"how well do you know the following terms and/or methodology?"* The selected rating was a numerical scale as follows:

0 = very limited knowledge

1 = little knowledge

2 = some knowledge

3 = considerable knowledge

4 = comprehensive knowledge

**Table 7. The awareness on management methods and techniques among parliamentarians (n=15).**

| Technique/term | Score (0-4) |
|---|---|
| **Project decision** | |
| Delphi method | 0.4 |
| SMART method | 0.4 |
| Weighted models | 0.7 |
| SWOT analysis | 1.3 |
| Utility based methods | 0.7 |
| Sunk cost effect | 0.8 |
| Decision tree | 0.9 |
| Average (points):<br>Average (%): | **0.8**<br>**15%** |
| **Project management** | |
| Project scope | 1.5 |
| WBS | 0.7 |
| Critical path analysis | 0.8 |
| Average (points):<br>Average (%): | **1.0**<br>**19.9%** |
| **Project feasibility** | |
| Net Present Value | 2.0 |
| Statistical forecasting distributions | 1.6 |
| Sensitivity analysis | 1.6 |
| Monte Carlo simulation | 0.9 |
| Average (points):<br>Average (%): | **1.5**<br>**30.8%** |

The results can be visualized in table 7. If comprehensive knowledge is 100% awareness and very limited knowledge is 0% awareness, project decision methods score 20.8%, project management 19.9% and project feasibility 30.8%. The total average awareness was 23.8% indicating a limited knowledge base.

There was also one more interesting addition to the survey. Committee members were also asked if they had a structured approach when contemplating a decision in the various categories. The question posed was: *"does the committee rely on procedure policies or regulations when discussing and appraising public projects?"* Ten of 15 parliamentarians responded "no". They were then asked: *"would you consider it important that a public body issued benchmarks on recognized and defined*

*methods that committee members could use to aid in decision-making in regard to important issues?"* 12 of 15 responded "yes".

All in all this indicates three things. First, parliamentarians making decisions on public projects have limited knowledge of management terms. That does not come as a surprise as other parts of the study reveal that parliamentarians and others, in contrast to their peers in Norway and the UK, have very little support in the form of a procedural framework. Second, they make decisions based on "common sense" rather than a procedure that leads to a structured decision. Last, they would welcome a set of standards and guidelines issued by a public body as a directive in their work.

## 4.4 Study III: Does the perceived risk attitude among Icelandic decision makers correlate with the reality of cost overruns?

In 1459, *Pope Pius II* decided to transform the look of his birthplace in the town of Pienza in Tuscany. He chose the architect Bernardo Rossellino to lead the project which resulted in wonderful constructions in the form of a cathedral and a papal palace. There was nonetheless one problem with the Rossellino project. The egocentric architect had faked the account ledgers to hide the real cost of the project. The cost overrun was 500% and Rossellino had obviously taken a huge risk by his deceit. But to the relief of Bernardo Rossellino the pope was an unusual client. After taking a tour of his new town he reportedly told the brilliant but tricky architect: *"You did well, Bernardo, in lying to us about the expense (...) Your deceit has built these glorious structures, which are praised by all except the few consumed with envy"* (Mayernik, 2003).

This event allegedly happened almost 600 years ago but the problem of cost overruns and over optimistic planning still exists.

This study examines the following research question: *as cost overruns are frequent in public projects, are parliamentarians aware of their behaviour when facing different probable cost overruns for projects?* This is an interesting subject for two reasons. First, many Icelandic parliamentarians have openly declared the will to reform governance by, for example, issuing detailed reports on the causes that led to the financial collapse. Second, there are currently few indications that these alleged reforms have led to fewer cost overruns.

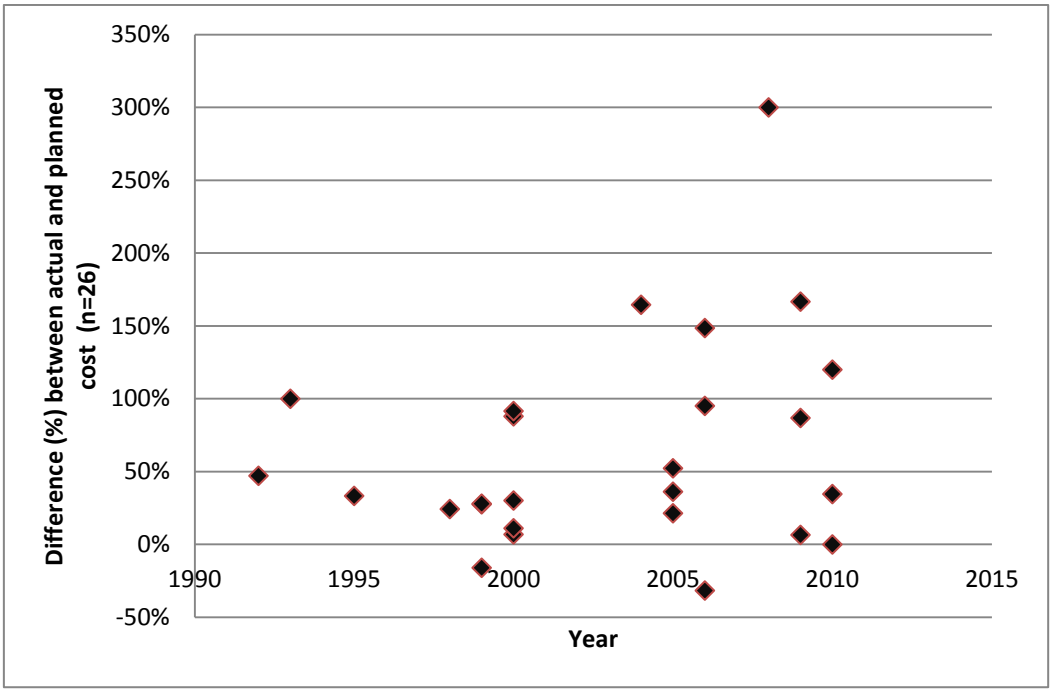
### 4.4.1 Purpose

We identified large projects through document analysis, searching an on-line archive[12] containing almost all Icelandic newspapers and periodicals over the past 25 years. In total, 26 large projects were identified, most of which were construction projects (24) but also the renovation of a ferry and a technical installation. The average value of all projects is ISK 7.4 billion (approximately USD 65 million) and the mode is ISK 1.2 billion (approximately USD 11 million). Only three projects were completed on budget or had expenditure less than the budget, meaning that close to 90% experienced cost overruns. The average cost overrun of all projects is close to 60% and the total difference in monetary values between the actual cost and the planned cost at fixed prices is 20%.

The distribution of the difference between actual cost and planned cost over the two decades is shown in figure 9.

[12] The database is assessible at www.timarit.is

**Figure 9. The distribution of the public projects (n=26) over two decades and the differences between actual cost and planned cost in percentages.**




It is to be noted again that this method of searching was chosen because no database of public projects is accessible.The statistics indicate that public projects in Iceland may have abnormal problems and so it was considered worthwhile to investigate if some fundamental causes could be identified. With this in mind, a survey of decision makers was designed. The aim of the survey was to demonstrate whether there is a different risk attitude between investments options when a budget has been prepared and submitted to the decision maker followed by a risk estimate stating the range of possible cost overruns.

The survey presented the decision makers with options from which to choose. In this way we were able to draw frequency curves based on their preferences and make a direct comparison between the groups under screening (see below). In EU theory, the shape indicates the risk preferences of a decision maker (figure 5). We chose to define the investment options offered so that they could mirror an array of decision problems.

### 4.4.2 Design

The project options selected were: first, a project to improve staff facilities; second, to invest in new production lines; and, third, to improve onsite safety. The investment in staff facilities exemplifies a non-profit project intended to improve the working environment. The investment in a new production line exemplifies a profit project intended to directly increase monetary income. The investment in a safety system exemplifies a non-profit project intended to improve employees' safety. In the survey, the participants were asked to select the statement[13] best describing their

[13] You are a part of a team expected to make an investment decision concerning three projects. The budget is accessible and also an estimate of the chance that the actual cost will exceed the budget of ISK (...) million. Once approved, it will be virtually impossible to reverse the decision. What of the following options best describes your attitude towards the risk of cost overrun?

willingness to risk a cost overrun. In the case of the parliamentarians, the project categories were substituted as follows: staff facilities became a health care centre, production line became a power station and the security system became a rescue helicopter. The questions were the same but the investment figures were adjusted to a plausible figure as public projects are generally larger in size.

The survey groups were parliamentarians, CEOs of production companies, CEOs of service companies and CEOs of seed companies (entrepreneurs). The names of the managers in the private companies were found in an archive published by the business magazine, *Frjals Verslun* (2013a; 2013b). The magazine publishes a list of companies in industrial categories. The categories of production, service and seed companies were selected to represent the different characteristics that might be expected within different realms of business. The names of the parliamentarians were taken from the website of the Icelandic parliament, *Althingi*.

### 4.4.3 Data gathering

All participants were sent a personal email explaining the survey objectives: anonymity was assured. The email was followed by an internet survey[14]. Of 63 parliamentarians contacted, 23 responded (36%), of 73 CEOs contacted in production companies 47 responded (64%), of 91 CEOs in service companies 52 responded (56%) and of 82 entrepreneurs contacted 31 responded (38%). In the parliamentarian group, 65% of the responses were from males, 95% were male in the group of CEOs in production companies, 87% in service companies were male and 67% of the entrepreneurs were male. The average age of the parliamentarians was 49 years, of CEOs in production companies 47 years, in service companies 52 years and the average age of the entrepreneurs was 36 years.

The survey was designed to investigate personal perception of risk by asking the respondents to rate themselves on a scale from 1-10 (1= never willing to take risk, 10= always willing to take risk). This personal risk attitude was persisted by asking how the respondent would invest a lottery win of ISK 16 million (approximately USD 100,000) if a respected financial institution offered to invest the sum as a whole, or in part, in a profitable but risky[15] option.

This survey was conducted in October and November 2013 over a four-week period. The groups were not equally responsive, with the parliamentarians being the one group that had to be urged again and again to participate. The parliamentarian sample is also the smallest. The danger of a biased sample is obvious for several reasons. First, the parliament is divided into government and opposition and as the survey was nameless we do not know how the participants are distributed on the political spectrum. It cannot be out ruled that a parliamentarian has his/her political agenda on his mind when voting. Second, only 23 parliamentarians participated so the distribution is more sensitive to outliers. Third, the CEOs are dominated by males whereas 35% in the parliament sample are females. Males are more likely to take risks than females which might contribute to more conservative attitude (see, for example, Harris et al (2006)).

[14] Survey Monkey.

[15] Imagine that you have just won ISK 16 million (≈USD 100.000) in the lottery. The same day as you receive the USD 16 million, a respected financial institute approaches you with an investment proposal. There is a 50% chance that you can double the figure in two years. It is equally likely you will lose all the money. How much of the 16 million ISK would you invest on these terms?

### 4.4.4 Data analysis

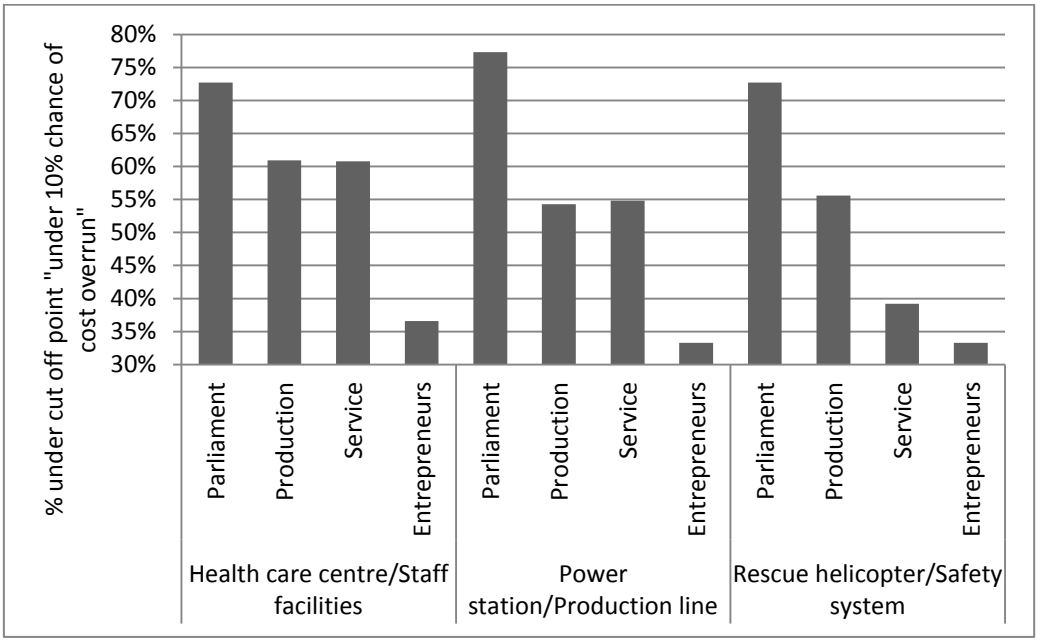
The results from Survey Monkey were formatted in a spreadsheet document. An overview can be seen in table 8, where colour shading has been used to bring out the contrast between the responses of the groups of respondents.

**Table 8. An overview showing the responses from all groups and how the answers are distributed among the investment options.**

| Options | Health care centre/Staff facilities | | | | Power station/Production line | | | | Rescue helicopter/Safety system | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Parliament | Production | Service | Entrepreneurs | Parliament | Production | Service | Entrepreneurs | Parliament | Production | Service | Entrepreneurs |
| No cost overrun | 14% | 20% | 14% | 3% | 18% | 15% | 12% | 10% | 14% | 18% | 10% | 10% |
| Less than 10% over | 59% | 41% | 47% | 33% | 59% | 39% | 43% | 23% | 59% | 38% | 29% | 23% |
| Less than 20% over | 18% | 24% | 22% | 30% | 9% | 24% | 22% | 27% | 14% | 11% | 35% | 13% |
| Less than 30% over | 5% | 7% | 8% | 27% | 5% | 17% | 16% | 23% | 9% | 20% | 12% | 27% |
| Less than 40% over | 0% | 4% | 2% | 3% | 5% | 2% | 0% | 3% | 0% | 4% | 2% | 20% |
| Less than 50% over | 0% | 4% | 6% | 0% | 5% | 2% | 6% | 7% | 0% | 0% | 4% | 7% |
| Less than 60% over | 0% | 0% | 2% | 0% | 0% | 0% | 2% | 0% | 5% | 4% | 0% | 0% |
| Less than 70% over | 5% | 0% | 0% | 3% | 0% | 0% | 0% | 0% | 0% | 2% | 2% | 0% |
| Less than 80% over | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 7% | 0% | 2% | 6% | 0% |

The colour scale shows clearly that parliamentarians stand out when comes to careful investment strategies. If we draw out the first two rows in table 8, the difference is even clearer as can be seen in figure 10.

**Figure 10. A summary of the frequency of answers for the options from Table 8.**




Note. The cut-off point in the option "I would approve the (..) project if the chance of cost overrun is 10% and the chance of being on budget 90%" (first two rows in table 8).

The members of the Icelandic parliament are therefore the most risk averse group according to this study and the entrepreneurs the most risk seeking group as can be seen in figure 10, 11 and 12. Managers in production and service have almost identical risk attitude. The benchmark groups dominate[16] the parliamentary members in all research questions.

[16] The situation when one probability distribution can be ranked as superior to another is referred to as stochastic dominance (Goodwin and Wright, 2009:195).

**Figure 11. The accumulated frequency distribution for all groups.**

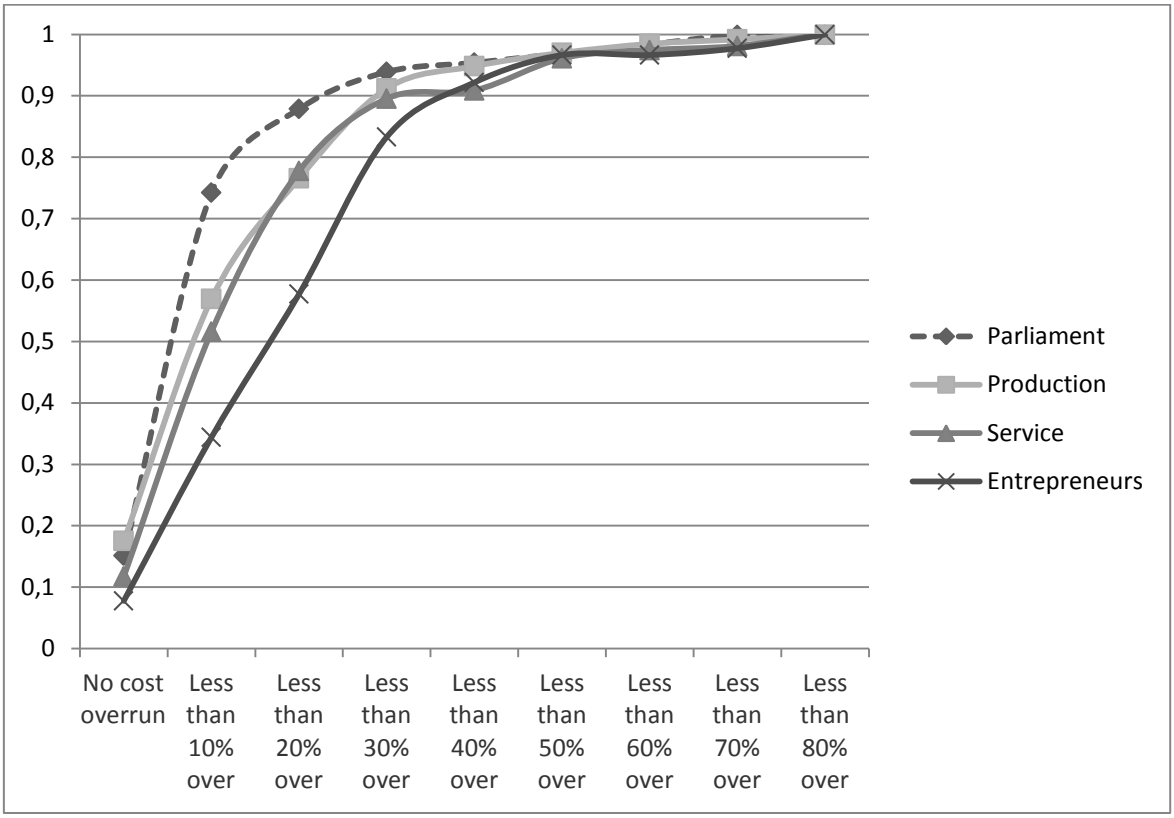
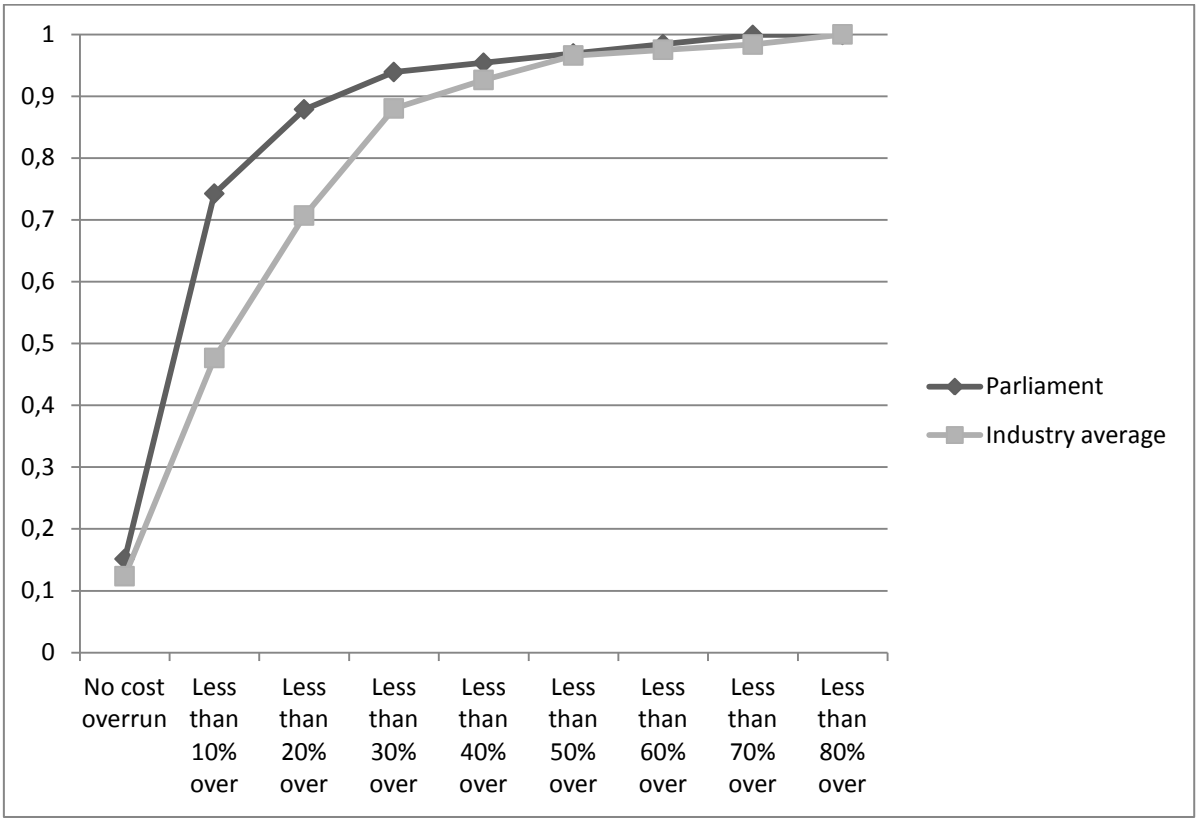



Figure 12 shows the accumulated frequency distribution for the parliamentarians and the average value of the other three groups. A chi-square test verified the difference and confirms the significant difference in the risk attitude between the groups.

**Figure 12. The accumulated frequency distribution for the industry average and the parliamentarian group.**




### 4.4.5 Results and interpretations

Attitude towards risk is significantly more conservative among parliamentarians than the other groups in the survey. In contradiction of this, analysis of large public projects in Iceland reveals an average cost overrun close to 60%. The most likely explanation is that the parliamentarians feel it is their duty to respond in a conservative way. The parliamentarians, just as the Icelandic public, are clearly aware of the high proportions of cost overruns in projects approved and included in the national budget. However, when confronted with an array of questions descriptive of different probabilities of cost overruns they select low risk options even in an anonymous survey.

Another paradox is interesting. There is a significant difference between the perceived risk attitude of the parliamentarians and the benchmark groups of high-ranked managers in the three business sectors. The former group is significantly more risk averse. Logically, this might come as a surprise since the CEOs are in most cases held accountable for their investment decisions by their management boards. The entrepreneurs usually own their companies and they are the most risk-seeking group even though they are risking their own money. A parliamentarian is certainly not risking his/her own money and there is very little chance that he/she will be held accountable for cost overruns later in the project lifecycle. Beyond project approval, the public project and accountability for it is transferred from the legislative authority to the executive power. Again, the perceived risk attitude of public decision makers in Iceland, according to this survey, makes little sense when compared to reality and how other decision makers react to the same questions.

It could be argued that the outcome of this type of research is predictable, but the research needed to be done to establish the behaviour of parliamentarians towards risk in their role as key decision makers in the promotion and approval of large public projects. Few will admit to taking risks on cost overruns. Another notion is that the project types are not fully comparable. This is true, but we believe that this research reveals an attitude problem. Time after time, in three major investigations (see Chapter 1), public governance in Iceland has come under heavy criticism. Complacency, judgmental errors, lack of formal procedures and risk behaviour are identified as the underlying cause of huge losses and difficulties that will burden Icelandic taxpayers for a long time. These reports were ordered and issued to a large extent by the same parliamentarians who still perceive themselves as risk conservative in spite of the strong evidence contradicting this self-evaluation more than five years after the financial collapse in 2008.

To some extent the above impressions are understandable and it is only human for persons heavily criticized on many fronts to react in the manner presented here. On the other hand, we cannot rule out that this is the true behaviour when facing investment decisions. Even if the decision maker is conscious that the project he/she opted for is highly likely to cost more than projected he/she just hopes for the best.

## 4.5 Study IV Prerequisites and decision-making procedures on an Icelandic public project compared with Norwegian standards

In Luke 14:28 Jesus addresses the crowd: *"For which of you, desiring to build a tower, does not first sit down and count the cost, whether he has enough to complete it? Otherwise, when he has laid a foundation and is not able to finish, all who see it begin to mock him, saying, "This man began to build and was not able to finish."* In the context of management, it might be argued that Jesus is advocating for strategic planning where every stone is turned in the conception phase to ensure successful implementation.

In this study, we attempt to answer the research question: is the due diligence process in Iceland concerning the conception of a specific individual project comparable with Norwegian standards?

### 4.5.1 Purpose

Public projects in Iceland frequently suffer from cost overruns. The following list contains examples of the difference between actual cost and planned cost in Icelandic public projects implemented over the last two decades: Bolungarvikur road tunnel (7%), Children Hospital Barnaspítali Hringsins (7%), Grimseyjarferry (167%), Concert and Conference hall Harpa (173%), Hedinsfjarðartunnel (26%), Hof Culture Center (35%), Karahnjuka hydro power plant (60%), Leifsstöð – enlargement (11%), University Center Askja (33%), Reykjavik Energy headquarters (165%), Perlan (28%), Reykjavik City Hall (47%), Reykjavik Art Gallery (28%), Office building Alþingi (88%), Audience stands at Kopavogs-stadiumi (149%), Audience stands at Laugardals-stadium (52%), National library (100%), National Culture House (30%), National Museum – rebuilding (36%) and Service Center in Vatnajökuls-National Park (21%) (see also Chapter 4.4.1.).

This is not a complete list and there are examples of public projects that have been on budget and schedule. A recent example of such project is Landeyja-harbor finished in 2010. However, it can be stated that cost overruns are a real and significant problem in Iceland. It is therefore of interest to the Icelandic taxpayer to understand better the causes of this problem. In Study II, we compared Icelandic governmental standards on the arrangement of public projects with the procedures found in Norway and the UK for similar purposes. We found that the Icelandic guidelines lagging considerably behind in both volume and detail. In this study, we investigate a particular project.

One of the few large public projects to go ahead since the financial collapse in 2008 is a road tunnel on the north coast of Iceland connecting Eyjafjord and Fnjoskadal. This project, commonly called Vadlaheidar-tunnel, was subject to weighty debates in the Icelandic media, among experts and in the Parliament. The message to the public was paradoxical and confusing. The viability of Vadlaheidar-tunnel project was, in some expert reports, declared to be substantial. In other expert reports, the viability was judged as negligible and the project risky. Even the two parliamentary committees responsible for vetoing approval apparently came to different conclusions in spite of basing their verdict on the same evidence. The *Committee of Environment and Transport* (Umhverfis og samgöngunefnd) concluded that the project was too risky in terms of public benefits, but the *Committee of State Budget* (Fjárlaganefnd) concluded that the project was viable.

Vadlaheidar-tunnel was originally intended to be a private project relying on market financing. The revenues generated from toll fees were supposed to cover construction, operation and investment costs (Jonasson, 2006). However, the project took another direction when private investors were not

willing to finance the project on the terms offered. The project ended as private-public partnership with the Icelandic state securing the necessary investment loan to finance the project. This arrangement was heavily criticized – see, for example, the parliamentarians Mosedottir (2012), calling the deal "Greek accounting", and Gretarsdottir (2013) claiming that the project assumptions were clouded with uncertainty and the risk fully transferred to the state account. This criticism is arguably based on the agreement that the state now has the obligation to finance the project. The insurance is a mortgage in the company Vadlaheidargöng. This company is building and operating the tunnel. The problem is, according to critics, that the Icelandic state is the major shareholder in this company. The risk hedging for the financing is therefore the credit in a company owned by the risk taker.

The agreement had to be passed as law from the parliament prior to formalizing the loan agreement. When the proposal[17] was submitted to the parliament for discussion and voting, an opinion report from the Ministry of Finance was included. This is the procedure used so the decision makers can orient themselves by analysing arguments and facts regarding the project. In the attachment to the bill, several expert reports are cited. It can therefore be assumed that the consultants cited in this document are contributing to the decision-making regarding the Vadlaheidar-tunnel.

External consultancy is widely used in the world as part of the public project lifecycle. Consultants are used on all stages, but in this study we are interested in how consultants are used at the decision stage prior to the commitment of public capital. The Icelandic law and directives were both enacted in 2001. However, no specific governmental demands regarding the role of external consultants can be found either in the law on the arrangement of public projects (Althingi, 2001) or in the directive specifying the management procedure (Ministry of Finance, 2002). Nothing can be detected regarding consulting besides a declaration stating that the Government Construction Contracting Agency will provide advice on *"technical matters regarding construction and project preparation"*. In fact, very few official guidelines exist regarding the management and the application of best practice in public projects in Iceland. Needless to say, this makes direct comparison regarding Icelandic demands and any other official framework difficult.

The opinion report attached to the bill proposal authorizing the government to secure the financing of the tunnel provides the opportunity to investigate the use of external consultants in large projects and to benchmark them as they were quoted in the bill. This is important in the context of what is previously stated in this text. The Vadlaheidar-tunnel project was the subject of a paradoxical and confusing debate as specialists argued either for the project or against the project. Parliamentarians, apparently judging the project from the same technical specifications and expert reports, came to totally different conclusions regarding the project's viability. This controversy is disturbing and it is difficult to bypass the thought that human biases are at work.

The role of consultants has not escaped the debate on strategic misrepresentation. The official role of external expert opinion in the context of the decision-making seems obvious – to seek professional advice so that the project under screening is without reasonable doubt in favour of the stakeholder paying for the investment. If this is put into context with the law on the arrangement of public projects it is reasonable to cite once more the argumentation for the legislation in the words of the

[17] Parliamentary document 1156–718.

then Minister of Finance*; "[the] objective of this legislation [was] to ensure optimal use of capital invested in public projects"* (Haarde, 2001).

As other studies in this thesis have indicated the framework for public projects in Iceland is not on a par with what might be expected in a developed country. The same applies to the framework for the use of independent consultants regarding public projects. This can lead to risk especially if the role of the consultant is not clear. Instead of a decision-making process where information is gathered, collated and introduced in an unbiased and professional manner the opposite could be true. The consultancy could in fact be supporting strategic misrepresentation instead of enabling the decision maker to decide the *"optimal use of capital invested in public projects"*. What adds to the problem is that decision makers might tactically decide to rely on consultants willing to serve the special interest at stake. In the words of Wachs (1989), *"[the] most effective planner is sometimes the one who can cloak advocacy in the guise of scientific or technical rationality"*.

The most critical stage is in the beginning of the project lifecycle, i.e. when the initial decision of go/no-go is made. When the project enters the implementation stage, it is difficult to stop. In Norway, assurance of the viability of a major public project is managed through a process called *Quality Assurance (QA1)*. The objective is: *"[to] ensure that the choice of concept has been subjected to a political process of fair and rational choice. The ultimate aim is that the chosen concept is the one with the highest economic returns and the best use of public funds. The choice of concept is a political decision to be made by the Cabinet, while the consultant's role is restricted to assert the quality of the documents supporting the decision"* (Norwegian Ministry of Finance, 2013).

QA1 is in fact the initial conception and includes the following: cost-benefit analysis; a business case in the realms of strategic, tactical and project management disciplines; assessment placing the project in context of the general interest of the state and indirect impact; validation of derived opportunities outside the project scope; assessment of budget, schedule and risk for at least two other options plus assessment of not investing in the project; and a project plan for the proposed project idea. The Norwegian Ministry of Finance also provides consultants with checklists and detailed technical and economical guidelines as part of the process (see, for example, Norwegian Ministry of Finance (2012)). All this must be present prior to the decision-making in the Norwegian parliament.

### 4.5.2 **Design**

The argumentation for using a detailed description of procedures, processes and work methods can be found, for example, in the OECD definition of what governance is: *"the formal and informal arrangements that determine how public decisions are made and how public actions are carried out, from the perspective of maintaining a country's constitutional values in the face of changing problems, actors and environments"* (OECD, 2005). OECD also emphasizes the need for an effective governance framework to impact the *"overall economic performance"*(OECD, 2004:17), where *"[corporate] governance involves a set of relationships between a company's management, its board, its shareholders and other stakeholders. Corporate governance also provides the structure through which the objectives of the company are set, and the means of attaining those objectives and monitoring performance are determined"* (OECD, 2004:11).

It is evident that OECD recommends a clear definition of the interface between different stakeholders to strengthen the bounds between strategy, tactics and operation. In other words, the wedding of the public interests with the cost of the activities required to serve those interests. The effort to increase the quality of public governance is also referred to as New Public Management (NPM) (see Chapter 4.3.1.).

The approach is that of a case study based upon analysing, first, how the formal demands for the arrangement of public projects are in the respective countries of Iceland and Norway in context of the governance strategy. Second, the decision process regarding the Vadlaheidar-tunnel was analysed on the basis of evidence presented at the time of the decision to approve the project. Third, a checklist stating the minimum (Norwegian) criteria was prepared upon the basis of the QA1 process.

### 4.5.3 Data sources/gathering

As noted above, during the early stages the conception of the project was not easy as expert views where almost totally contradictory. In addition, the rules of decision-making were unclear since the public project lifecycle in Iceland is supported by general rules only, not protocols or detailed guidelines. Direct comparison with the Norwegian criteria is therefore difficult. However, an opportunity to investigate how decisions are supported surfaced when a new bill (Althingi, 2012) was presented to allow an exception to the ruling law concerning state guarantees. The Icelandic state secured the loan for the construction period with the intention of refunding the project when ready and operational. But there was an obstacle since the private sector promoters could not come up with the equity required by the law on public-private partnerships (no. 122/1977). According to that law, the treasury is not allowed to provide a state guarantee unless 20% of the total project cost is secured by the private sector partner. So an exception had to be made to lower this percentage to 5%. When promoting the bill, a number of reviews and export opinions were attached to the bill and cited as argumentations for this deviation from the general rule. The reviews gave the opportunity to compare the content of the cited reports against the Norwegian due diligence process. In addition, we covered other reports not cited in the bill attachment probably due to how negative they were. By including other reports, it was possible to have the level of information on the project's viability that was sufficient for the purpose of evaluation. The following is a list of the reports with the original Icelandic names in parenthesis.

1. Estimate on macroeconomic benefits (Mat á þjóðhagslegri arðsemi).
2. Introduction to a road tunnel under Vadlaheidi and road connections (Kynning á jarðgöngum undir Vaðlaheiði ásamt vegtengingum).
3. Estimate on social impacts (Mat á samfélagsáhrifum).
4. Fees for the use of transport constructions (Gjaldtaka fyrir notkun samgöngumannvirkja).
5. Can fees cover construction and operational costs? (Geta veggjöld staðið undir kostnaði við gerð og rekstur).
6. Estimate on solvency and assumptions (Mat á greiðslugetu og forsendum).

All in all, six reports were screened by means of document analysis to understand how the content complied with the following set of criteria taken from the QA1 process (NTNU, 2010).

- Review the documentation with emphasis on internal and reciprocal consistency.
- Assess the process and methods used for mapping the opportunity space to see if it is sufficiently wide to allow all relevant alternatives to be considered.
- Provide an assessment of the presented alternatives in terms of:
    - their ability to attain the goal and purpose;
    - compliance with overall needs/requirements; and
    - whether they capture the most interesting and feasible alternatives within the opportunity space.
- Undertake an independent uncertainty analysis of all alternatives, using the same framework as in QA2[18] for investment costs, but with a level of precision adapted to the pre-study phase. Also quantify uncertainty related to the long term flows of costs and benefits.
- Undertake a cost-benefit analysis using the expected values and stochastic spread (for the systematic elements) from the uncertainty analysis as inputs.
- Give recommendations regarding the decision strategy.
- Rank the proposed alternatives, based on an overall assessment of impacts (expressed in monetary or other terms), as well as the alternatives' decision flexibility and feasibility of the fiscal plan.
- Give recommendations regarding the implementation strategy. Focus on benefits realization and aspects regarding the owner perspective (governance). Give advice on which elements from QA1 should be included in the project's overall project management document (steering document).

### 4.5.4 Data analysis

Compliance with the QA1 process was given in accordance with values from 0 = none compliance to 4 = strong compliance. If the criterion was evaluated as not applicable (NA) it received no value and therefore did not contribute to the overall assessment.

[18] The QA2 process is the quality assurance basis for the project execution (Samset et al., 2006).

**Table 9. The matrix used to evaluate the compliance of six expert reports forwarded in the conception of the Vadlaheidar-tunnel project.**

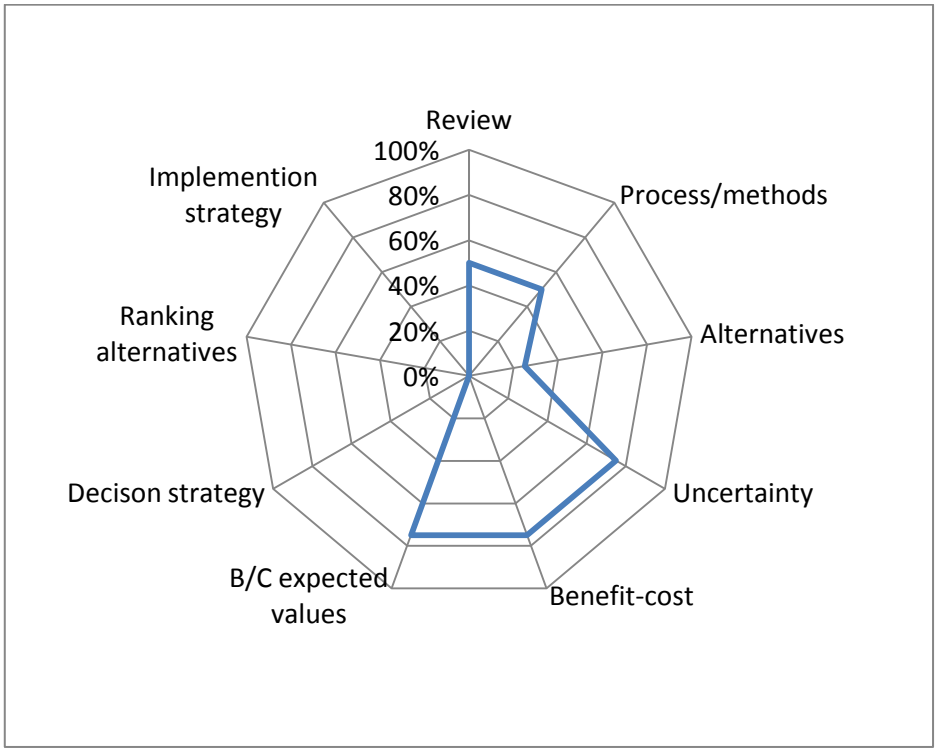
| Report # | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Criteria* | *Com-pliance* | *#* | *Com-pliance* | *#* | *Com-pliance* | *#* | *Com-pliance* | *#* | *Com-pliance* | *#* | *Com-pliance* | *#* |
| Review | Some | 2 | Little | 1 | Some | 2 | NA | NA | Little | 1 | Some | 2 |
| Process/ methods | Little | 1 | Some | 2 | Some | 2 | NA | NA | Some | 2 | Some | 2 |
| Alternatives | None | 0 | Little | 1 | None | 0 | NA | NA | Little | 1 | NA | NA |
| Uncertainty | None | 0 | None | 0 | None | 0 | NA | NA | Some | 2 | Much | 3 |
| Benefit-cost | Little | 1 | Some | 2 | Little | 1 | Some | 2 | Much | 3 | Much | 3 |
| B/C expected values | None | 0 | None | 0 | None | 0 | Some | 2 | Some | 2 | Much | 3 |
| Decison strategy | None | 0 | None | 0 | None | 0 | NA | NA | None | 0 | None | 0 |
| Ranking alternatives | None | 0 | NA | NA | None | 0 | NA | NA | None | 0 | NA | NA |
| Imple-mention strategy | NA | NA | NA | NA | NA | NA | NA | NA | None | 0 | None | 0 |

Table 9 shows the degree of compliance between the QA1 criteria and the six expert reports.

### 4.5.5 **Results and interpretations**

The results are presented in a radar chart in figure 13. This can be interpreted as if a decision maker had read all six reports and had gained a decent insight and understanding regarding the benefits and costs of the project, the uncertainties, processes and methods and its social value. The other criteria are hardly mentioned in the reports.

**Figure 13. A radar chart with values as ratio of 100% of compliance.**




These results rhyme well with Study I, where feasibility studies on public projects in Iceland were compared with best practice. Overall, just 40% of QA1 criteria are included in those reports, representing a significant gap.

It is not appropriate to generalize from a study such as this one. As there is no archive or database where information kept by the government is available, we have to rely on documents within reach. This is also in a contrast with how Norway arranges projects as the relevant information for QA programs are kept in a database (NTNU, 2014). Arguably, some reports were accessible to the decision makers that were not cited in the attachment to the aforementioned bill. However, we believe we can assume from the case study of Vadlaheidar-tunnel that the decision-making process provides considerable room for improvement. The difficult and controversial debates regarding the project's feasibility speak volumes by themselves. There are clear signs of strategic misrepresentation. For instance, the two committees primarily responsible for feasibility and cost estimating came to totally different conclusions. The Transport and Environment Committee openly declared the project too risky (Gretarsdottir, 2012), but the Finance Committee voted for the project anyway. No parliamentarians from the constituency where the project will be implemented are in the former committee, but three parliamentarians from this part of the country were in the Finance Committee and the same goes for the (then) Minister of Finance.

## 4.6 Study V: Reference class forecasting in Icelandic transport infrastructure projects

Lovallo and Kahneman (2003) describe how easy it is to make estimating errors. A group of academics where estimating the timeframe to develop a new curriculum for high schools in Israel. The worst case scenario was considered to be 30 months. In spite of being prompted over doubts regarding the longevity of the process, the team conducting the project choose to ignore the pessimistic information and proceed as planned. The process took eight years or to quote the paper: *"[the] wise decision at this point would probably have been for the team to disband. Instead, the members ignored the pessimistic information and proceeded with the project. They finally completed the initiative eight years later, and their efforts went largely for naught – the resulting curriculum was rarely used."*

This account has been widely used to show that people are not particularly good at estimating when asked to forecast personal future achievements. However, when asked to estimate other people's feats, the accuracy is much better (Lovallo and Kahneman, 2003). The best accuracy is achieved when supported by empirical evidence. This observation was developed into a forecasting method called the *outside view* also called reference class forecasting (RCF). The opposite of the outside view is the *inside view* where the decision maker is frequently distracted by what are called planning fallacies, which were discussed earlier in this thesis. This study attempts to answer the research question: can reference class forecasting improve forecasting accuracy? The context is the Icelandic Road Administration (ICERA).

### 4.6.1 Purpose

Certain types of project are notoriously prone to inaccurate cost forecasts. Flyvbjerg et al. (2002) reviewed 258 projects and found that nine out of ten suffered from a cost overrun. When Jennings (2012) investigated the cost estimates for the London 2012 Olympics over a five-year period, the project's cost had escalated from an original estimate of £1.8 billion to more than £9.3 billion when the budget was formally reviewed. Later examples of cost overruns are The Winter Olympics in Sochi (Guardian, 2014), World Football Cup in Brazil (IBTimes, 2014) and The Eurovision Song Contest 2014 held in Denmark (DR, 2014).

Jennings (2012:458) identifies three underlying factors contributing to the underestimation of cost for a large-scale project: the first is how risk and uncertainties are downgraded in the political and bureaucratic context; second, is the problem of decision-making under uncertainty leading to systematic biases; and third, the complex technical challenges inherent in large-scale projects resulting in lack of management and administration.

There is no simple explanation for under-performance in cost forecasting but, at the most basic level, it can be grouped into three categories: technical, psychological and political (Flyvbjerg, 2006; 2011). Technical explanations cover inaccuracy in terms of project uncertainty, unreliable or out-dated data and the use of inappropriate forecasting models (Vanston and Vanston, 2004). These are often typical explanations, used by management, for under-performance against forecasts. Psychological explanations describe inaccuracy in terms of optimism bias. Circumstances are interpreted in favour of taking risks if the decision-maker is convinced that the rewards exceed the cost. In so doing, it provides decision-makers with an attractive argument to explain failed projects, i.e. they were taking

reasonable risks. In other words, optimism bias occurs when planners fall into the trap that psychologists call the planning fallacy (Lovallo and Kahneman, 2003). Political explanations cover inaccuracy in terms of strategic misrepresentation, which occurs when forecasters and managers deliberately and strategically over-estimate the benefits and under-estimate the costs of a project in order to increase the probability of approval for funding (Flyvbjerg, 2005a; 2006).

Planners might also see themselves in two distinct roles that are in contradiction with each other. On the one hand, planners are scientists who analyse data to provide the best solution for a problem but must at the same time accept the preference of the client (see Chapter 3.4.5.).

Reference class forecasting (RCF) is a method for systematically taking an outside view when planning projects, by basing forecasts on actual performance of comparable projects rather than focusing only on the project in hand. Originally, RCF was developed to compensate for the cognitive bias that Kahneman and Tversky (1974; 1979) discovered in their work on planning and decision-making under uncertainty. In short, their work demonstrated that human judgement is generally optimistic and over-confident with a tendency to under-estimate cost, completion times, and risk of planned actions, whilst over-estimating benefits. Flyvbjerg has since expanded the use of RCF to improve control and due diligence evaluation of project front-end preparation (Flyvbjerg, 2013).

The work of Flyvbjerg and COWI (2004) on procedures for dealing with optimism bias in transport planning is primarily focused on the use of RCF in the initial stage of a public project when the decision for go/no-go is under review. This study differs as it focuses on the application of RCF to the planning stage following the decision to implement the project. The subject of the research is the work of the Icelandic Road Administration (ICERA). The purpose of this study is the building of a reference class forecasting model with data provided by ICERA to evaluate the risk of cost overrun on transportation projects in Iceland.

### 4.6.2 Design

The research is quantitative and covers the population of all accessible ICERA projects at the time of study. The method adopted to construct the model is comparable to the procedure originally used by UK government (Department of Transport) under the supervision of Flyvbjerg and COWI (2004). The research method is based on analysing empirical data of completed projects to establish statistical information on the differences between actual cost at project completion and the forecasted cost at the beginning of the project (Lovallo and Kahneman, 2003). The following three key steps were defined.

1. Identification of a relevant reference class of past projects. It was important that the class was broad enough to be statistically meaningful, yet narrow enough to be comparable with the specific project at hand.
2. Establishing a probability distribution for the selected reference class. This required access to reliable data on cost overruns for a sufficient number of projects within the reference class to make a statistically meaningful conclusion (normally, at least 10).
3. Comparison of the specific project with the reference class distribution. The most likely outcome for the specific project was established.

**Step 1**

The main issue when identifying a relevant reference class of past projects is how the classification should be determined. Reference classes cannot be too narrow, e.g. transportation projects cannot be divided into too many categories because it could be difficult to establish valid optimism bias uplift as each category would be too small. Similarly, reference classes cannot be too wide, because some projects within each reference class are unlikely to be comparable (Flyvbjerg and COWI, 2004). Each reference class should reveal the risk of cost overrun based on statistical analysis, benchmarking and other forms of analysis. Uplift refers to the amount of additional funding that is needed to raise the cost estimate so that there is an equal chance of the outturn cost being above or below the planned cost. In other words, it produces the 50:50 or 50% cost estimate.

**Step 2**

Once the reference classes had been built, an accurate probability distribution for overrun was found for each class. Cost overruns in percentiles were defined according to equation (1), where *I* = Cost overrun in %, *Ta* = Actual cost of a project and $T_f$ = Forecasted cost of a project. Actual cost is defined as real, accounted cost is determined at the time of completing a project and forecasted cost is defined as the cost at the time the decision is made to implement the project.

$$I = \frac{(T_a - T_f)}{T_f}$$

In order to ensure comparability, it was important that the definition of forecasted and actual cost was identical for all projects. The distribution for each reference class was used to establish the optimism bias uplifts – see step 3.

A particular concern was the representativeness of the data sample. A number of issues were considered in the light of Flyvbjerg and COWI (2004). In this connection, it could be argued that projects that are well-managed regarding data availability are also likely to be well-managed in terms of other factors which result in better than average performance.

Managers of projects that have large over-expenditure are likely to be less interested in making cost data available, while more successful project managers might well to be interested in making cost data available. This leads to under-representation of bad projects, but over-representation of good projects in the sample.

Even when managers have made cost data available, they might have decided to provide data that present their projects as favourably as possible. Often, there are several forecasts of cost and several estimates of actual cost to choose from. There might therefore be a temptation for managers to choose the combination of forecasted cost and actual cost that make their projects look good on paper.

There might be difference in the representation of different sub-samples, e.g. in a reference class that is supposed to be comparable for both bridges and tunnels, 85% of the projects might be bridges and only 15% tunnels.

**Step 3**

Once a probability distribution for cost overrun has been found for each reference class, it is possible to determine the required optimism bias uplift. Required uplifts are established as a function of the level of risk one is willing to take. A lower level of acceptable risk results in a higher required uplift (Flyvbjerg and COWI, 2004).

If the project being examined is regarded as average then it should be expected that, on average, the final cost will exceed the forecasted cost by the average budget increase. For example, if in a single reference class the average cost overrun is, say, 10%, then to have a 50% chance of being under or over forecasted cost, 10% uplift should be added to the project being compared to the reference class. If it is unacceptable to have a 50% chance of cost overrun then the uplift needs to be higher than the average budget increase.

For ICERA, which had, and which continues to implement, a large portfolio of projects, the total realised budget increase across all projects can be expected to be close to the expected average. ICERA might have to decide if the 50% chance of the actual cost exceeding the budget is an acceptable risk or not. If not ICERA should add an uplift to the budget relative to the frequency of the empirical data of past projects in the reference class.

The uplifts refer to cost overrun calculated in constant prices. The lower the acceptable risk for cost overrun, the higher the uplift. For instance, if there is a willingness to accept a cost overrun in a project in a given reference class of only 10%, ICERA must add an uplift of 90% to the projects. If ICERA accepts a 20% chance of cost overrun it must add 80% of the cost overrun in the reference class and so on.

### 4.6.3 Data sources/gathering

A database of projects over a five-year period was obtained directly from ICERA covering projects completed between 2007 and 2011. The database contained 80 projects, 11 of which had been completed in 2007, 24 in 2008, 22 in 2009, 15 in 2010 and 8 in 2011. As each project can comprise different project segments, i.e. a single project can consist of bridges, roads and tunnels, some projects had to be split. For that reason, the database contained 110 projects (project segments) in all, 14 of which were completed in 2007, 39 in 2008, 23 in 2009, 23 in 2010 and 11 in 2011. All projects for which cost data were available were initially included in the sample.

The 110 projects in the database covered the following types of work: roads, entrance ramps, traffic roundabouts, intersections, bridges, underpasses, drainage, waterside protection, road lighting and electrical installations, fences, conduits and wiring systems, ditches, poles and utilities. Project information included the following.

1. Primary cost plan both from ICERA and from the contractor who was awarded the main contract.
2. Secondary cost plan both from ICERA and from the contractor.
3. Actual cost of the project.

Cost data were provided in two categories: forecasted cost (primary cost plan) and actual cost (including additional cost items). The information was not however completely reliable as closer examination showed that items that should have been recorded as additional cost were, in some instances, recorded as forecasted cost and vice versa. Correcting these anomalies ensured that the forecasted cost, as shown in the primary cost plan, and actual cost were comparable.

After identifying the transportation projects included in the database, it was decided to make two reference classes similar to those classified in the UK for the same kind of project. After discussing this proposal with the directors of ICERA, it transpired that it was not possible to say if traffic roundabouts, entrance ramps and intersections should be placed in the same group as roads in general or if they should be treated as statistically similar: much depended on the nature of the project. Eventually, it was decided to classify transportation projects into roads and fixed links (see table 10).

### 4.6.4 Data analysis

For all possible cost overruns, the frequency of a project having a given cost overrun or higher value was counted. The number of projects with a given maximum cost overrun was determined. The probability distribution with cost overrun on the x-axis and the share of projects with a given maximum cost overrun on the y-axis were determined.

**Table 10. Classification of Icelandic transportation projects.**

| Category | Types of projects | Source of optimism bias uplifts |
|---|---|---|
| Roads | Main roads | Reference class of 65 road projects |
| | Connecting roads | |
| | Region roads | |
| Fixed Links | Bridges | Reference class of 11 bridge and underpass projects |
| | Underpasses | |

Since the database contained both the primary cost plan of ICERA and the primary cost plan of the contractor awarded the project, it was decided to find the uplift for both. Key statistics about each reference class are summarized in tables 11 and 12.

**Table 11. Key statistics on Reference Class 1 – Roads.**

| Reference Class 1 – Roads | | |
|---|---|---|
| | ICERA | Contractor |
| N= | 65 | 65 |
| Average overrun | 6% | 27% |
| Standard deviation | 0.237 | 0.213 |
| Variance | 0.056 | 0.045 |
| Maximum overrun | 118% | 97% |
| Minimum overrun | 36% | -7% |

**Table 12. Key statistics on Reference Class 2 – Fixed Links.**

| Reference Class 2 – Fixed Links | | |
|---|---|---|
| | ICERA | Contractors |
| N= | 11 | 11 |
| Average overrun | 7% | 19% |
| Standard deviation | 0.207 | 0.199 |
| Variance | 0.043 | 0.04 |
| Maximum overrun | 34% | 63% |
| Minimum overrun | -24% | 1% |

In ICERA's Reference Class 1 – Roads, the project with the second highest cost overrun had an overrun of 53%, but the project with the highest cost overrun had an overrun of 118%. If this project, with the highest cost overrun, had been left out of the reference class the difference between the maximum and minimum overrun would have decreased substantially. However, it was decided to include this project in the reference class as there was nothing to indicate that the data on this project were unreliable. Projects were excluded from the reference class only if there was a belief that the data might be erroneous.

The practical application of this model is that when a new project is scheduled a primary cost plan is prepared as normal. With a primary cost plan, it is necessary to choose an acceptable risk level. It is then possible to add an appropriate uplift to the primary cost plan as risk capital. The 50% percentile

should only be used in instances where it is accepted there is a high risk that cost overrun will occur and in situations where investors are funding a large number of projects and cost savings on one project may be used to cover the costs of overruns on other projects. The 80-90% percentile (20-10% acceptable chance of cost overrun) should be used when it is agreed that overrun must not occur on a particular project.

Figures 14 and 15 show the distribution of cost overrun for each reference class for both ICERA and the contractor.

**Figure 14. Probability distribution of cost overrun for Reference Class 1 – Roads, N=65 (ICERA).**

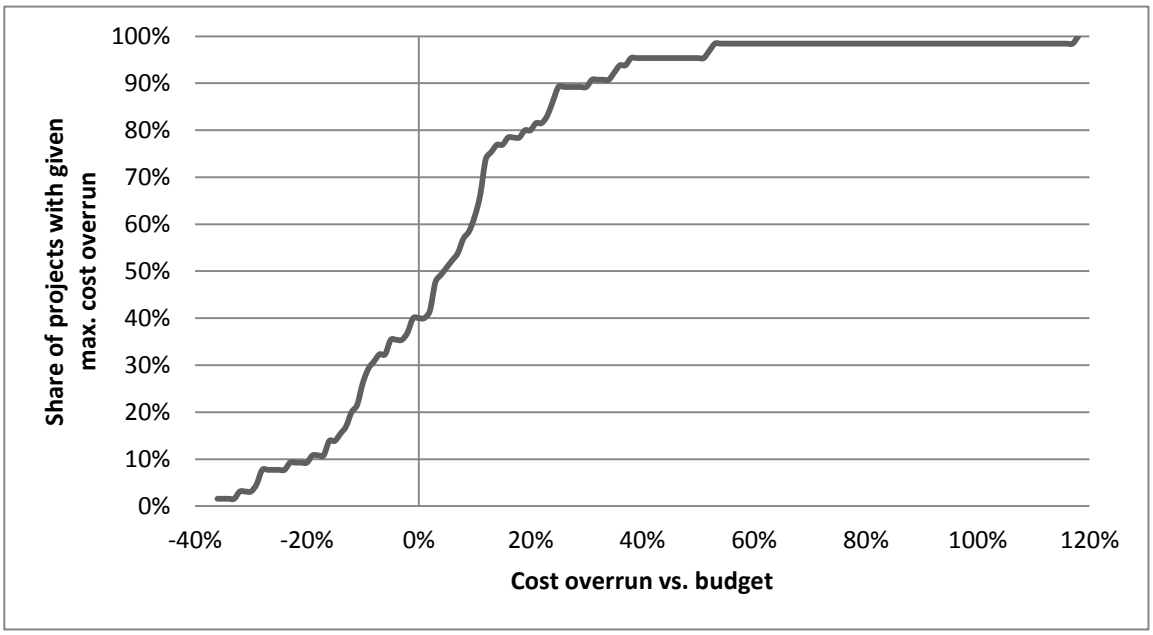



Figure 14 shows the distribution of cost overrun for ICERA's primary cost plan covering road projects. For example, 40% of projects have a maximum cost overrun of 0% and 80% of projects a maximum overrun of 19%.

**Figure 15. Probability distribution of cost overrun for Reference Class 1 – Roads, N=65 (Contractor).**

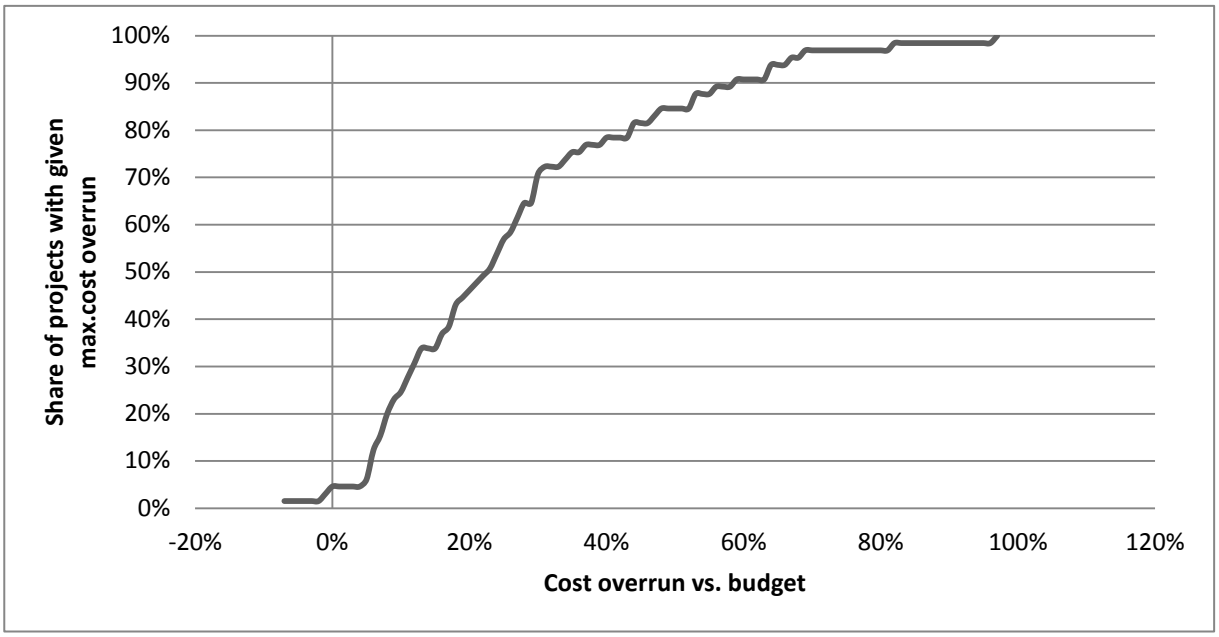



Figure 15 shows the distribution of cost overrun for the contractor's primary cost plan covering road projects. For example, 40% of projects have a maximum cost overrun of 17-18% and 80% of projects have a maximum overrun of 43-44%.

**Figure 16. Probability distribution of cost overrun for Reference Class 2 – Fixed links, N=11 (ICERA).**

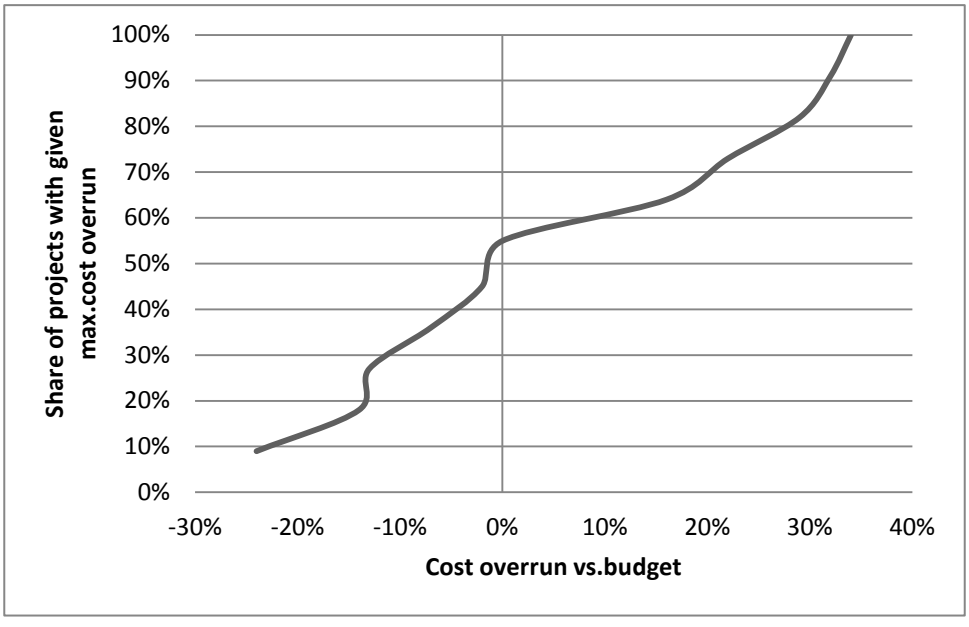
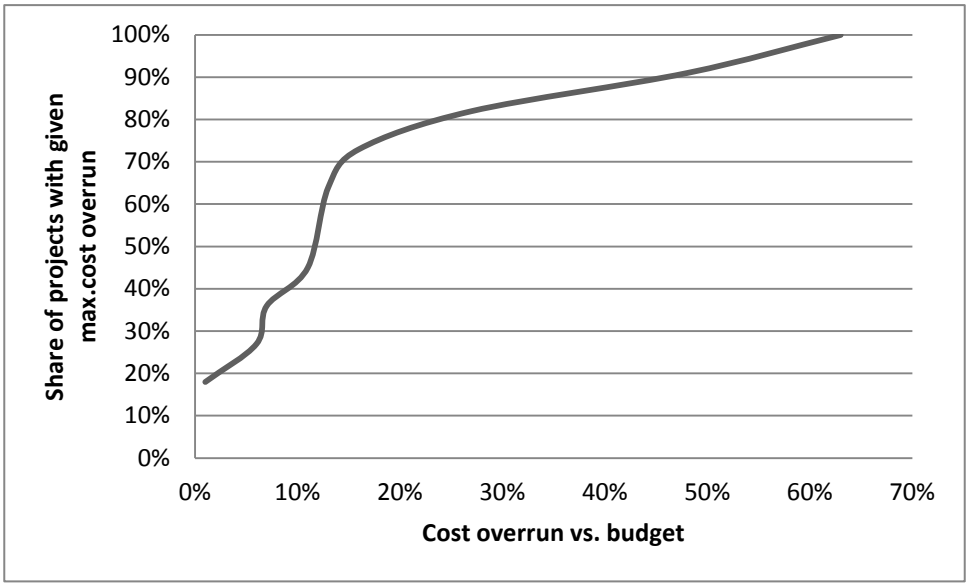



Figure 16 shows the distribution of cost overrun for ICERA's primary cost plan regarding fixed links projects. For example, 40% of projects have a maximum cost overrun of (-3)-(-2)% and 80% of projects a maximum overrun of 28-29%.

Finally, Figure 17 shows the distribution of cost overrun for the contractor's primary cost plan covering fixed links projects. For example, 40% of projects have a maximum cost overrun of 10-11% and 80% of projects a maximum overrun of 26-27%.

**Figure 17. Probability distribution of cost overrun for reference class 2 – Fixed links, N=11 (Contractor).**




Figures 18 and 19 shows the required uplift as a function of the maximum acceptable level of risk. These figures apply to Reference Class 1 – Roads and show the required uplift that should be added to ICERA's and the contractor's cost plans.

**Figure 18. Required uplift as function of the maximum acceptable level of risk for cost overrun – Roads (ICERA).**

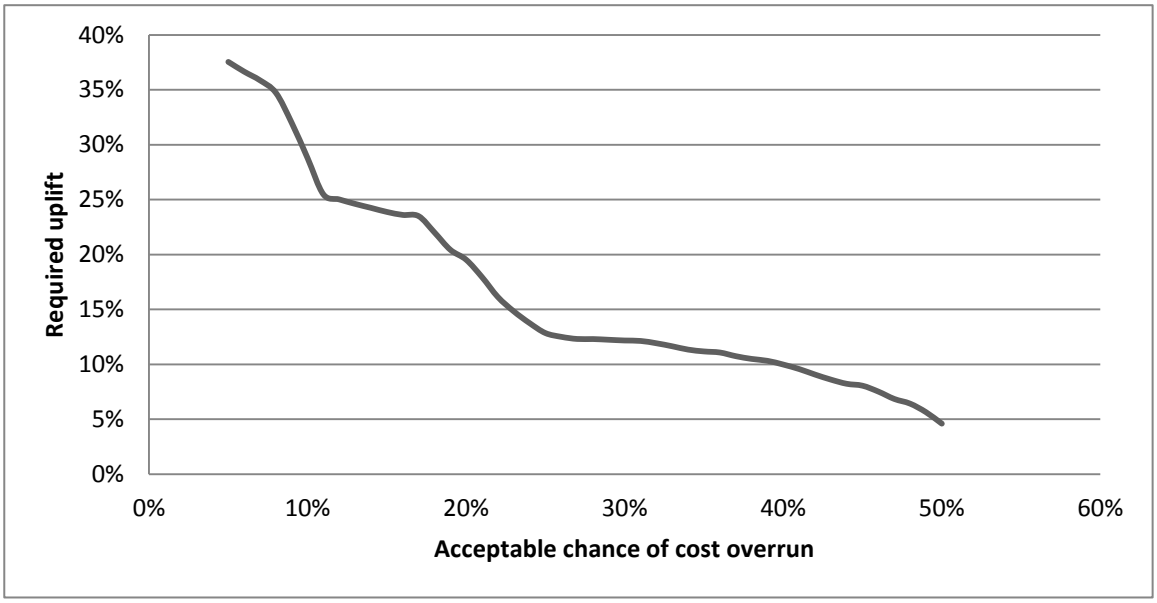
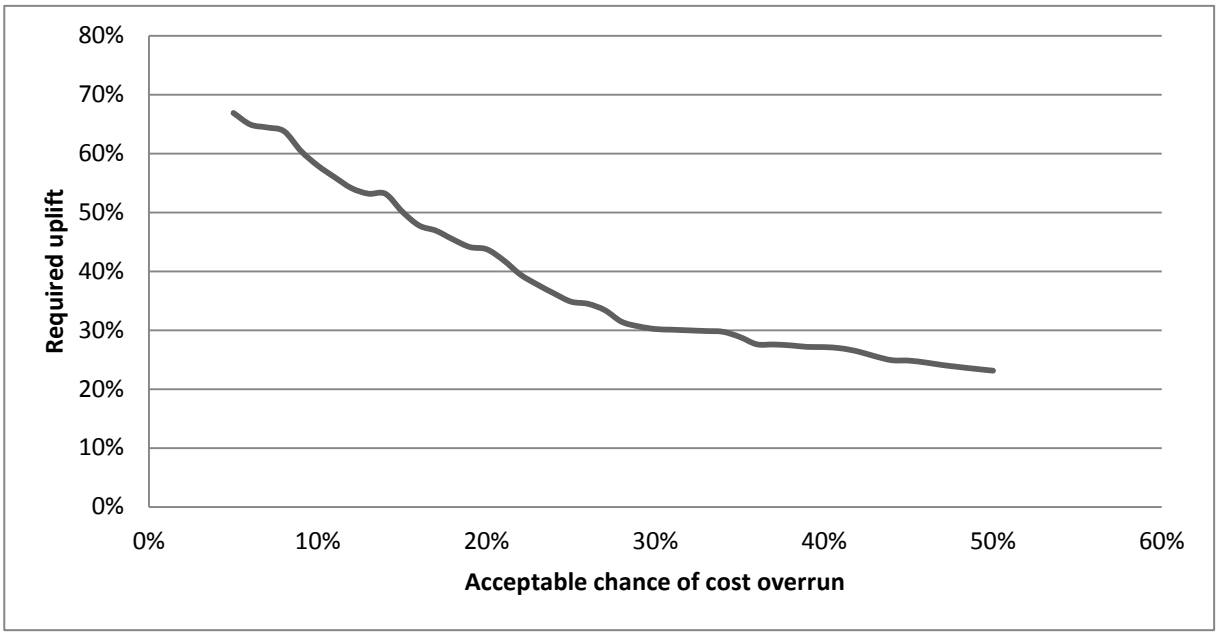


**Figure 19. Required uplift as function of the maximum acceptable level of risk for cost overrun – Roads (contractors).**




Figures 18 and 19 indicate that, if it had been decided, the risk of cost overrun for a road project should be less than 50% (having a 50% chance to be within budget), it would be necessary to use an uplift of 5% on ICERA's primary cost plan with an uplift of 23% on the contractor's primary cost plan. If it had been decided that the risk of cost overrun should be less than 20% (having a 80% chance to be within budget) then an uplift of 20% should be added to ICERA's primary cost plan with 44% added to the contractor's primary cost plan.

Figures 20 and 21 apply to Reference Class 2 – Fixed Links and show the required uplift that should be added to ICERA's and the contractor's cost plans.

**Figure 20. Uplift as function of the maximum acceptable level of risk for cost overrun – Fixed links (ICERA).**

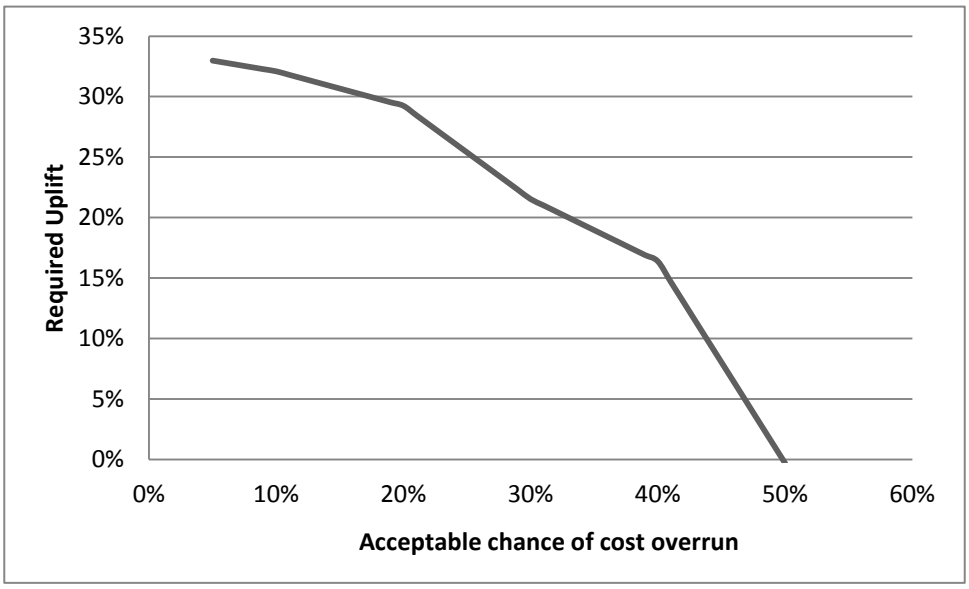
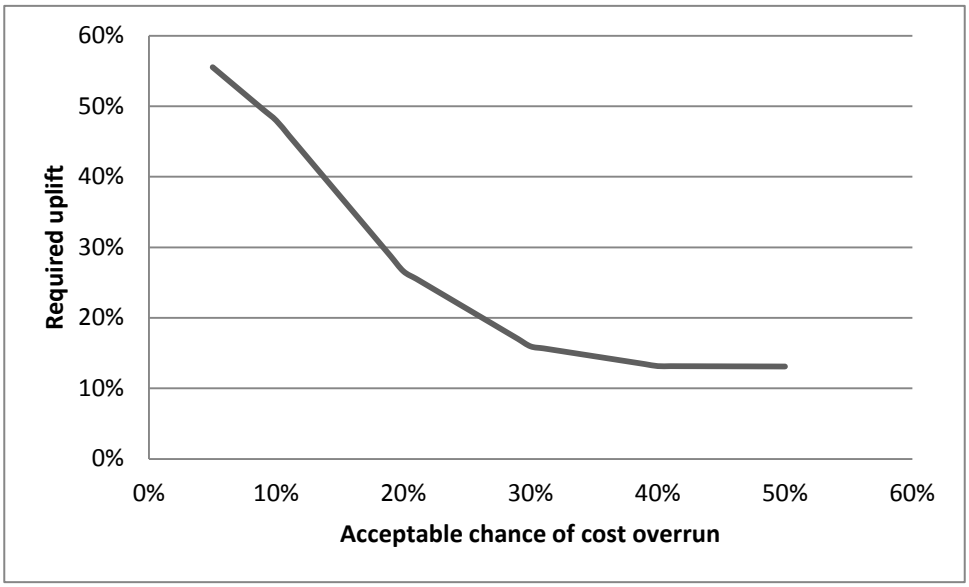


**Figure 21. Uplift as function of the maximum acceptable level of risk for cost overrun – Fixed links (Contractors).**




Figures 20 and 21 show that, if it had been decided that the risk of cost overrun for a fixed link project should be less than 50% (having a 50% chance to be within budget), it would not be necessary to add an uplift on ICERA's primary cost plan. However, an uplift of 13% would be required on the contractor's primary cost plan. If it had been decided that the risk of cost overrun should be less than 20% (having an 80% chance to be within budget) then an uplift of 29% should be added to ICERA's primary cost plan and 27% should be added to the contractor's primary cost plan.Table 13 summarizes the required uplift for selected percentiles for both reference classes for ICERA and contractors.

**Table 13. Overview – the required uplifts for ICERA and contractors.**

| | | Applicable optimism bias uplifts | | | | |
|---|---|---|---|---|---|---|
| Category | Types of projects | 50% | 60% | 70% | 80% | 90% |
| ICERA | | | | | | |
| Roads | Main roads | 5% | 10% | 12% | 20% | 29% |
| | Connecting roads | | | | | |
| | Region roads | | | | | |
| Fixed links | Bridges | 0% | 16% | 22% | 29% | 32% |
| | Underpasses | | | | | |
| Contractors | | | | | | |
| Roads | Main roads | 23% | 27% | 30% | 44% | 58% |
| | Connecting roads | | | | | |
| | Region roads | | | | | |
| Fixed links | Bridges | 13% | 13% | 16% | 27% | 48% |
| | Underpasses | | | | | |

### 4.6.5 Results and interpretations

The short answer to the results is that there is no urgent need for ICERA to adopt reference class forecasting as its current methodology based on time series data seems to work well enough. Projects completed over a five-year period record an average overrun of 6%, which could be considered a moderate indicator of success. The ideal position is to have an average overrun as close to zero as possible. To reach this position, ICERA could add 5% uplift for optimism bias to all its primary cost plans for road projects, but it is questionable if the effort is worthwhile for such a small reward.

Even though the research did not succeed in finding a sufficient uplift for the proposed two reference classes, it is still the best estimate of the chance of cost overrun that currently exists for Icelandic transportation projects. If data were collected, the reference class forecasting is easy to adopt. For this reason, we expect that the forecasting model presented here will be further developed to reduce the incidences of inaccurate forecasting and cost overruns.

A reference class is a class of projects with statistically similar attributes and is intended to decide the risk in a new project proposal based on empirical evidence. Even so we found it interesting for educational purposes and for discussions to apply the method on the 26 projects previously discussed in Study III. If we assume that these projects form a reference class the outcome can be seen in Figures 22 and 23.

**Figure 22. Probability distribution of cost overrun for pseudo reference class of the 26 public projects from Study II.**

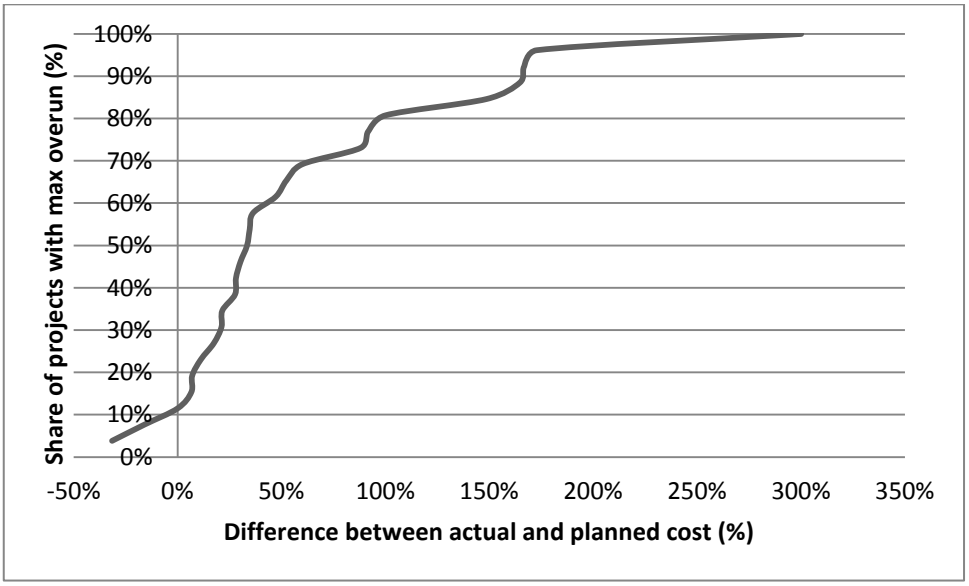
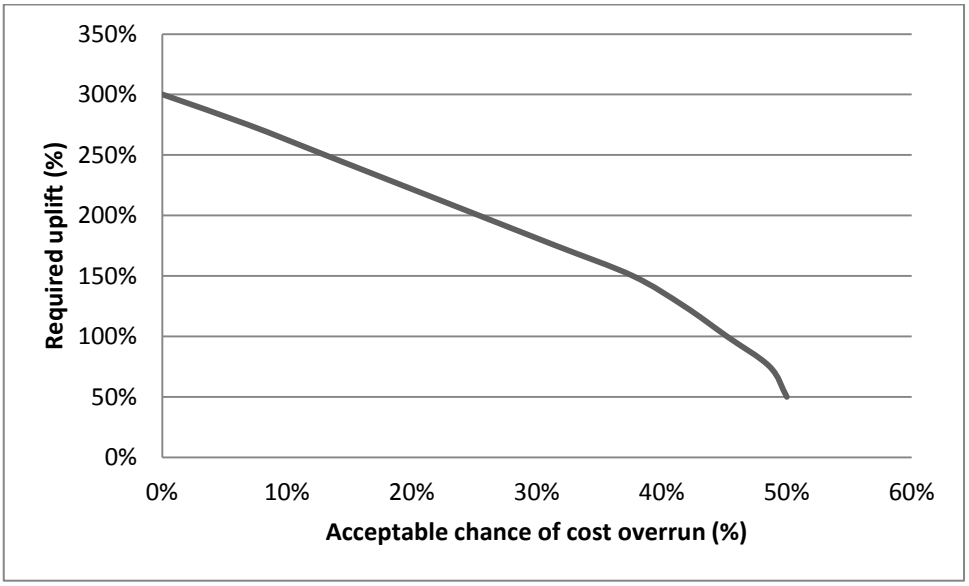



**Figure 23. Uplift as function of the maximum acceptable level of risk for cost overrun for the 26 public projects in Study III.**




As can be seen from figure 23 more than 50% uplift would be required to have even chance (50/50) to be within budget. This indicates that the use of RFC could be useful as a risk management tool in the beginning of the project lifecycle (approval- and conception stage) when the inital cost projection is presented. This is also in line with the application of RFC in other countries as mentioned earlier.

# 5 Conclusions

The research has the following hypothesis: *persistent cost overruns in Icelandic public projects can be traced to the lack of governance in the form of inadequate sets of standards, limited risk awareness among decision makers and limited compliance with best practice in project management.*

The studies undertaken to test this hypothesis indicate strongly that the hypothesis is true so an alternative hypothesis is not required.

## 5.1 Research questions revisited

The following research questions were asked. Each is re-evaluated and accompanied by brief comments on the findings.

### 5.1.1 Study I: The Feasibility of Public Projects in Iceland.

**Research question**: *Do the arrangements for a feasibility study on public projects in Iceland align with current best practice?*

Feasibility studies on public projects are mandatory according to Icelandic legislation. However, no detailed requirements are set forth to explain what is expected from the planner. The current process of feasibility analysis during the inception phase was found to be inconsistent. Moreover, there seem to be few practices that align with current best practice..

### 5.1.2 Study II: Benchmark study of Icelandic and international planning and decision procedures in projects.

**Research question***: Are Icelandic sets of standards regarding the conception, planning and management of public projects comparable with Norwegian, UK and other international standards?*

Icelandic legislation lags behind international developments. While other nations coordinate meticulous sets of standards with strong connections to contemporary evolution in project management, the Icelandic legislation mostly comprises general recommendations.

### 5.1.3 Study III: Does the perceived risk attitude among Icelandic decision makers correlate with the reality of cost overruns?

**Research question**: *As cost overruns are frequent in public projects, are parliamentarians aware of their behaviour when facing different probabilities of cost overruns in projects?*

In spite of strong evidence of a consistent problem of cost overruns in Icelandic public projects, parliamentarians consider themselves more conservative than decision makers in the private sector. Whilst the response is understandable, it is an indication of cognitive biases, i.e. this alleged conservatism is not supported by empirical evidence.

### 5.1.4 Study IV: Prerequisites and decision-making procedures on an Icelandic public project compared against Norwegian standards

**Research questions**: *Is the due diligence process in Iceland concerning the conception of an individual project comparable with Norwegian standards?*

The due diligence process reveals considerable room for improvement. If the quality assurance process applied in Norway to large projects were applied to Iceland's Vadlaheidar-tunnel project, there is virtually no likelihood that the project would be accepted as a liability on the state account.

### 5.1.5 Study V: Reference class forecasting in Icelandic transport infrastructure projects

**Research questions**: *Can reference class forecasting improve forecasting accuracy?*

The application of reference class forecasting offers the prospect of fewer surprises in terms of the gap between actual cost and forecast cost. Much depends, however, on the extent to which forecasting techniques have been developed in the respective agency. In the case of ICERA, it was found that RCF would not improve significantly forecasting accuracy from that presently achieved from the use of time series data.

## 5.2 General discussions

All studies, except one, reveal considerable room for improvement and so significant effort must be devoted to bringing Iceland to the same level as nations with similar governmental structure and economic prosperity. One study highlights a sound and realistic forecasting environment at the planning stage, which is in contrast to what was generally found at the decision stage.

International developments suggest noteworthy activities to clarify the interface between the market and the public organization. Governance has been improved by clarifying roles, accountability and the channels in the value chain. Besides the effort to improve governance with management procedures, emphasis is also on the application of behavioural sciences. Many countries have taken specific measures to bypass the risk of biases in decision-making by, for example, introducing a reality check on proposed public projects with the application of the outside view (reference class forecasting) (Flyvbjerg, 2013). Detailed guidelines and methodological frameworks are published and are easily accessible. These publications form an important point of reference for decision makers, planners and other stakeholders engaged in the process. The findings show how governance has been impacted by developments in project management and how risk management and decision analysis have been incorporated into project management as the project lifecycle has expanded to include strategic and tactical issues. This has also strengthened compelling international interest in project management, leading to the commencement of bodies of knowledge, accreditation and certification programs. These are often cross-referenced in official guidelines on governance.

The Icelandic legislation has the same strategic and tactical objectives as the countries with which it has been compared, namely Norway and the UK: to improve governance and optimize the investment of public capital. However, in spite of good intentions, the procedural foundation is missing to a large extent[19]. The relative gap between the comparator countries and international standards is large. This leads to inconsistency as public projects are conceived, planned and executed on case by case basis. The lack of a managerial framework not only increases the chance of cost overruns, but is also distracting for the public. An example of this is the Vadlaheidar-tunnel project where experts, in the absence of formal prerequisites, apparently interpret the project assumptions, in the context of viability, almost at will.

There is also evidence of false perception among parliamentarians as to the the true state of nature. Parliamentarians cannot be deaf to the debates and evidence of continuing problems regarding the likelihood of significant cost overruns on Icelandic public projects. The findings indicate that there is up to a 90% chance of a cost overrun on larger projects; it is impossible that decision makers in the parliament are unaware of this problem. Yet, they consider themselves extremely conservative compared to decision makers in the private sector which makes little sense. This gap between reality and perception is even more surprising as the parliament has invested resources in investigations to shed light on the root problems triggering the collapse of the financial system.

[19]It is worth mentioning that a sign of improvement can be detected. In 2013 the Prime Ministry issued two handbooks on governance. (1) Handbook on strategic planning (Prime Ministry Office, 2013a). (2)Handbook on project management (Prime Ministry Office, 2013b). The third handbook concerning the process of preparation and arrangement of the fiscal budget is a work in progress at the time of writing. These publications could not be included in the benchmark analysis accounted for in Study I or other relevant studies as they had not been published at time of writing. However, these steps arguably indicate increased awareness on the problems accounted for in this work and hopefully indicate further improvements on the public project lifecycle.

## 5.3 Evaluation of objectives

The scope of this work and the objectives of this thesis where outlined as follows:

1. Ascertain if the method for determining the feasibility of a proposed public project in Iceland is consistent with best practice.
2. Evaluate the procedural/methodological framework concerning the arrangement of public projects and compare it with international standards and legislation found in other countries.
3. Determine if cost overruns are, indeed, a problem for public projects and, if so, identify the reasons.
4. Investigate if the technique of reference class forecasting can improve cost forecasting by examining practices in an example public agency.

All research objectives were reached and contribute to the overall aim of the study which was to identify improvement in the public project lifecycle.

## 5.4 Recommendations

Our findings indicate room for improvement in the context of the scope of this work. The public project lifecycle commences in approving the project, deciding the strategy, developing the project tactically, the implementation of the project, closing it and preparing it for operation. The following activities are recommended to strengthen the management of the public project lifecycle.

### 5.4.1 Recommendations from a theoretical standpoint

The **governance** of public projects should be aligned with the values already defined in the current legislation. The objectives must be the optimization of value for money from investments in public projects. Many examples of potential risk of moral hazards in a system where accountability is unclear have been highlighted. Particular emphasis should be on the behavioural side of governance.

The criteria for the **project management** of public projects should incorporate effectiveness (strategy) and efficiency (tactics and operations). This implies that the lifecycle starts at the decision stage. All stages must be carefully defined and documented both from a managerial and theoretical viewpoint. International bodies of knowledge should be applied, with lessons taken from countries judged to be successful in this regard, as the embodiment of current best practice.

The **risk management** of public projects should also follow current international best practice. Decision makers should not expect that "everything will go according to the plan" as the findings reveal that there is up to a 90% chance of cost overruns. Risk management should include standardized assessments and risk principles from the behavioural sciences.

### 5.4.2 Recommendations from a managerial standpoint

The Ministry of Finance should define precisely the public project lifecycle. It is recommended that the lifecycle starts at the point when a project idea is proposed and closes when the project is handed over as ready for operation. As role models, there is the Norwegian *Quality Assurance* approach for the front end of projects and the UK's *OGC Gateway Process* for lifecycle management.

There should be at least five *control gates* in the lifecycle as can be seen in figure 24. Each control gate should measure actual outcomes and compare them to planned outcomes. A deviation exceeding predetermined project-based tolerances should result in a decision of continuity. Accountability, responsibility and transparency must be ensured at all stages of the project lifecycle. This approach is fundamentally different from the contemporary arrangement. The structure outlined in law no. 84/2001 (Althingi, 2001) and the attached directive (Ministry of Finance, 2002) are linear and omit feedback processes in addition to their procedural shortcomings.

The guidelines should, as a minimum, include the following.

#### 5.4.2.1 *At the Approval stage*

- How strategy is shaped at the decision stage based on macroeconomic and utility theories
- How risk is assessed with normative methods
- How risk is accessed with empirical data
- How options are selected
- How independent consultants are used

#### 5.4.2.2 *At the Conception stage*

- How project effectiveness is ensured by a business case
- How feasibility is decided by a cost/benefit analysis
- How sensitive major tasks are in relation to risks
- How alternatives are compared and evaluated
- How forecasting ensures unbiased forecasts of benefits and project metrics
- How risk is assessed, measured and mitigated

#### 5.4.2.3 *At the Development stage*

- How project efficiency is decided by tactical planning
- How the project structure is decided, i.e. by work packages and a timeline
- How the project cash flow will evolve
- How project tolerances are decided
- How risk factors will be monitored and controlled
- How project tasks will be monitored and controlled
- How contracts will be arranged, monitored and controlled

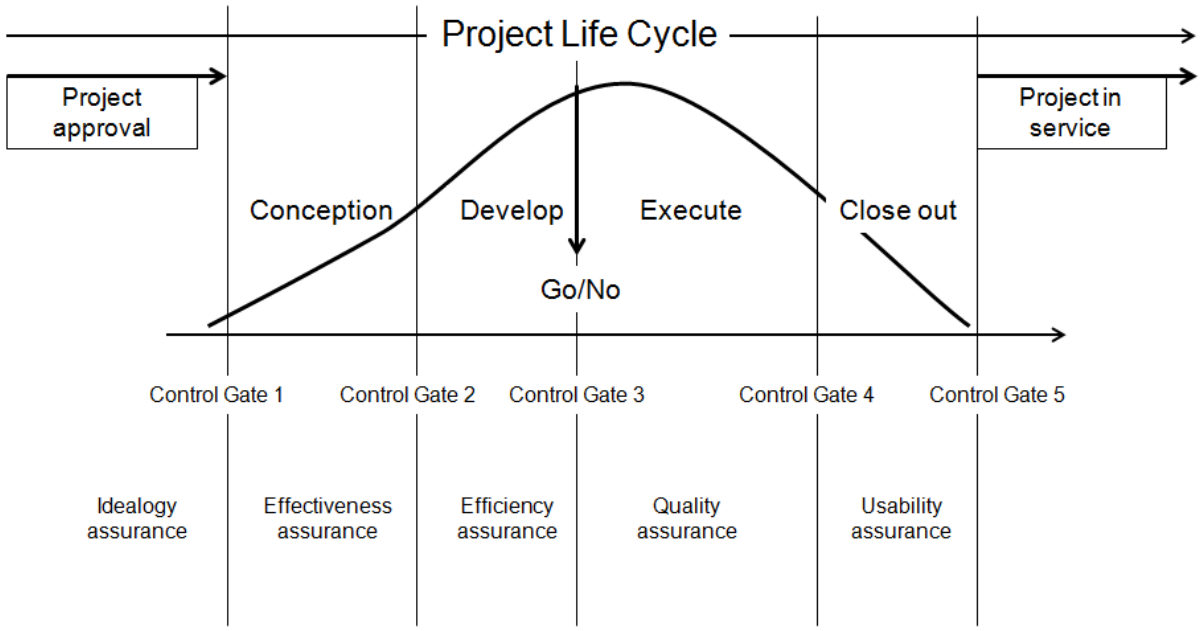
#### 5.4.2.4 *At the Execution stage*

- How feedback procedures will work
- How risks are responded to

#### 5.4.2.5 *At the close out stage*

- How the project is accepted
- How the project is evaluated
- How the projected is handed over

**Figure 24. The procedural framework of the Public Project Lifecycle in context of the thesis.**




The Ministry of Finance should form a committee of specialists from the government, industry and academia to ensure the review of the procedural framework as new knowledge surfaces. Furthermore, the Ministry should arrange for the establishment of a database for the storage of project data. Such a database can be instrumental in improving forecasting, transparency and continuous improvement. The use of the framework should be made mandatory for larger projects where public money is invested.

## 5.5 Further research

Further research is needed and the following have been distilled from the research questions and studies

**Research question**: *Do the arrangements for a feasibility study on public projects in Iceland align with current best practice?*

One of the findings from this research is poor information control (see, for example, Chapter 4.4.1.). There is no one place in the system where information is stored and we had to collect documents from several ministries. A related problem is that information seldom comes in time series but in fragments. Information of some projects lasting more than one year must therefore be collected and put together. This is not transparent and progress tracking is difficult. Another interesting research subject is to investigate the scope of this problem. Yet another study would be a requirement analysis for a central database where project information is stored and analysed.

**Research question**: *Are Icelandic sets of standards regarding the conception, planning and management of public projects comparable with Norwegian, UK and other international standards?*

This research had to be narrowed down to include a few benchmark studies. It would be interesting to repeat the research by increasing the number of projects in the sample. The projects under screening were all construction projects and it would be informative to investigate other types of projects like technical installations, service projects etc. Further studies on this subject should include other Scandinavian countries, the APM *Body of Knowledge*, the UK *OGC Gateway Process*, the UK *MoD Acquisition Operating Framework* and the TERESA decision model from Denmark.

**Research question**: *Does the perceived risk attitude among Icelandic decision makers correlate with the reality of cost overruns?*

Interesting research would be a detailed study of the real risk attitude of parliamentarians. This research question revealed primarily that there is not a correlation between the perception and the reality. So the true risk/utility function remains to be established. A utility function describing mathematically the real attitude is an exciting idea. This research could be repeated on an international level. Icelanders have been stereotyped as optimistic people that seize opportunities in a reactive way. How does the Icelandic utility function compare to, for example, Germans who are often described as conservative in financial matters?

**Research questions**: *Is the due diligence process in Iceland concerning the conception of an individual project comparable with Norwegian standards?*

The Norwegian authorities have taken governance and project management very seriously, especially the front-end preparation. The Norwegian approach should be studied further and adapted for use in Iceland. An interesting study would be to investigate how Norwegians form cooperation between academia, industry and government, for example via the Concept program.

**Research questions**: *Can reference class forecasting improve forecasting accuracy?*

The investigation should be repeated for the decision stage. The number of projects in a particular reference class is too few in Iceland to establish the necessary statistics; for instance, how many

conference halls like Harpa can be expected in Iceland? This could be solved by tracking international projects and including them in the Icelandic database. An interesting further research project is to build a reference class database with the intention of serving the parliament and Ministry of Finance as a risk assessment tool.

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# Part 2 - List of papers

## List of papers

| Title | Publication | Status |
|---|---|---|
| The feasibility of public projects in Iceland. | 28th IPMA World Congress, Rotterdam, Holland, September 29-October 1, Academic submissions | Approved for publication |
| Prerequisites and Decision-making Procedures of an Icelandic Project compared against Norwegian Standards | Iceland Review of Politics & Administration (Stjórnmál og stjórnsýsla), 10(1), 17-30. | Published |
| Reference class forecasting in Icelandic Transport Infrastructure Projects, | Transport Problems, Scientific Journal, The Silesian University of Technology, Faculty of Transport Krasińskiego 8, 40-019 Katowice, Poland | Under review |
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| Er samræmi á milli þeirrar áhættu sem íslenskir ákvörðunartakar telja sig tilbúna til að taka og raunverulegrar hættu á kostnaðarframúrkeyrslu verkefna? (Does the perceived risk attitude among Icelandic decision makers correlate with the reality of cost overruns?) | Verktækni, Tímarit Verkfræðingafélags Íslands. The Journal of the Icelandic Engineering Association | Under review |
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28th IPMA World Congress

# The feasibility of public projects in Iceland

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**Abstract**

In the context of the public sector, there will always be more demand for projects than available resources. The portfolio of possible projects is restricted since investment capital is limited. To ensure the optimal use of investment capital, it is essential to select the most promising projects only. In order to support this goal the correct procedures must be in place and applied consistently. The subject of the study presented here is the preparation of feasibility studies for public projects in Iceland. Since the collapse of the country's financial system in 2008, a reform program has been enacted in several areas of governance resulting in, among other things, the draft of a new constitution. Even so, it seems that reform has not reached as far as capital projects since they continue to be a subject of debate and a challenge for managers. In this study, six projects were screened from the perspective of how the initial feasibility is determined in relation to notional best practice. The findings show that there is a disparity between best practice and current practice in Iceland to an extent that should be of concern to all stakeholders, not least taxpayers.

Selection and peer-review under responsibility of the IPMA.

*Keywords:* public projects; cost-benefit analysis; feasibility study; optimism bias; strategic misrepresentation; governance

## Introduction

The Icelandic governance has been the target of heavy criticism following the meltdown of the country's financial system in October 2008. The financial crisis has precipitated several activities aimed at addressing the consequences. Perhaps the single, most dramatic activity was when the (then) Prime Minister of Iceland was brought before a Supreme Court and found guilty of complacency (Landsdomur, 2011). The Prime Minister was the first individual in the history of the Republic of Iceland to be brought to justice in this way and so his conviction can be considered to be an extremely rare event. Another noticeable event has been the writing of a new constitution (Althingi, 2010) by activating the Icelandic public via a management process (crowd sourcing) where over one thousand individuals worked in groups on the constitutional principles (Stjornlagarad, 2010). The process culminated in a national referendum on the context of the new constitution prior to submitting the approved draft to the legislative authority.[20]

Despite these momentous events, this desire for reform seems not to apply to the execution of public projects. Fridgeirsson (2014) investigated the preparation of a particular Icelandic public project and compared the decision process with Norwegian standards. The conclusion was the Icelandic due diligence process regarding this particular project lags significantly behind the Norwegian process.

[20] The new constitution process later came to a halt when a new government came to power after the 2013 Parliamentary election.

Since the financial collapse there have been relatively few major public construction projects. Exceptions include a concert and conference centre in the capital Reykjavik, a ferry harbour on the south-east coast, a new national hospital in Reykjavik and a two tunnel projects on the north coast. These public projects have been openly criticized both before and after their execution. Examples include cost overruns (Blondal, 2013), operational dysfunction (Siglingastofnun, 2011), overly optimistic cost projection ignoring past experience (Olafsdottir, 2012) and risks outweighing public interests (Gretarsdottir, 2012). The criticism is primarily directed towards governance. It is suitable to cite the OECD definition of what governance is: *"the formal and informal arrangements that determine how public decisions are made and how public actions are carried out, from the perspective of maintaining a country's constitutional values in the face of changing problems, actors and environments"* (OECD, 2003:16). There are some prerequisites in Icelandic legislation on the governance of public project and one of them is the conduction of a feasibility study prior to the deployment of a public project. However we do not know how if the application of a feasibility analysis in Iceland complies with best practises. If inconsistency can be verified we might gain further understanding on the root causes contributing to the problem of cost overruns in Icelandic public projects.

In the context of project management, the criticism of lack of governance is interesting and can be examined against the critical success factors (CSFs) of a project. Atkinson (1999) names cost, time and quality, often referred to as the iron triangle, as measurement of a project success. The iron triangle is still regarded as measurement of team performance on projects (Kandelousi and Abdollahi, 2011). However, the CSFs of a project have expanded to include strategic and tactical issues such as how effective the project will be post-execution. Jugdev and Müller (2005) identified, in chronological order, how the project management literature has evolved from being primarily concerned with the implementation of projects to include issues like the client expectations and the strategic value. The 21$^{st}$ century is characterized by *strategic project management* (Jugdev and Müller, 2005:23). Projects are increasingly a part of a bigger picture that crosses processes and organizational units to achieve success and manage core functions of a business. Jugdev and Müller (2005:20) distinguish between project efficiency being the effort to maximize output for a given level of input (resources) and project effectiveness being the achievement of the project's strategic goals and objectives.

This has had impact on the international project management community. Part of this development is the issuing of detailed protocols in regard to project portfolios and project programs to connect strategy, tactics and operations. In the UK, the Association for Project Management (APM) has issued the APM Body of Knowledge – an up-to-date collection of topics that should be known to practitioners, academics and experts. However, APM body of knowledge is not a set of competencies or methods (APM, 2006). Detailed protocols in regard to projects and programs in order to coordinate strategy, tactics and operations via projects, programs and portfolios of projects can be found in the standards issued by the *Project Management Institute* (PMI). PMI has issued standards on *project portfolios* (The Project Portfolio Standard) which specifies that a portfolio is a component collection of programs and projects to achieve strategic objectives (PMI, 2012). PMI also issues

standards on *project programs* (The Program Management Standard), providing guidance to manage multiple projects where the feasibility of a project is advertised as one of the keys to answer and verify the proposed direction (PMI, 2006:100). Furthermore, PMI issues standards on *projects* (Project Management Body of Knowledge) (PMI, 2008). Although the Project Management Body of Knowledge is mainly focused on the management techniques, tools and processes required for managing a project for a successful outcome, the standard also emphasizes the role of projects in achieving a strategic plan and how projects, programs and portfolios interact (PMI, 2008:8, 10).

The grounds for addressing the international approach to professional project management are to emphasize the great interest in the subject. Over the last two decades, a change can be seen in the received doctrines of public accountability and administration (Winch, 2010). An approach aimed at increasing the quality of public governance has now been widely implemented and is generally referred to as the New Public Management (NPM) (Hood, 1995). One of the doctrines for ensuring public interest via NPM is the use of an elaborate structure of procedural rules designed to guarantee integrity, transparency and professional service to the public.

**Literature review**

When the Icelandic law on public project procurement (no. 84/2001) received ascent in the Parliament in 2001 (Althingi, 2001), the Minister of Finance stated that "[the] objective of this legislation [was] to ensure optimal use of capital invested in public projects" [21] (Haarde, 2001). The legislation outlines the government's goals regarding the conception, planning and execution of public projects. The law notes that the Minister of Finance will issue further guidelines for planning and other procedural work on projects.

The aforementioned law no. 84/2001 (Althingi, 2001) is four pages and approximately 1,700 words. No specific reference to best practice project management or procedures can be detected in the document. The content is mainly generic descriptions of terms such as cost plans, planning and construction, without clarification of what is considered a minimum requirement in terms of rigour or quality of deliverables. The official guideline on methods and procedures is called the Public Procedure Policy on Conception, Planning and Implementation of Public Projects (Ministry of Finance, 2002), which covers of the following requirements.

**Project inception**, including project argumentation, stakeholder analysis, *feasibility study*, appraisal of alternatives, estimate of initial investment cost and operation cost, comparison of alternatives and decision-making. At this stage the initial scope is determined and the cost baseline and schedule are prepared with a detailed report on the decision. **Planning** which moves the project to the next stage, with further information on design, cost, materials and tender preparation. **Implementation** describing how contracts are made, accountability and the project control mechanism. **Close down**

21 Translation by author

**evaluation and audit**, with study on the differences on planned results and actual results together with a close down report.

The purpose of this paper is to present the results of an investigation into the extent to which current understanding of industry practices covering the *feasibility stage* in a project's lifecycle aligns with notional best practice. It is to be noted that the requirement in the law is the Icelandic word "hagkvæmniathugun" which could also mean *cost-benefit analysis*. No English translation is accessible to the term from the Ministry so a standpoint had to be taken. A feasibility study and cost-benefit analysis are related but the simple difference is that feasibility is a more generic approach including cost-benefit analysis, see for example (PMI, 2008). In this study "hagkvæmniathugun" is interpreted as "feasibility study". This interpretation rhymes well with the words of Haarde (2001) and how PMI (2006) defines feasibility as instrumental in justifying the project in context of time, budget and scope. The findings are discussed and conclusions drawn on the consequences of an observed misalignment between them.

A balance between the correct strategy to ensure an effective project long-term outcome and the efficient implementation of the project may be particularly hard to achieve in capital projects in the public sector (Wachs, 1990). Flyvbjerg et al. (2002) found that nine out of ten transport projects were underestimated in terms of cost. 111 projects undertaken between 1920 and 2000 were investigated, yet it was not possible to discern any improvement in cost accuracy over the period (Flyvbjerg, et al., 2002: 287). From a historical perspective, this seems strange as achievements in many areas impacting project planning were seen in the 20$^{th}$ century, for instance software for forecasting and data access via the internet. Even so, increased knowledge in project management and project planning during the 20$^{th}$ century has not resulted in a significant reduction in the cost overrun of large projects. Flyvbjerg (2006) offers two explanations: biases in human judgement and deliberate deception.

Theories of bias in human judgement are based on the initial work of Daniel Kahneman and Amos Tversky who conducted a number of studies in the 1970s resulting in the *Prospect Theory* (Kahneman and Tversky, 1979). Prospect theory contradicted the *Expected Utility Theory* which, at the time, dominated the analysis of decision-making in risky domains (Gilovich and Griffin, 2002). The expected utility theory assumes that people make rational decisions based on the expected utility and attitude towards the risk (Kahneman and Tversky, 1979). With ingeniously arranged tests, Kahneman and Tversky demonstrated several cases where people violated the expected utility assumptions. They argued that people apply mental rules, i.e. heuristics, to simplify the complex task of assessing probabilities and predicting values. Decisions are made by how easily events are brought to mind rather than utilising statistical evidence (availability), what is typical (representative) rather than the law of small numbers or statistical independence of events and how data are interpreted by the human mind (anchoring and adjustment). Although useful in practice, these heuristics can lead to judgmental errors as Kahneman and Tversky (1974) noted in their seminal work on judgment and uncertainty. Psychology describes this as cognitive bias, a pattern of deviation in judgment that occurs in particular situations that can lead to planning fallacies resulting in overoptimistic

forecasting. This particular phenomenon is called *optimism bias* and is rooted in how the human mind processes information. In lay terms, it might be described as self-deception.

Another phenomenon contributing to flawed forecasts and ill-conceived projects is called *strategic misrepresentation*. Jones and Euske (1991) defined this phenomenon in the public domain thus: "*[strategic] misrepresentation is the planned, systematic distortion or misstatement of fact, lying, in response to incentives in the budget process"* (Jones and Euske, 1991:437).

Flyvbjerg (2006) claims that strategic misrepresentation is particularly common in public projects. The primary reason is the pressure political decision makers feel to advocate for "their" projects when competing with other project ideas: *Here, when forecasting the outcomes of projects, forecasters and managers deliberately and strategically overestimate benefits and underestimate costs in order to increase the likelihood that it is their projects, and not the competition's, that gain approval and funding"* Flyvbjerg (2006:6). This deliberate underestimation of cost and overestimation of benefits can lead to the selection of the least feasible projects or what Flyvbjerg calls "inverted Darwinism" (survival of the un-fittest) (Flyvbjerg, 2005).

**Public capital projects in Iceland**

Icelandic public projects are also subject to cost overruns. Fridgeirsson (2009) analyzed 78 close-out reports from Iceland's Government Construction Contracting Agency (GCCA). The study revealed that 73% of the projects under the supervision of GCCA had cost overruns with the overall average cost-overrun at 10%. This is interesting because a majority of the projects were relatively small construction work (<€1m) and not large infrastructure projects as in the Flyvbjerg studies. A majority of the larger projects are placed in the responsible ministries or are managed by public companies outside the domain of the GCCA. An unpublished study (Fridgeirsson, 2004) of 26 large Icelandic public projects indicates that 90% had cost overruns with the average variance between the actual and planned cost in excess of 50% of the approved budget.

The most critical aspect of Icelandic governance is arguably a nine-volume work called the *Report of the Special Investigation Commission* (Hreinsson et al., 2010). This report (SIC) was requested by the Icelandic parliament (Althingi) to clarify and explain the rise and fall of the Icelandic banking system. In short, this report is a cry for improvement in how decisions are made and on the management integrity of the governmental system. Criticism of the SIC report has also been echoed by the business community and other stakeholders.

**Public procurement legislation in Iceland**

Prerequisite feasibility studies (PFS) based on a multi-criteria decision-making process to evaluate project viability for large capital investment is something that many countries demand (Yun and Caldas, 2009). Public projects in Iceland must be prepared and executed in accordance with the Icelandic law on public project procurement (Althingi, 2001). The law requires that different approaches must be examined and compared internally before applying for funding. One of the requirements is a *feasibility analysis.* The law does not, however, define a feasibility analysis and no formal minimum is demanded. This might lead to inconsistency and a lack of rigorous appraisal.

The feasibility study is the first and most important step before undertaking project design and construction. The effectiveness of the feasibility study will affect directly the success of a project. Mistakes at this stage can permanently handicap the project's performance, even fatally (Shen et al, 2010:255). Feasibility analysis is the principal methodology for gaining comprehensive and transparent information on the implications of a proposal. This can be interpreted as a safety measure to ensure the strategic efficiency of the project. According to PMBOK (PMI, 2008), *"[the] feasibility of the new undertaking may be established through a process of evaluating alternatives. Clear descriptions of the project objectives are developed, including the reasons why a specific project is the best alternative to satisfy the requirements."*

Yun and Caldas (2009) used data mining techniques to analyse decision variables in a PFS. According to their study, the feasibility analysis for an infrastructure project covers four processes*: project overview*, *economic feasibility*, *political viability* and *total viability*. The project overview explains the origin of the project, i.e. its background and objectives along with procedures to be used to achieve the defined objectives. Economic feasibility determines the project's investment potential along with its effects on the national economy. This is achieved by estimating the demand and calculating the economic and financial return on the investment such as benefit-cost ratio (B/C), net present value (NPV) and internal rate of return (IRR). Political viability is concerned with determining the importance of the project to all members of society. This is performed by evaluating factors such as the regional level of development, regional economic impact, attitudes towards the project, compliance with relevant governmental policies and environmental impact. Total viability is based upon the results of both the economic and political evaluations. The combined process helps in reaching a "go/no-go" decision, determining investment priority across infrastructure projects and indicating the optimal alternative (Yun and Caldas, 2009).

The practice of feasibility analysis differs according to the type of project. The difference can be seen in the factors and/or attributes that are considered when conducting the analysis. Shen et al. (2010) showed that feasibility analysis includes 18 economic, nine social and eight environmental performance attributes, where some performance attributes are common to all projects and others apply to individual projects only. This finding is largely in line with Yun and Caldas (2009); however,

there is one distinct difference. Shen et al. (2010) do not specify benefit-cost ratio as a performance attribute in their feasibility analysis, neither do they give a reason for its exclusion. A possible explanation may be found in the statement that a benefit-cost ratio can sometimes confuse the selection process when the projects under consideration are of a different scale (Boardman et al., 2011). Furthermore, the benefit-cost ratio is sensitive to situations where negative values are subtracted from benefits or added to cost. For these reasons, Boardman et al. (2011) recommend that analysts avoid using benefit-cost ratios and rely instead on net benefits in order to rank options.

**Research method**

The methodological approach is based upon document analysis or, more specifically, content analysis. As a part of documentary research, it has advantages over other methods – insofar as it is unobtrusive and non-reactive – and is a viable technique for making reliable, replicable and valid inferences (Robson, 2011). Documents can also be used for triangulation and for longitudinal studies, where the latter has a relevance to the longer-term study of the Icelandic case.

Official documents have provided data and insights for the analysis of official definitions and explanations of decisions-making in regard to public project procurement. A further aspect of this approach is that of critical analysis, which has involved scrutinising the assumptions underpinning decisions, taking account of other factors or issues that might possibly have been concealed. Primarily for this reason, it has involved moving beyond official documents to include a critical analysis of the institutional and social structures within which the documents have been produced.

The Icelandic national budget in any given year excludes a complete list of accepted construction projects despite being registered under initial capital expenditure along with investment in machinery, equipment, software etc. In addition, many projects are included in the total funding for various institutions making it difficult to see which projects have been approved. It was necessary, therefore, to seek information from the Icelandic Ministry of Finance about the distribution of resources down to the level of individual construction projects. A complication was that such information is not available at the Ministry of Finance, but is stored at the ministry concerned with the particular project. For this reason, it was decided to defer selecting construction projects from the Icelandic national budget and instead to select construction projects from several ministries. The sampling strategy was therefore in the nature of a convenience sample. No claims are therefore made as to the representativeness of the sample in a statistical sense.

The projects are a diverse set chosen to represent different project types (tunnel, harbour, concert hall, avalanche barrier, school and tourists service centre). In the event, six funded construction projects under the authority of three ministries were identified: Vadlaheidi tunnel (Ministry of the Interior), Landeyjar port (Ministry of the Interior), Harpa Concert hall and Conference Centre (Ministry of Education, Science and Culture), avalanche protection in Bolungarvik (Ministry for the

Environment) School building in the town of Mosfellsbær (Ministry of Education, Science and Culture) and Snæfellsstofa Visitor Centre in Vatnajökull National Park (Ministry for the Environment).

The research is an unobtrusive study aimed at analysing a problem for further understanding and clarification. On a more detailed level, the research method represents a qualitative, structured content analysis of projects cases resulting in a quantitative appraisal. Sampling strategies may be more complicated in mixed methods research because sampling schemes must be designed for both the qualitative and quantitative research components of these studies. Onwuegbuzie and Collins (2007:288) suggest 3-5 cases as a minimum sample size for case study research, which supports the approach taken here.

The research design has focused on the content not the context, as the latter is defined by Law no.84/2001 (Althingi, 2001). Descriptive material, in the form of initial study reports for six projects, were analysed and scored on a numerical scale against requirements outlined in the literature review. The requirements covered 7 themes: Project overview, comparison of alternatives, cost-benefit analysis, net present value (NPV), sensitivity analysis and making a recommendation.

Data abstraction from documents was undertaken in such a way that all were scrutinized with resultant findings registered in a prepared format against each of 17 questions (Q) pared with the respective theme.

**Project overview:** Q1. Has the origin of the project been explained? Q2. Has the background of the project been described? Q3. Have the project objectives been defined? Q4. Has a needs analysis been carried out?

**Alternatives:** Q5. How many alternative schemes/projects were considered? Q6. Was the zero alternative included?

**Cost-benefit:** Q7. Were benefits and beneficiaries identified? Q8. Were costs identified? Q9. Have the impacts been recorded as performance indicators? Q10. Have the impacts been predicted quantitatively over the life of the project? Q11. Have all impacts been monetized?

**Net present value (NPV):** Q12. Have the benefits and costs been discounted to obtain present values? Q13. Has the net present value (NPV) been computed and compared for each alternative?

**Sensitivity analysis:** Q14. Has sensitivity analysis been performed for each alternative?

**Make a recommendation:** Q15. Has evaluation of alternatives been performed? Q16. Has the selection of the *most promising* alternative been made?

**Independent consultants:** Q17. Has an evaluation from independent, external consultants been performed?

**Findings**

Consistency with best practice was assessed and classified into the following three categories:

full consistency, partial consistency and no consistency.

In assessing consistency with the literature review, each question was evaluated for its consistency with best practice as identified from the literature review. “Full consistency” indicates that all the relevant information can be tracked in the project document, “partial consistency” indicates fragmented information and “no consistency” indicates that information covering the topics could not be detected within the category. The 17 questions and six projects accounts for 102 occurrences (17 x 6) which were paired with the consistency scale. Thirty occurrences fall on a pair with full consistency, 28 on a pair with partial consistency and 44 with no consistency. A closer examination is shown in Table 1 where the six selected projects are compared with notional best practice. *No consistency* varies from 18% to 65% with a mean of 43%. *Full consistency* varies from 12% to 59%, with a mean of 29%.

**Table 1. Consistency with best practice for six selected projects.**

| **Project name:** | Full consistency | Partial consistency | No consistency | Full consistency | Partial consistency | No consistency |
|---|---|---|---|---|---|---|
| Vadlaheidi tunnel | 5 | 3 | 9 | 29% | 18% | 53% |
| Landeyjar harbour | 6 | 8 | 3 | 35% | 47% | 18% |
| Harpa concert hall | 10 | 2 | 5 | 59% | 12% | 29% |
| School in Mosfell town | 2 | 7 | 8 | 12% | 41% | 47% |
| Avalance protection | 4 | 5 | 8 | 24% | 29% | 47% |
| Snaefells stofa | 3 | 3 | 11 | 18% | 18% | 65% |
| | | | Average: | 29% | 27% | 43% |

In this study, no attempt was made to evaluate if the categories or topics within each category were different in importance in terms of evaluating project feasibility.

Table 2 demonstrates the distribution of the scores and the normalized results due to different number of topics (questions) within each category. To name an example there were five topics in the category, *benefits and cost*, whilst in the category, *independent consultants*, there was one only. The

consistency percentages are therefore based on the number of topics within each category and the consistency strength within each category.

The category *project overview* is the most consistent with best practice, but the general conclusion is a disappointing gap of 76% of the categories where there is only partial consistent with best practice.

**Table 2. Consistency of approach towards feasibility analysis for six selected projects (points and weighted percentages taken into the account the number of activities in each category).**

| Category | Normalized weight | Full consistency | Partial consistency | No consistency | Weighted Full consistency | Weighted Partial consistency | Weighted No consistency |
|---|---|---|---|---|---|---|---|
| Project overview | 0,24 | 15 | 1 | 8 | 63% | 4% | 33% |
| Alternatives | 0,12 | 3 | 2 | 7 | 25% | 17% | 58% |
| Benefits and cost | 0,29 | 7 | 16 | 7 | 23% | 53% | 23% |
| Net present value (NPV) | 0,12 | 1 | 2 | 9 | 8% | 17% | 75% |
| Sensitivity analysis | 0,06 | 0 | 2 | 4 | 0% | 33% | 67% |
| Make a recommendation | 0,12 | 2 | 5 | 5 | 17% | 42% | 42% |
| Independent consultants | 0,06 | 2 | 0 | 4 | 33% | 0% | 67% |
| | | | | Average: | 24% | 24% | 52% |

All of the projects, apart from the school building, ran into problems. Even the Vadlaheidargong, which had not been started at the time of the study, has caused major debates (Gretarsdottir, 2012). Harpa, the avalanche protection in Bolungarvik and Snaefellstofa had large cost overruns (Fridgeirsson, 2014) and the Landeyja-harbour has been inoperable for long periods following a string of unexpected problems (Siglingastofnun, 2011).

The study was limited to the examination of the initial study reports on the feasibility analysis of six public projects under the authority of three ministries. Yet, the results are a clear indication of a problem. It is therefore valid to ask if a different group of projects would have revealed greater consistency with best practice. This question cannot be answered with certainty, but in the light of the results presented above there is a reason to believe that the analysis of other public projects would not produce significantly different results. It is also worth mentioning the consistency variance indicating that feasibility studies are arranged on case by case basis without reference to public guidelines which rhymes with the findings of Fridgeirsson (2014).

Kristinsson (1999) argues that Iceland is somewhat different from many other western countries. This is traced to the arrangement during the nation's struggle for independence. Iceland was given the right to pass independent laws – the resurrection of Althingi in 1871 – before the nation acquired the rights to execute them with local governance infrastructure. When the executive power became Icelandic in 1904, the Althingi had a strong position relatively to the governance structure (Kristinsson, 1999:144). One of the consequences could arguably be weak governance. Apparently, there is a weak definition of how the legislative power defines the interface between the governmental bodies and the private companies undertaking public projects.

**Conclusions**

A case study of six funded public projects in Iceland, based on document content analysis including the evaluation of initial study reports, has found that the current process of feasibility analysis during the inception phase is inconsistent. Moreover, there seem to be few practices that align with current best practice. To improve the position, it is important that the Minister of Finance issues detailed guidelines for conducting feasibility analysis in accordance with current best practice.

Limited transparency was found in the management of initial study reports and none of the three ministries contacted could directly provide initial study reports for proposed projects despite the fact that these reports should be preserved at the respective ministries. All of the reports had eventually to be collected at the relevant public agency. To improve this aspect, it is important to increase awareness of the availability of initial study reports within each ministry.

The Icelandic national budget gives very limited information on the financing of public projects and does not include a complete list of all accepted construction projects. Many projects are included in the total funding provided to various institutions, making it very difficult to see which projects have been approved. Moreover, the national budget accounts for each financial year, but never the total project cost if the construction period extends beyond one year. Minor improvements in the Icelandic national budget contents and arrangement would improve considerably the transparency of funding for public constructions projects. It would be interesting to see if other small countries with related legislative structure are also exposed to similar problems.

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# Stjórnmál eða stjórnsýsla? - Frumundirbúningur og ákvörðunartaka vegna opinbers verkefnis á Íslandi borið saman við norskar lágmarkskröfur


## Útdráttur

Opinber verkefni fara gjarnan fram úr áætlun bæði hvað varðar tíma, kostnað auk þess að standast ekki væntingar um ávinning. Sýnt hefur verið fram á með rannsóknum að við undirbúning opinberra verkefna kann sjálf ákvörðunin um verkefnið að byggja á óskhyggju frekar en raunsæi. Þetta er hætta sem mörg vestræn samfélög hafa brugðist við með því að gefa út ítarleg viðmið um ferla og aðferðir sem skylt er að nota við frumundirbúning verkefna. Við undirbúning Vaðlaheiðarganga voru gefnar út nokkrar álitsgerðir sem innlegg við ákvörðunartökuna. Þær eru um sumt mótsagnakenndar. Í þessari grein eru þær skoðaðar sérstaklega, bæði einar og sér og sem heild, og bornar saman við þær kröfur um vinnubrögð við frumundirbúning opinberrar framkvæmdar sem eru gerðar í Noregi.



Efnisorð: Vaðlaheiðargöng, opinberar framkvæmdir, verkefnastjórnun, opinber viðmið


## Prerequisites and decision-making procedures on an Icelandic public project compared against Norwegian standards


Public projects are frequently subject to cost overruns, late schedules and debatable benefits. Research indicates that the initial project decision is based on unrealistic assumptions and judgmental biases. This is a risk factor that is mitigated in many western societies by issuing detailed guidelines on procedures and methods to apply in the conception of a public project. At the initial stages of the tunnel project Vadlaheidargöng number of expert reports were issued to serve as a input in the decision-making process. Apparently some of these reports contradict each other. In this paper we screen these reports both individually and as whole and compare them against the minimal demands required for the conception of a large public project in Norway.



Keywords: Vadlaheidargong, public projects, project management, public standards


## Inngangur

Opinberar framkvæmdum hafa oft valdið deilum í samfélaginu og ekki er alltaf ljóst á hvaða forsendum einstaka ákvarðanir byggja. Þekkt er gagnrýni varðandi að ákvarðanir séu teknar út frá pólitískum hagsmunum frekar en fræðilegum rökum eða –útreikningum. Rannsókn þessi er tilviksrannsókn vegna undirbúnings á stóru verkefni á íslenskan mælikvarða, þ.e. vegna umferðaganga um Vaðlaheiði sem munu tengja saman Eyjafjörð og Fnjóskadal. Rannsóknin er meðal annars gerð vegna umræðu um arðsemi ganganna þar sem opinberir jafnt sem óopinberir umsagnaraðilar komast að öndverðri niðurstöðu þó að svo virðist sem að sömu gögn hafi legið til

grundvallar. Gefur slíkt misræmi tilefni til að skoða hvort eitthvað í þeim stjórnsýsluháttum sem varða undirbúning opinberra verkefna á Íslandi gæti skýrt þær mótsagnakenndu niðurstöður sem fyrr var minnst á. Einnig er vert að skoða hvort íslenskri stjórnsýslu svipi til þess sem búast mætti við borið saman við nágrannaríki.

Erfiðar umræður og deilur um opinber verkefni eru ekki sérstaklega bundnar við Ísland og fyrir liggja erlendar rannsóknir sem virðast staðfesta að sérhagsmunir kunna að ráða ákvörðunum frekar en ávinningur í þágu samfélagsins. Benda má á rannsóknir dr. Bent Flyvbjerg, prófessors við Oxford háskólann, sem kallar þetta fyrirbæri mistúlkun af ásetningi (strategic misrepresentation). Flyvbjerg hefur í mörgum ritrýndum greinum fjallað um hvernig verkefni fá framgang á öðrum forsendum en þjóðfélagslegum ávinningi.

Annað fyrirbæri sem talið er hafa áhrif á ákvarðanir er kallað bjartsýnisbjögun (optimism bias) eða óhóflega bjartsýni í upphafi umræðunnar um mögulegt verkefni. Það voru ísraelsku fræðimennirnir Daniel Kahneman og Amos Tversky sem fyrstir sýndu fram á þessa bjögun með flokki merkra greina á áttunda áratugi síðustu aldar. Bjartsýnisbjögun gerir það að verkum að fyrstu spár eru oft óraunhæfar og byggja á mesta hugsanlega ávinningi og minnstu mögulegu áhættu (Kahneman og Tversky, 1974, 1979) frekar en þeim ávinningi sem er líklegastur vegna verkefnisins.

Bjartsýnisbjögun og mistúlkun eru hvoru tveggja blekkingar á sinn hátt en þó er munur á; sú síðarnefnda verður til af ásetningi á meðan bjartsýnisbjögun er sjálfsblekking sem tengist því hvernig mannshugurinn vinnur úr upplýsingum. Þó að eðli þessara fyrirbæra sé ólíkt er afleiðingin sú sama: Óraunhæfar forspár um ávinning, kostnað og tímalengd verkefna skekkir myndina um raunverulega fjárþörf og ávinning, vekur upp deilur og óþarfa erfiðleika á líftíma verkefnisins.

Íslensk framkvæmdaverkefni eru ekki undanskilin deilum og ágreiningi. Aðeins fá stærri verkefni hafa litið dagsins ljós frá efnahagshruninu árið 2008. Þó má nefna ráðstefnu- og tónleikahúsið Hörpu, Landeyjahöfn, tvenn göng á Norðurlandi og undirbúning að byggingu háskólasjúkrahúss. Öll hafa þessi verkefni orðið tilefni opinberrar gagnrýni sem lýtur að margvíslegum stjórnunar- og stjórnsýsluháttum. Má þar nefna framúrkeyrslu kostnaðar (Blöndal, 2013), rekstarerfiðleika (Siglingastofnun, 2011), áhættusækni á kostnað almennings (Grétarsdóttir, 2012) og óraunsætt kostnaðarmat án tengsla við fyrri reynslu af stórum framkvæmdum (Ólafsdóttir, 2012).

Rannsókn höfundar (Friðgeirsson, 2009) á skilamötum Framkvæmdasýslu ríkisins leiddi í ljós að yfir 70% verkefna undir eftirliti stofnunarinnar fara framúr áætluðum kostnaði. Voru þó þessi verkefni mörg hver tiltölulega lítil í fjárhagslegu tilliti. Eftirfarandi eru upplýsingar teknar úr óbirtri rannsókn höfundar um þekkt og minna þekkt mannvirki frá undanförnum árum í stafrófsröð og er kostnaðarframúrkeyrslan[22] innan sviga aftan við hvert verkefni: Bolungarvíkurgöng (7%), Barnaspítali Hringsins (7%), Grímseyjarferja (167%), Harpa (173%), Héðinsfjarðargöng (17%), Hof menningarhús

[22] Kostnaðarframúrkeyrsla er mismunur (í prósentum) á upphaflega áætluðum kostnaði og raunkostnaði á föstu verðlagi.

(35%), Kárahnjúkavirkjun (60%), Leifsstöð - stækkun (11%), Náttúrufræðahús HÍ – Askja (33%), Hús Orkuveitu Reykjavíkur (165%), Perlan (28%), Ráðhús Reykjavíkur (47%), Listasafn Reykjavíkur (28%), skrifstofur Alþingis (88%), stúka á Kópavogsvelli (149%), stúka á Laugardalsvelli (52%), Þjóðarbókhlaðan (100%), Þjóðmenningarhús (30%), Þjóðminjasafn - endurbætur (36%), og þjónustumiðstöð í Vatnajökulsþjóðgarði (21%). Vissulega eru til stór opinber framkvæmdaverkefni sem ekki fara framúr kostnaði eða kosta minna en ætlað var en fyrrgreind rannsókn bendir til að framúrkeyrsla kostnaðar í íslenskum framkvæmdaverkefnum sé raunverulegt vandamál og áhugavert viðfangsefni út frá sjónarhóli almennings.

Vandamál sem tengjast óraunhæfum væntingum við undirbúning og frumáætlunargerð hafa haft áhrif á þróun verkefnisstjórnunar sem fræða- og fagsviðs. Ef stuðst er við ISO staðal um verkefnastjórnun (ISO 10006, 2003) þá er verkefni sú framkvæmd sem er einstæð og innifelur samræmdar og samhæfðar aðgerðir, með tímasett upphaf og lok, sem hafa þann tilgang að ná fram mælanlegum markmiðum innan viðmiða um tíma, kostnað og aðföng. Þetta er sú skilgreining sem telja má algengasta. Fræðasvið verkefnastjórnunar hefur þó tekið verulegum breytingum á þeim tíma sem liðin er síðan það kom fram um miðja síðustu öld. Til dæmis er verkefnastjórnun nú á tímum ekki aðeins áætlunargerð og aðfangastjórnun heldur hluti af stefnumörkunarferlinu (Jugdev og Müller, 2005) Þá má nefna Söderlund (2012) sem kennir verkefnisstjórnun okkar samtíma við ákvarðanir (decision school) og vísar sérstaklega til mikilvægis þess að þekkja vel hið félagslega og sálræna samspili á milli ákvörðunartaka í verkefnum. Nútíma verkefnastjórnun felur í sér stjórnun verkefnasafna (portfolio management), stjórnun verkefnastofna (program management) og stjórnun verkefna (project management). Lífhringur verkefnisins hefur þannig stækkað og innifelur undirbúning, ákvörðunartöku og stefnumörkun auk áætlunargerðar og innleiðingar. Þetta má draga saman og segja sem svo að framkvæmd verkefni þurfi ekki aðeins að vera skilvirkt heldur þarf sjálf ákvörðunin um framkvæmd einnig að tryggja að verkefnið sé hagkvæmt til lengri tíma litið fyrir þá sem greiða fyrir það og/eða nota afrakstur þess.

Hlutur sérfræðinga og ráðgjafa við ákvörðunartöku kann að skipta miklu máli. Sérfræðingar gefa út álitsgerðir sem síðar eru notaðar sem röksemdafærsla í ákvörðunartökuferlinu með eða á móti verkefninu eftir atvikum. Rétt unnin álitsgerð af sérfræðingi dregur fram það sem sannast er vitað um viðfangsefnið byggt á þeim staðreyndum og upplýsingum sem liggja fyrir. Á hinn bóginn gera álitsgerðir sérfræðinga einnig verið áhættuþáttur við undirbúning verkefnis ef þær hafa annan tilgang en að vera faglegt mat óháðs sérfræðings. Það má jafnvel hugsa sér meðvirkni og margfeldisáhrif sem verða þegar að álitsgerð samin á seinni stigum vísar í fyrri álitsgerðir til að undirbyggja tiltekið mat. Fyrri álitsgerðinni er þannig ljáður trúverðugleiki jafnvel þótt að hún sé byggð á hæpnum forsendum og aðferðum. Þekkt dæmi  frá öðrum löndum um þannig margfeldisáhrif eru göngin undir Ermarsund sem studdust við ófullkomið mat á viðskiptafæri (business case) frá upphafi. Göngin undir Ermarsund fóru að lokum 80% framúr áætluðum framkvæmdakostnaði, 140% framúr áætluðum fjármögnunarkostnaði og eftirspurn var aðeins 50% af upphaflega áætlaðri umferð (Flyvbjerg et al., 2003). Þá má benda á rannsóknir Flyvbjerg et al (2002) sem leiddu í ljós að 9 af 10 stærri samgönguverkefnum fara framúr kostnaði. Í sömu rannsókn voru verkefni yfir 80 ára tímaskeið (1920-2000) metin tölfræðilega m.t.t. hvort martækar framfarir hefðu orðið á forspám um áætlaðan kostnað Reyndist svo ekki vera sem er áhugavert og jafnvel sláandi ef litið er til framfara á flestum öðrum sviðum. Vandamál framúrkeyrslu er því hugsanlega ekki skortur á þekkingu heldur fremur

ríkuleg óskhyggja sem byrgir ákvörðunartökum sýn í bland við þrýsting um að veita tilteknum verkefnum brautargengi. Mikilvægi þess að undirbúningur verkefnis sé faglegur og byggi á mótaðri aðferðafræði er því mikið út frá sjónarhóli almennings.

Álitsgerð sem ekki styðst við bestu aðferðir er ekki aðeins gegn góðum starfsháttum ráðgjafa og sérfræðinga heldur getur hún virkað á öndverðan hátt við viðurkenndan tilgang faglegra rannsókna. Í stað þess að koma í veg fyrir að ákvörðun sé tekin án óhóflegrar bjartsýni eða mistúlkunar getur óvönduð álitsgerð þess í stað stuðlað að því að þessi fyrirbæri séu ráðandi við ákvörðunartökuna. Það sem enn eykur á stærð þessa vandamáls er að þeir ákvörðunartakar sem stunda sérhagsmunagæslu kunna að sækjast eftir þjónustu sérfræðinga sem eru tilbúnir til að taka þátt í leiknum frekar en þeirra sem það ekki vilja. Martin Wachs orðar þetta svona : “The most effective planner is sometimes the one who can cloak advocacy in the guise of scientific or technical rationality” (Wachs, 1989). Leiða má líkur að því að vönduð vinnubrögð séu sérstaklega mikilvæg í upphafi verkefnis þegar tekist er á um hvort eigi að ráðast í það eða ekki. Verkefni sem er komið í fullan gang verður ekki auðveldlega stöðvað.

Ákvarðanataka vegna opinberra verkefna hefur þá sérstöðu, borið saman við einkaframkvæmdir, að þeir sem taka ákvarðanir um að ráðast í verkefnin bera ekki fjárhagslega ábyrgð sjálfir. Þeir sem að lokum greiða fyrir opinber verkefni eru yfirleitt skattgreiðendur. Vandamálið sem við blasir er að þar sem menn eru ekki að hætta eigin fjármunum ráði önnur sjónarmið en ávinningurinn fyrir samfélagið. Vera má að hagsmunir heildarinnar víki fyrir hagsmunum ákvörðunartakans. Þetta fyrirbæri hefur stundum verið nefnt „fé án hirðis“ sem í þessu tilfelli lýsir sér þannig að þar sem ákvörðunin er tekin án persónulegrar ábyrgðar sé áhættu- og kostnaðarvitundin minni en ella.

Víðast hvar í hinum vestræna heimi gera stjórnvöld sér grein fyrir þessari hættu. Hluti lausnarinnar er að gefa út ítarlegar leiðbeiningar og viðmið til að tryggja að ákvörðun um opinber verkefni sé í upphafi vel ígrunduð og takmarki áhættu skattgreiðandans eins og kostur er. Dæmi um slíkar leiðbeiningar eru QA1[23] og QA2 verklagsreglurnar sem norska fjármálaráðuneytið gefur út. TERESEA líkanið sem danska samgönguráðuneytið gefur út, Business Case Guide sem kanadíska fjármálaráðuneytið gefur út og Green Book sem breska fjármálaráðuneytið gefur út, o.s.frv. Þetta eru opinberar lágmarkskröfur um vinnulag og aðferðir. Í óbirtri grein höfundar er á hinn bóginn sýnt fram á að Ísland er eftirbátur annarra þjóða hvað varðar slíkar grunnforsendur. Opinber viðmið á Íslandi eru fyrst og fremst almennar yfirlýsingar um fagmennsku án frekari skilgreininga á hvað er átt við nákvæmlega (Lög nr. 84/2001 og reglugerð nr. 715/2001).

Bestu aðferðir (best practises) eru aðferðir sem hafa reynst vel til að ná árangri í tilteknum viðfangsefnum og eru viðurkenndar sem slíkar af fræðasamfélögum og fagfélögum. Project Management Institute (PMI), helstu samtök verkefnastjórnunar í heiminum, orða bestu aðferðir á þennan hátt: „A best practice in an optimal way currently recognized by industry to achieve a stated goal or objective...“ (PMI, 2013).

Bestu aðferðir eru jafnan ákveðnar með viðmiðum sem gefin eru út opinberlega af viðurkenndum aðilum. Dæmi um slíka aðila eru ISO staðlasamtökin sem gefa út samnefnda staðla, breska

[23] QA stendur fyrir Quality Assurance.

viðskiptaráðuneytið sem upphaflega gaf út PRINCE2 staðalinn um verkefnastjórnunarferla og fyrrnefnd PMI samtök sem gefur The Project Portfolio Standard (um verkefnasöfn), The Program Management Standard (um verkefnastofna), PMBOK (um verkefni) viðmiðin um verkefnastjórnun og Organization Project Management Maturity Model (um samanburðarmat á hæfni). PRINCE2 staðallinn er fyrst og fremst útfærsla á ferlum verkefnis frá upphafi til loka líftíma þess. PMI staðlarnir byggja í meira mæli byggður á þekkingarforsendum (knowledge areas) og eru ítarlegustu viðmið um bestu aðferðir verkefnastjórnunar sem gefin hafa verið út enn sem komið er.

Vel má spyrja hvort slík viðmið séu nauðsynleg? Sem almennt innlegg í rökræðuna skipta bestu aðferðir hugsanlegu ekki öllu máli. En bestu aðferðir miklu máli til að tryggja eins og kostur er nauðsynleg heilindi við undirbúning ákvörðunartöku vegna opinberra framkvæmda í ljósi þess sem áður segir um bjartsýnisbjögun og mistúlkun af ásetningi.

## Tilgangur rannsóknarinnar

Ef viðmið norska fjármálaráðuneytisins, þ.e. fyrrnefnd Q1 og Q2, eru notuð til að lýsa því verklagi sem algengt er að notað sé í vestrænu samfélagi til að tryggja að vandað sé til verka, felast þær orðrétt í eftirfarandi markmiðslýsingu: „To ensure that the choice of concept has been subjected to a political process of fair and rational choice. The ultimate aim is that the chosen concept is the one with the highest economic returns and the best use of public funds. The choice of concept is a political decision to be made by the Cabinet, while the consultant's role is restricted to assert the quality of the documents supporting the decision“ (Norska fjármálaráðuneytið, 2013).

Verkefnin sem falla undir norska ákvörðunarferlið eru stærri opinber verkefni (>750m NKR). Q1 ferlið er sjálft frummat verkefnisins.

Frummatið skal fela í sér eftirfarandi að lágmarki:

1. Þarfagreiningu þar sem fram þarf að koma hverjir hagsmunaaðilar séu og tengsl þeirra við verkefnið ásamt mikilvægi og forgangi verkefnisins í samhengi við þarfir þjóðfélagsins.
2. Stefnumörkun, markmið og tilgangur verkefnisins í samhengi við kröfur verkefnastjórnunarfræða.
3. Heildarmat á verkefninu í samhengi við markmið þess og/eða hvernig það rímar við þætti sem eru utan þess s.s. heildarstefnumörkun ríkisins. Hér skal sérstaklega horfa til óbeinna áhrifa en ekki á tæknilegar lausnir eða smáatriði.
4. Mat á möguleikum sem felast í þörfum, markmiðum og kröfum til verkefnisins. Þetta mat á að tryggja að þeir möguleikar sem af verkefninu hljótast séu ekki skilgreindir of þröngt.
5. Mat á valkostum sem felst í að skoða sérstaklega hvað felst í að ráðast ekki í verkefnið og minnst tvo aðra valkosti við þá hugmynd sem verið er að meta. Fyrir aðra valkosti skal tilgreina kostnaðaráætlun, niðurstöðu og óvissu ásamt ávinnings/kostnaðarmati.
6. Verkefnisáætlun fyrir hina völdu hugmynd.

Þessu til viðbótar er tilgreint hvernig ráðgjafar eiga að bera sig að við vinnu sína við frumundirbúningin með eftirfarandi lágmarkskröfum.

1. Hvað vel samræmist verkefnið hagsmunum í húfi fyrir þjóðfélagið.

2. Hvaða möguleika verkefnið felur í sér fyrir þjóðfélagið.
3. Hvaða aðrir valkostir koma til greina.
4. Hvaða líkur eru á að markmið verkefnisins náist.
5. Hvaða óvissu er til staðar um kostnað og ávinning.
6. Hver er ávinningurinn á móti kostnaði með tölfræðilegum aðferðum (margar mögulegar niðurstöður).
7. Hvaða aðferðir henta til ákvörðunartöku.
8. Hvernig raðast valkostur ef notað er vegið fjárhagslegt mat byggt á heildarmati á bæði áhrifum og hvað auðvelt er að stýra verkefninu.
9. Hvernig verkefnishandbók á að útbúa til að stýra verkefninu yfir líftíma þess

Allt ofangreint skal gera svo tímanlega að þegar þessari undirbúningsvinnu er lokið er enn hægt að snúa af leið eftir atvikum. Fyrst að þessu loknu er hægt að leggja málið fram og tekur þá við annað ferli sem kallast Q2. Eins og áður greinir eru hin norsku fyrirmæli í samræmi við það sem þekkist víða um heim til að tryggja hagsmuni almennings.

Loks má geta þess að norska fjármálaráðuneytið gefur út ítarlegar leiðbeiningar um hagkvæmniathuganir (cost benefit analyse) teknar saman af sérfræðingum sem tilnefndir eru af ríkisstjórn landsins. Yfirlýstur tilgangur leiðbeininganna er að fara sem best með fjármuni almennings (Norska fjármálaráðuneytið, 2012). Þessar leiðbeiningar eru þó ekki hluti af þeim samanburði sem fjallað er um í þessari rannsókn nema að því leyti að þær skýra hagfræði- og aðferðafræðilega þau skilyrði sem getið er um að ofan.

Gerð Vaðlaheiðarganga kann að gefa innsýn í þau vinnubrögð sem tíðkast við undirbúning opinberra verkefna á Íslandi. Í upphafi var raunar reiknað með því að göngin yrðu gerð í einkaframkvæmd og að veggjöld myndu standa undir öllum kostnaði við byggingu og rekstur ganganna (Jónasson, 2006). Þetta breyttist þegar ekki tókst að fjármagna framkvæmdina á frjálsum markaði. Ríkið fjármagnar því framkvæmdina á framkvæmdartímanum og var lánasamningur þess efnis undirritaður 30. nóvember 2012. Tryggingar fyrir láninu eru „félagið sjálft, eignir þess og tekjustreymi“ (Alþingi, 2012). Félagið sem um er getið kallast Vaðlaheiðargöng hf. og er í meirihlutaeigu Vegagerðarinnar (51%) á móti Greiðri leið ehf. Þegar rekstur ganganna er kominn í gott horf verður leitast við að fá langtíma fjármögnun. Þetta er líklega stærsti óvissuþáttur ríkisins við framkvæmdina þ.e.a.s. hvort langtíma fjármögnunin fæst á ásættanlegum kjörum.

Það vekur athygli að meirihluti umhverfis- og samgöngunefndar Alþingis vildi ekki samþykkja framkvæmdina og ályktaði um að göngin færu á samgönguáætlun ríkisins. Var það afstaða meirihluta nefndarmanna að áhættan væri of mikil og að önnur samgöngumannvirki væru brýnni. Guðfríður Lilja Grétarsdóttir, formaður nefndarinnar, sagði í fjölmiðlum það vera skyldu nefndarinnar að skoða hvort forsendur fyrir byggingu ganganna stæðist: „Meirihluti nefndarinnar telur að þessi grunnforsenda sé langt frá því að vera hafin yfir eðlilegan vafa og að ríkir óvissu- og áhættuþættir séu varðandi hana. Í reynd er öll áhættan varðandi þessa framkvæmd á skattgreiðendum og ríkinu“ (Grétarsdóttir, 2013). Einn þingmaður gekk svo langt að kenna fyrirgreiðslu við framkvæmdina við „gríska bókhaldsfærslu“

(Mósesdóttir, 2012) í umræðum um fjármögnun ganganna. Vera má að þingmaðurinn vísi til þess að veðið fyrir láninu er hlutafélagið Vaðlaheiðargöng sem ríkið sjálft á meirihluta í.

Fjárlaganefnd samþykkti hins vegar framkvæmdina og byggði ákvörðunina á sömu gögnum og umhverfis- og samgöngunefnd hafði til skoðunar. Það er umhugsunarefni að þessar tvær nefndir skuli komast að ólíkri niðurstöðu og vekur upp spurningar um hvort þær álitsgerðir sérfræðinga sem voru lagðar til grundvallar séu fullnægjandi undirstaða.  Er ástæða þess að hin faglegu álit má túlka á mismunandi vegu  að fáar lágmarkskröfur hafa verið gefnar út um hvað þarf að vera til staðar til að slíkar álitsgerðir teljist marktækar?

Rannsókn þessi er ætlað að svara þeirri spurningu hvort þessi vöntun á lágmarksviðmiðum hafi hugsanlega haft áhrif á þá ákvörðun sem að endingu var tekin

## Rannsóknaraðferð

Rannsókn af því tagi sem hér um ræðir nefnist eigindleg rannsókn. Eigindleg rannsókn felst í að skoða og skilgreina vandamál í þau augnamiði að skilja þau betur og leita leiða til að fást við þau. Algengt er að eigindleg rannsókn víkji að mannlegri hegðun og aðferðirnar því ekki bundnar við rannsóknarstofur heldur fremur hagnýt viðfangsefni t.d. í viðskiptum, menntamálum, umhverfismálum, heilbrigðismálum o.s.frv. Niðurstöðurnar eru oft vísir að lausn á því vandamáli sem er fjallað um. Þar sem niðurstöðurnar eru oft byggðar á litlum úrtökum, flóknum aðstæðum, miklum breytileika og huglægri túlkun þarf að hafa í huga að túlka þarf niðurstöður af hófsemi og virðingu fyrir viðfangsefninu.

Rannsóknum er oft skipt upp í hlutlægar (quantitative) og huglægar (qualitative). Fyrrnefnda gerðin byggir á söfnum gagna á tölulegu formi og úrvinnslu þeirra en sú síðarnefnda á að skoða lýsandi gögn, t.d. texta og viðtöl. Það er hins vegar til þriðja gerðin (multi strategy) sem er blanda af því að skoða texta og tölulegri úrvinnslu og má telja þessa rannsókn í þeim flokki. Þess skal getið að þau sjónarmið þekkjast til að þessar tvær aðferðir séu ósamrýmanlegar. Einn fræðimaður, Egon Guba, orðar það svo að „önnur aðferðin útilokar hina rétt eins og að trúin á að jörðin sé hnöttur útilokar trúna á að hún sé flöt“ (Guba, 1987).

Hvað sem efasemdarröddum líður vex blönduðum rannsóknaraðferðum fiskur um hrygg og margir telja að hlutlægar og huglægar rannsóknir geti vel stutt hvor við aðra þótt vissulega sé munur þarna á (Howe, 1988). Meginmunurinn er að í hlutlægum aðferðum eru leitað að breytum, þær mældar með vísindalegum aðferðum og loks tengdar saman þannig að hægt sé að leggja tölulegt mat á niðurstöðurnar. Matið felst s.s. í tölfræðilegri úrvinnslu á eigindum rannsóknarinnar til dæmis frávikum.  Bent hefur verið á að hættuna á að hin hlutlæga og vísindalega tölfræðilega niðurstaða sé ofmetin en sjálft rannsóknarferlið vanmetið. Rannsóknarmenn geta t.d. valið hvaða breytur þeir telja mikilvægar til að gera mælingar á og hvaða mælingaraðferðir við hæfi. Þetta val rannsóknarmannsins kann að vera huglægt sem þýðir að hin tölfræðilega niðurstaða er aðeins jafn áreiðanleg og gögnin og aðferðirnar sem liggja til grundvallar (Huberman, 1987). Því má leiða að því rök að allar rannsóknir séu huglægar að einhverju marki.

Í þessari rannsókn voru skoðaðar skýrslur sem út hafa komið í tengslum við undirbúning Vaðlaheiðarganga og ætla má að Ríkisábyrgðarsjóður hafi haft til hliðsjónar samkvæmt umsögn um frumvarpið um fjármögnun Vaðlaheiðarganga (Frumvarp til laga um heimild til handa ráðherra f.h. ríkissjóðs til að fjármagna gerð jarðganga undir Vaðlaheiði, Þingskjal 1156 - 718. Mál).

Aðferðin sem notuð er við rannsóknina er svokölluð tilviksrannsókn (case study). Tilviksrannsóknir byggja á því að hafa rannsóknaraðferð (strategy) og að safna gögnum (evidence) með aðferðum sem henta viðfangsefninu (Robson, 2011, bls. 136), (Fellows og Liu 2009). Eigindlegi hluti rannsóknarinnar felst í því að bera saman þær skýrslur sem út hafa komið um Vaðlaheiðargöng við lágmarkskröfur norska fjármálaráðuneytisins um störf ráðgjafa sem áður er um getið. Megindlegar niðurstöður eru svo settar fram til frekari úrvinnslu og túlkunar (sequential exploratory design).

Mælikvarðinn sem er notaður er svokallaður Likert-skali. Likert-skalar henta í skjalarýni eins og hér um ræðir því þeir fela í sér að hægt er meta að hvaða hlutfallsmarki skýrslurnar sem verið er að skoða uppfylla norsku lágmarkskröfurnar.

Athugað var hvort skýrslan innihéldi þá hugmyndafræði og aðferðir sem Norðmenn gera sem lágmarkskröfur og voru svarmöguleikarnir eftirfarandi: mjög mikið, mikið, nokkuð, lítið, ekkert, á ekki við. Út frá svörunum var gefin einkunn á skalanum 0-4 þar sem 0 miðast við að „ekkert“ komi fram í skýrslunum og 4 að „mjög mikið“ komi fram og því í samræmi við norsku viðmiðin. Ef tiltekin aðgerð eða aðferð átti ekki við í viðkomandi skýrslu var valmöguleikinn „á ekki við“ valinn og þá hafði sá þáttur ekki áhrif á niðurstöðuna. Hæsta skor var síðan valið til að gefa heildarmynd af því hvort sá sem læsi allar skýrslurnar hefði þær forsendur sem norsku lágmarkskröfurnar gera ráð fyrir við mat á hagkvæmni stærri verkefna.

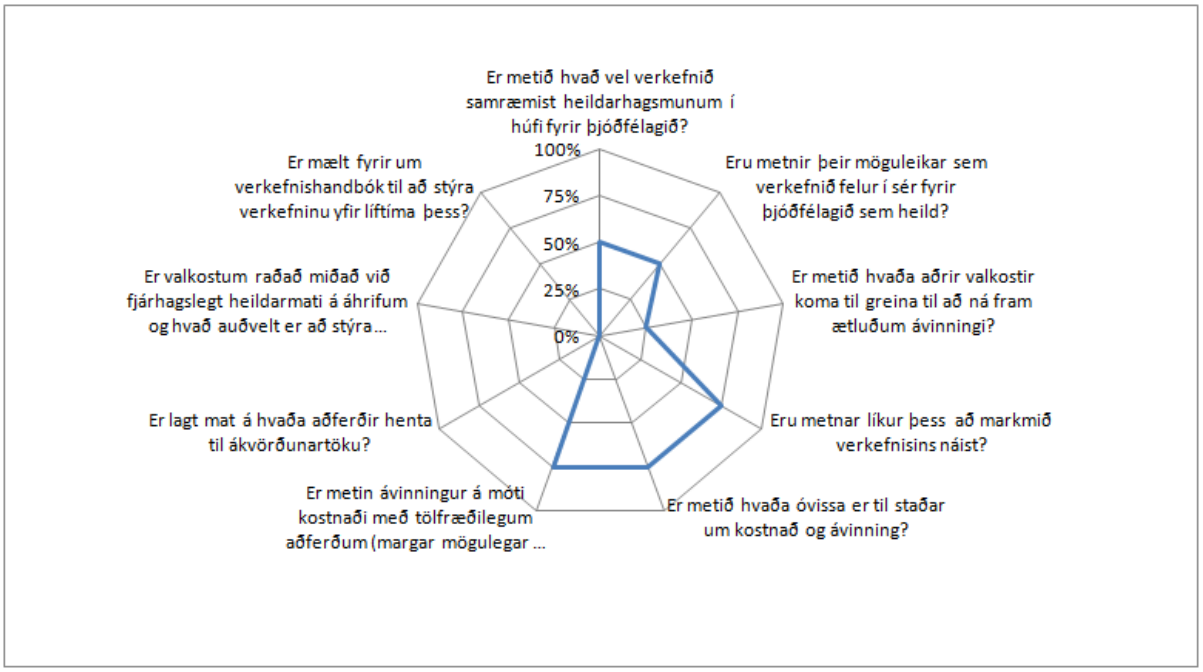
Tafla 1. Listi yfir álitsgerðir sem birst hafa opinberlega um Vaðlaheiðargöng, stutt lýsing á innihaldi, útgáfutímabil og höfundur.

| Heiti | Markmið | Úgáfutími | Höfundur | Niðurstaða |
|---|---|---|---|---|
| Mat á þjóðhagslegri arðsemi | Mat á þjóðhagslegri arðsemi með forsendum frá Greiðri leið ehf. | Janúar 2006 | Jón Þorvaldur Heiðarsson (JÞH) | Jákvæð niðurstaða fyrir fram-kvæmdinni |
| Kynning á jarðgöng undir Vaðlaheiði ásamt vegtengingum. | Lýsingar á staðháttum, áhrif framkvæmdarinnar, umhverfisáhrif og lýsing á framkvæmdinni og framkvæmdarsvæðinu miðað við einkaframkvæmd. | Júni 2006 | Pétur Þór Jónasson (PÞJ) | Jákvæð niðurstaða fyrir fram-kvæmdinni |
| Mat á samfélagsáhrifum | Mat á samfélagsáhrifum með tilliti til atvinnu, búsetu og samskipta með tilkomu ganganna miðað við einkaframkvæmd. | Júni 2006 | Haraldur Reinhardsson (HR) | Jákvæð niðurstaða fyrir fram-kvæmdinni |
| Gjaldtaka fyrir notkun samgöngumannvirkja | Fjármögnun fjögurra samgöngumannvirkja með innheimtu gjalda fyrir notkun þeirra og mat á fjárhagslegri sjálfbærni. | Júní 2010 | Hagfræðistofnun Háskóla Íslands | Metur framkvæmdina áhættusama |
| Geta veggjöld geti staðið undir kostnaði við gerð og rekstur. | Gagnrýnið mat á forsendum verkefnisins | Desember 2011 | Pálmi Kristinsson (PK) | Neikvæð niðurstaða fyrir fram-kvæmdinni |
| Mat á greiðslugetu og forsendum | Mat á hvort forsendur viðskiptaáætlunar séu raunhæfar með mati á stofnkostnaði, rekstrarkostnaði, greiðsluvilja, umferðarþróun, þjóðhagslegum atriðum, endurfjármögnunaráhættu, lánakjörum og lánaskilmálum. | Janúar 2012 | IFS Greining (IFS) | Jákvæð niðurstaða fyrir fram-kvæmdinni en með fyrirvörum um forsendur. |

## Niðurstöður

Þessar skýrslur eru ólíkar hvað varðar efnistök og þær eru ólíkar hvað varðar tilgang. Þær hafa þó allar það markmið að leggja til upplýsingar þeim sem taka ákvörðun. Þær komast á hinn bóginn að mjög mismunandi niðurstöðum um flesta þá þætti sem máli skipta.

Mynd 1. Matsniðurstöður um hvernig samanlagðar niðurstöður allra álitsgerðanna ríma við norsku lágmarkskröfurnar.



Eftir að allar skýrslurnar höfðu verið metnar og þeim gefnar einkunnir og það fellt út sem ekki átti við kom Mynd 1 í ljós. Álykta má sem svo að því fari fjarri að sá eða þeir sem læsu allar þessar álitsgerðir væru með nægilega vel undirbyggð fagleg álit í höndunum til að taka ákvörðun sem væri í senn ólituð af of mikilli bjartsýni eða viljandi mistúlkun. Þá má álykta sem svo að ef Vaðlaheiðargöng væru norsk framkvæmd hefði verkefnið ekki verið samþykkt á grunni jafn takmarkaðra álitsgerða og hér ræðir um. Til einföldunar má segja að af þessum níu atriðum sem skal leggja til grundvallar er sex sinnt að einhverju marki en um þrjú er ekkert að finna. Samanlagt er aðeins tæplega 40% af norsku kröfunum sinnt ef niðurstöðurnar eru lagðar saman og hlutfallaðar að hundraði. Til að gæta sanngirni skal þó þess getið að ekki er víst að öll þessi atriði skipti í rauninni máli fyrir verkefnið sem hér er til skoðunar.

## Umræður

Erfið umræða einkennir stærri opinber verkefni á Íslandi. Nægir að nefna nýleg opinber verkefni eins og Landeyjarhöfn, Héðinsfjarðargöng, Hörpu, Vaðlaheiðargöng og Nýja Landspítalann. Þessi verkefni eru ekki aðeins umdeild heldur er umræðan mótsagnakennd. Sérfræðingar eru stundum á algjörlega öndverðri skoðun um ávinning verkefnisins og útgjöld vegna þess. Það er því ekki nema von að almenningur sé ruglaður í ríminu og eigi erfitt með að treysta því sem er sagt í opinberri umræðu. Hvernig getur verið það regindjúp á milli arðsemi af Vaðlaheiðargöngum eftir því hvaða sérfræðingur reiknar? Jafnvel niðurstöður um kostnaðarvirði veggjalds eru gjörólíkar eftir því hver í hlut á!

Hluti ástæðunnar kann að vera að ekki hafa verið skilgreindar ítarlega lágmarkskröfur til gæða eða innihalds slíkra álitsgerða eins og tíðkast víðast hvar. Af þeim sökum getur nánast hver sem er sagt hvað sem er með hvaða aðferð sem er. Ákvörðunartakar geta síðan valið þær álitsgerðir sem þjóna hagsmunum þeirra og notað sem réttlætingu fyrir að ráðast í sitt verkefni jafnvel þótt röksemdarfærslan sýnist langsótt.

Það er t.d. bent á það í skýrslu (Jónasson 2006) að arðsemi framkvæmdanna sé reiknuð 7,9% miðað við aðra skýrslu (Heiðarsson 2006) en ekki tekið fram að sú arðsemi miðar við að ekki sé tekið neitt veggjald fyrir að aka um göngin. Það er þó frumforsenda þess að byggja göngin að gjald sé tekið fyrir umferð um þau. Af hverju var ekki reiknuð út þjóðhagsleg arðsemi miðað við veggjald? Önnur ástæða þess að hægt er að komast að mismunandi niðurstöðu, þótt sömu gögn sé skoðuð, kann að vera sérhagsmunagæsla ákvörðunartakanna en þingmenn kjördæmisins reyndust vera fjölmennir í nefndinni sem vildi framkvæmdina.

Þó að þessi ákvörðun sé ekki byggð á bestu aðferðum voru engu að síður lögð fram lög á Alþingi til fjármögnunar ríkissjóðs af framkvæmdinni. Ekki nóg með það heldur eru að auki gerðar undanþágur á lögum 121/1997 um ríkisábyrgðir. Í lögunum segir í 3. gr 3. málsgreinar að ríkissjóði sé óheimilt að takast á hendur ríkisábyrgð nema að ábyrgðarþegi leggi fram a.m.k. 20% af heildarfjárþörf verkefnisins. Það er ekki gert í þessu tilfelli því eigið fé er aðeins um 5% af heildarkostnaði verkefnisins.

Loks má spyrja hvort þau viðmið sem hér hafa verið lögð til grundvallar eigi við um Vaðlaheiðargöng en norsku viðmiðin eiga að ná til verkefna sem eru um 14 milljarðar ISK að fjárfestingarvirði? Svarið er að svo verði að teljast enda er uppreiknaður stofnfjárkostnaður Vaðlaheiðarganga, þegar þetta er ritað (mars 2013), næstum 12 milljarðar ISK og verkefnið mjög stórt á íslenskan mælikvarða. Við þessa upphæð mun síðan bætast við fjármagnskostnaður sem raunar engin veit hver verður. Líklegt má þó telja að hann nemi milljörðum ISK. Rétt er þó að taka fram að hæpið er að telja kostnað við

endurfjármögnun til sem stofnfjárkostnað en slíkur kostnaður er þó augljóslega hluti af heildarkostnaðnum við Vaðlaheiðargöng.

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**Keywords**: optimism bias, planning fallacies, cost forecasting, reference class forecasting, transportation projects.

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# REFERENCE CLASS FORECASTING IN ICELANDIC TRANSPORT INFRASTRUCTURE PROJECTS

## Abstract

Previous studies have indicated that the majority of infrastructure projects have cost overruns. The root causes are traced to political, technical and psychological reasons at the initial stage of the project. The consequences are either unintentional overoptimistic forecasting of perceived results or calculated interpretation of facts in favour of personal and political interests. These phenomena are called planning fallacies and strategic misrepresentation respectively. A step-wise procedure to avoid planning fallacies and strategic misrepresentation is called the *outside view*. The outside view bypasses human biases by using past experience and empirical data of past projects. It has evolved into a professional practice through a method called *reference class forecasting* which has been shown to provide improved cost forecasting accuracy in the initial stage of a project. The study reported in this paper examined reference class forecasting as a means for improving cost forecasting in the planning stage of the project lifecycle. Data from the Icelandic Road Administration (ICERA) were assembled in a cost forecasting model to determine if it might be possible to improve forecasting accuracy. The results proved inconclusive; however, a comparison with findings from similar projects in the UK showed that although cost overruns followed a similar curve, the chance of occurrence is significantly lower at the planning stage after the decision to proceed has been taken.

**Keywords**: optimism bias, planning fallacies, cost forecasting, reference class forecasting, transportation projects.

## Introduction

Certain types of project are notoriously prone to inaccurate cost forecasts. Flyvbjerg et al. (2002) reviewed 258 projects and found that nine out of ten suffered from a cost overrun. When Jennings (2012) investigated the cost estimates for the London 2012 Olympics over a five-year period, the project's cost had escalated from an original estimate of £1.8 billion to more than £9.3 billion when the budget was formally reviewed.

Jennings (2012:458) identifies three underlying factors contributing to the underestimation of cost for a large-scale project: the first is how risk and uncertainties

are downgraded in the political and bureaucratic context; second, is the problem of decision-making under uncertainty leading to systematic biases; and third, the complex technical challenges inherent in large-scale projects resulting in lack of management and administration. A variable that can influence monetary cost and/or income for industry and government the next decade

There is no simple explanation for under-performance in cost forecasting but, at the most basic level, it can be grouped into three categories: technical, psychological and political (Flyvbjerg, 2006; 2011). Technical explanations cover inaccuracy in terms of *project uncertainty*, *unreliable or out-dated data* and *the use of inappropriate forecasting models* (Vanston and Vanston, 2004). These are often typical explanations, used by management, for under-performance against forecasts. Psychological explanations describe inaccuracy in terms of *optimism bias*. Optimism bias is defined as *"the demonstrated systematic tendency for appraisers to be over-optimistic about key project parameters"* (HM Treasury, 2003:84). Circumstances are interpreted in favour of taking risks if the decision-maker is convinced that the rewards exceed the cost. In so doing, it provides decision-makers with an attractive argument to explain failed projects, i.e. they were taking reasonable risks. In other words, optimism bias occurs when planners fall into the trap that psychologists call *the planning fallacy* (Lovallo and Kahneman, 2003). Political explanations cover inaccuracy in terms of *strategic misrepresentation*, which occurs when forecasters and managers deliberately and strategically over-estimate the benefits and under-estimate the costs of a project in order to increase the probability of approval for funding (Flyvbjerg, 2005a; 2006).

Planners may see themselves in two distinct roles that are in contradiction with each other. On the one hand, planners are scientists who analyse data to provide the best solution for a problem. Conversely, planners are advocates who use data, models and methods to prove that a certain outcome is the best choice in a given situation. In the *AICP Code of Ethics and Professional Conduct* (APA, 2005a) one can see the conflict. The code says, in the same article for example, that planners must exercise independent professional judgment, but must also accept the decision of the client concerning the objectives and nature of a professional service. Planners, politicians and managers have the ability to choose how they decide to interpret the outcome of a forecast and how they present it to others (Wachs, 1989; 1990).

The situation when a planner is primarily focusing on the present project only often results in extremely optimistic plans. This is called the *inside view* and the alternative is called the *outside view* (Lovallo and Kahneman, 2003). The outside view completely ignores the present project and instead examines past experiences on similar projects. The resulting forecast is usually much more accurate as the outside view bypasses cognitive and political biases such as over-optimism and strategic misrepresentation, and cuts directly to the outcomes (Lovallo and Kahneman, 2003). The outside view is also known as *reference class forecasting*.

Reference class forecasting (RCF) is a method for systematically taking an outside view when planning projects, by basing forecasts on actual performance of comparable projects rather than focusing only on the project in hand. Originally, RCF was developed to compensate for the cognitive bias that Kahneman and Tversky (1974; 1979) discovered in their work on planning and decision-making under uncertainty. In short, their work demonstrated that human judgement is generally optimistic and over-confident with a tendency to under-estimate cost, completion times, and risk of planned

actions, whilst over-estimating benefits. Flyvbjerg has since expanded the use of RCF to improve control and due diligence evaluation of project front-end preparation (Flyvbjerg, 2013).

The RCF method has been recommended by The American Planning Association (APA), which *"encourages planners to use reference class forecasting in addition to traditional methods as a way to improve accuracy"* (APA, 2005b). The concept has also been adopted by the HM Treasury require that all budget estimates in investment appraisals to be adjusted for optimism bias by means of RCF (HM Treasury, 2003:85).

The work of Flyvbjerg and COWI (2004) on procedures for dealing with optimism bias in transport planning is primarily focused on the use of RCF in the initial stage of a public project when the decision for *go/no-go* is under review. The research reported in this paper differs as it is focuses on the application of RCF to the planning stage following the decision to implement the project. The subject of the research is the work of the Icelandic Road Administration (ICERA). The question that the research here aimed to answer was: *"could ICERA improve its cost forecasting by using reference class forecasting at the planning stage of a transportation project?"* With this aim in mind, this paper centres on the building of a reference class forecasting model which has been used with data provided by ICERA to evaluate the risk of cost overrun on transportation projects in Iceland. The forecasting model evaluates how much extra cost has to be added to a reference class of similar projects in order to cover the risk of cost overrun: this is known as the *optimum bias uplift*. The consequence of adding optimism bias uplift is that it should be possible to avoid (or substantially reduce) situations where costs exceed budgets, since the latter are set at more realistic levels.

## Research methods

The research is quantitative and covers the population of all accessible ICERA projects at the time of study. The method adopted to construct the model is comparable to the procedure originally used by UK government (Department of Transport) under supervision of Flyvbjerg and COWI (2004). The research method is based on analysing empirical data of completed projects to establish statistical information on the differences between actual cost at project completion and the forecasted cost at the beginning of the project (Lovallo and Kahneman, 2003). The following three key steps were defined.

1. *Identification of a relevant reference class of past projects.* It was important that the class was broad enough to be statistically meaningful, yet narrow enough to be comparable with the specific project at hand.
2. *Establishing a probability distribution for the selected reference class*. This required access to reliable data on cost overrun for a sufficient number of projects within the reference class to make a statistically meaningful conclusion (normally, at least 10).
3. *Comparison of the specific project with the reference class distribution*. The most likely outcome for the specific project was established.

*Step 1*

The main issue when identifying a relevant reference class of past projects is how the classification should be determined. Reference classes cannot be too narrow, e.g. transportation projects cannot be divided into too many categories because it could be difficult to establish valid optimism bias uplift as each category would be too small. Similarly, reference classes cannot be too wide, because some projects within each reference class are unlikely to be comparable (Flyvbjerg and COWI, 2004). Each reference class should reveal the risk of cost overrun based on statistical analysis, benchmarking and other forms of analysis. Uplift refers to the amount of additional funding that is needed to raise the cost estimate so that there is an equal chance of the outturn cost being above or below the planned cost. In other words, it produces the 50:50 or 50% cost estimate.

*Step 2*

Once the reference classes had been built, an accurate probability distribution for overrun was found for each class. Cost overruns in percentiles were defined according to equation (1), where *I* = Cost overrun in %, *Ta* = Actual cost of a project and *Tf* = Forecasted cost of a project. Actual cost is defined as real, accounted cost determined at the time of completing a project and forecasted cost is defined as the cost at the time the decision is made to implement the project.

$$I = \frac{(T_a - T_f)}{T_f} \qquad \text{(Equation 1)}$$

In order to ensure comparability, it was important that the definition of forecasted and actual cost was identical for all projects. The distribution for each reference class was used to establish the optimism bias uplifts – see step 3.

A particular concern was the representativeness of the data sample. A number of issues were considered in the light of Flyvbjerg and COWI (2004).

1. It could be argued that projects that are well-managed regarding data availability are also likely to be well-managed in terms of other factors which result in better than average performance.
2. Managers of projects that have large over-expenditure are likely to be less interested in making cost data available, while more successful project managers

might well to be interested in making cost data available. This leads to under-representation of *bad* projects, but over-representation of *good* projects in the sample.

3. Even when managers have made cost data available, they might have decided to provide data that present their projects as favourably as possible. Often, there are several forecasts of cost and several estimates of actual cost to choose from. There might therefore be a temptation for managers to choose the combination of forecasted cost and actual cost that make their projects look good on paper.
4. There might be difference in the representation of different sub-samples, e.g. in a reference class that is supposed to be comparable for both bridges and tunnels, 85% of the projects might be bridges and only 15% tunnels.

*Step 3*

Once a probability distribution for cost overrun has been found for each reference class, it is possible to determine the required optimism bias uplift. Required uplifts are established as a function of the level of risk one is willing to take. A lower level of acceptable risk results in a higher required uplift (Flyvbjerg and COWI, 2004).

If the project being examined is regarded as average then it should be expected that, on average, the final cost will exceed the forecasted cost by the average budget increase. For example, if in a single reference class the average cost overrun is, say, 10%, then to have a 50% chance of being under or over forecasted cost, 10% uplift should be added to the project being compared to the reference class. If it is unacceptable to have a 50% chance of cost overrun then the uplift needs to be higher than the average budget increase.

For ICERA, which had, and which continues to implement, a large portfolio of projects, the total realised budget increase across all projects can be expected to be close to the expected average. ICERA might have to decide if the 50% chance of the actual cost exceeding the budget is an acceptable risk or not. If not ICERA should add an uplift to the budget relative to the frequency of the empirical data of past projects in the reference class.

The uplifts refer to cost overrun calculated in constant prices. The lower the acceptable risk for cost overrun, the higher the uplift. For instance, if there is a willingness to accept a 50% risk for cost overrun in a project in a given reference class is only 10%, ICERA must add as an uplift the cost overrun of 90% of projects in the reference class. If ICERA accepts 20% chance of cost overrun it must add 80% of the cost overrun in the reference class and so on.

A database of projects over a five-year period was obtained directly from ICERA covering projects completed between 2007 and 2011. The database contained 80 projects, 11 of which had been completed in 2007, 24 in 2008, 22 in 2009, 15 in 2010 and 8 in 2011. As each project can comprise different project segments, i.e. a single project can consist of bridges, roads and tunnels, some projects had to be split. For that reason, the database contained 110 projects (project segments) in all, 14 of which were completed in 2007, 39

in 2008, 23 in 2009, 23 in 2010 and 11 in 2011. All projects for which cost data were available were initially included in the sample.

The 110 projects in the database covered the following types of work: roads, entrance ramps, traffic roundabouts, intersections, bridges, underpasses, drainage, waterside protection, road lighting and electrical installations, fences, conduits and wiring systems, ditches, poles and utilities. Project information included the following.

1. Primary cost plan both from ICERA and from the contractor who was awarded the main contract.
2. Secondary cost plan both from ICERA and from the contractor.
3. Actual cost of the project.

Cost data were provided in two categories: forecasted cost (primary cost plan) and actual cost (including additional cost items). The information was not however completely reliable as closer examination showed that items that should have been recorded as additional cost were, in some instances, recorded as forecasted cost and vice versa[24]. Correcting these anomalies ensured that the forecasted cost, as shown in the primary cost plan, and actual cost were comparable.

After identifying the transportation projects included in the database, it was decided to make two reference classes similar to those classified in the UK for the same kind of project. After discussing this proposal with the directors of ICERA, it transpired that it was not possible to say if traffic roundabouts, entrance ramps and intersections should be placed in the same group as roads in general or if they should be treated as statistically similar: much depended on the nature of the project[25]. Eventually, it was decided to classify transportation projects into roads and fixed links.

Table 1. Classification of Icelandic transportation projects.

| Category | Types of projects | Source of optimism bias uplifts |
|---|---|---|
| Roads | Main roads | Reference class of 65 road projects |
| | Connecting roads | |
| | Region roads | |
| Fixed Links | Bridges | Reference class of 11 bridge and underpass projects |
| | Underpasses | |

For all possible cost overruns, the frequency of a project having a given cost overrun or higher value was counted. The number of projects with a given maximum cost overrun

[24] Interview with R. Gunnarsson and S. Gudmundsson, ICERA Construction Department on 10 May 2012.

[25] Interview with S. Gudmundsson, ICERA Construction Department on 11 June 2012.

was determined. The probability distribution with cost overrun on the *x-axis* and the share of projects with a given maximum cost overrun on the *y-axis* were determined.

Since the database contained both the primary cost plan of ICERA and the primary cost plan of the contractor awarded the project, it was decided to find the uplift for both. Key statistics about each reference class are summarised in tables 2 and 3.

Table 2. Key statistics on Reference Class 1 – Roads

| Reference Class 1 – Roads | | |
|---|---|---|
| | ICERA | Contractors |
| *N* | 65 | 65 |
| Average overrun | 6% | 27% |
| Standard deviation | 0.237 | 0.213 |
| Variance | 0.056 | 0.045 |
| Maximum overrun | 118% | 97% |
| Minimum overrun | -36% | -7% |

Table 3. Key statistics on Reference Class 2 – Fixed Links

| Reference Class 2 – Fixed Links | | |
|---|---|---|
| | ICERA | Contractors |
| *N* | 11 | 11 |
| Average overrun | 7% | 19% |
| Standard deviation | 0.207 | 0.199 |
| Variance | 0.043 | 0.04 |
| Maximum overrun | 34% | 63% |
| Minimum overrun | -24% | 1% |

In ICERA's Reference Class 1 – Roads, the project with the second highest overrun had a cost overrun of 53%, but the project with the highest overrun had a cost overrun of 118%. If this project, with the highest cost overrun, had been left out of the reference class the difference between the maximum and minimum overrun would have decreased substantially. However, it was decided to include this project in the reference class as there was nothing to indicate that the data on this project were unreliable. Projects were excluded from the reference class only if there was a belief that the data might be erroneous.

The practical application of this model is that when a new project is scheduled a primary cost plan is prepared as normal. With a primary cost plan, it is necessary to choose an acceptable risk level. It is then possible to add an appropriate uplift to the primary cost plan as risk capital. The 50% percentile should only be used in instances where it is accepted there is a high risk that cost overrun will occur and in situations where investors are funding a large number of projects and cost savings on one project may be used to cover the costs of overruns on other projects. The 80-90% percentile (20-10% acceptable chance of cost overrun) should be used when it is agreed that overrun must not occur on a particular project.

Figures 1 and 2 show the distribution of cost overrun for each reference class for both ICERA and the contractor.

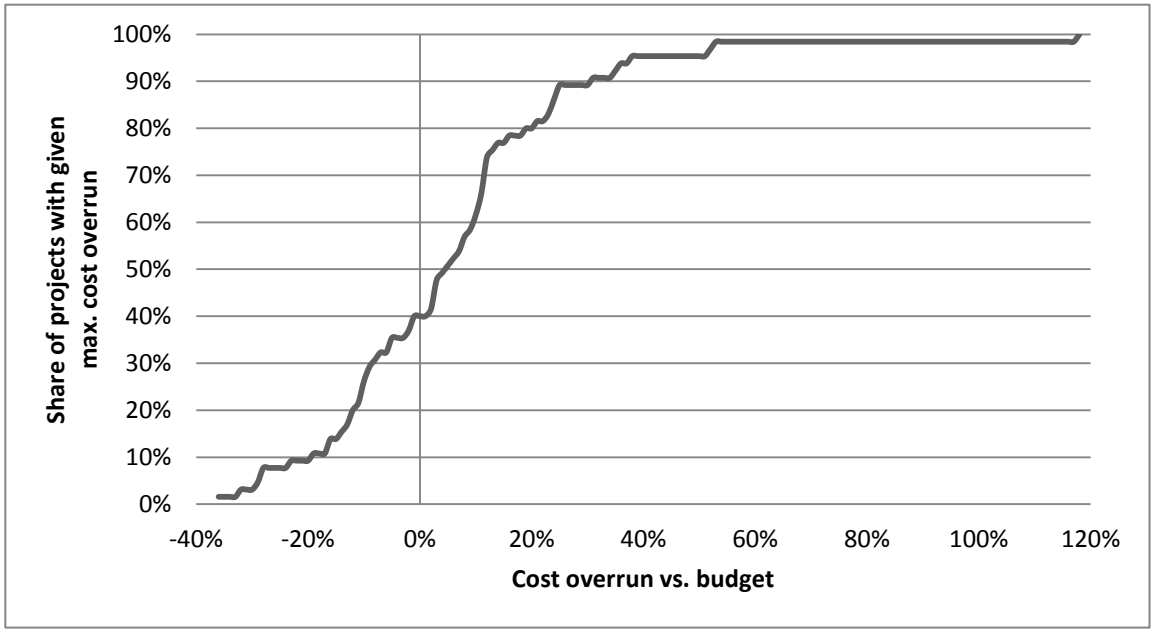


Figure 1. Probability distribution of cost overrun for Reference Class 1 – Roads, *N*=65 (ICERA).

Figure 1 shows the distribution of cost overrun for ICERA's primary cost plan covering road projects. For example, 40% of projects have a maximum cost overrun of 0% and 80% of projects a maximum overrun of 19%.

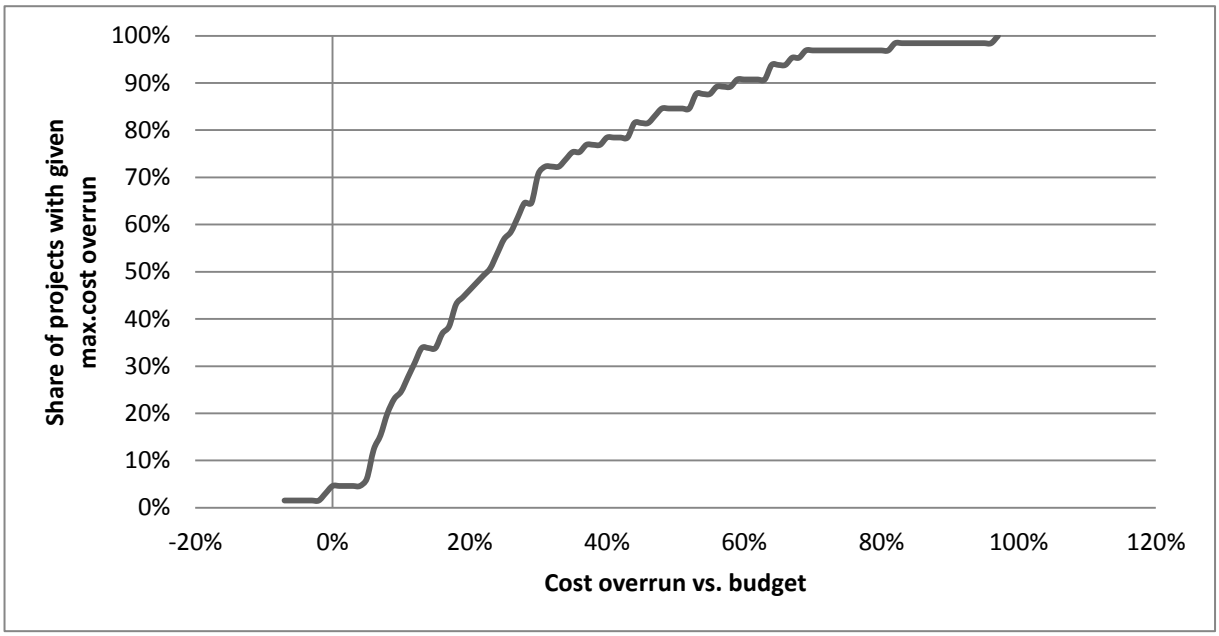


Figure 2. Probability distribution of cost overrun for Reference Class 1 – Roads, *N*=65 (Contractor).

Figure 2 shows the distribution of cost overrun for the contractor's primary cost plan covering road projects. For example, 40% of projects have a maximum cost overrun of 17-18% and 80% of projects have a maximum overrun of 43-44%.

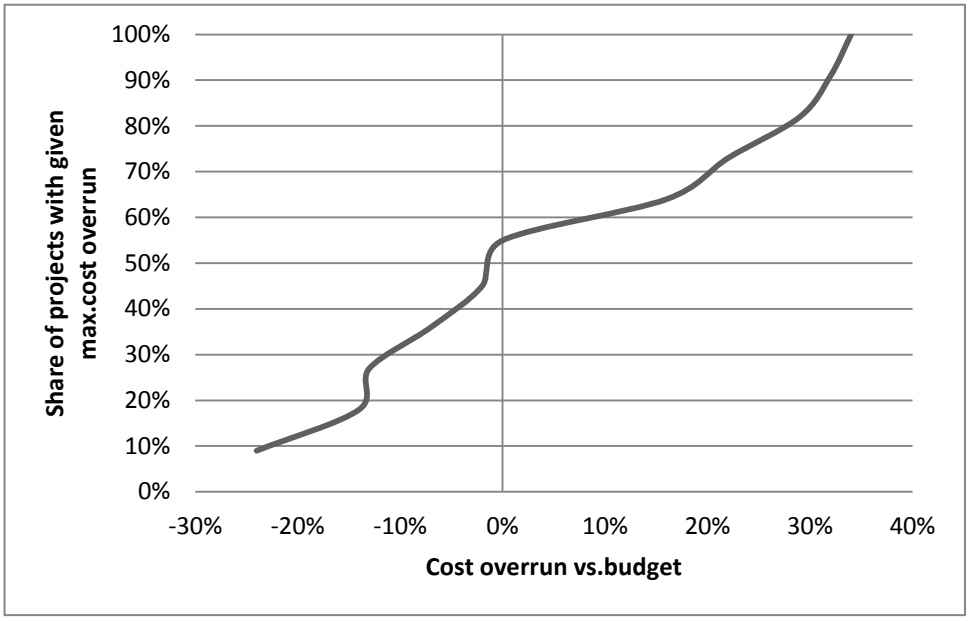


Figure 3. Probability distribution of cost overrun for Reference Class 2 – Fixed links, *N*=11 (ICERA).

Figure 3 shows the distribution of cost overrun for ICERA's primary cost plan regarding fixed links projects. For example, 40% of projects have a maximum cost overrun of (-3)-(-2)% and 80% of projects a maximum overrun of 28-29%.

Finally, Figure 4 shows the distribution of cost overrun for the contractor's primary cost plan covering fixed links projects. For example, 40% of projects have a maximum cost overrun of 10-11% and 80% of projects a maximum overrun of 26-27%.

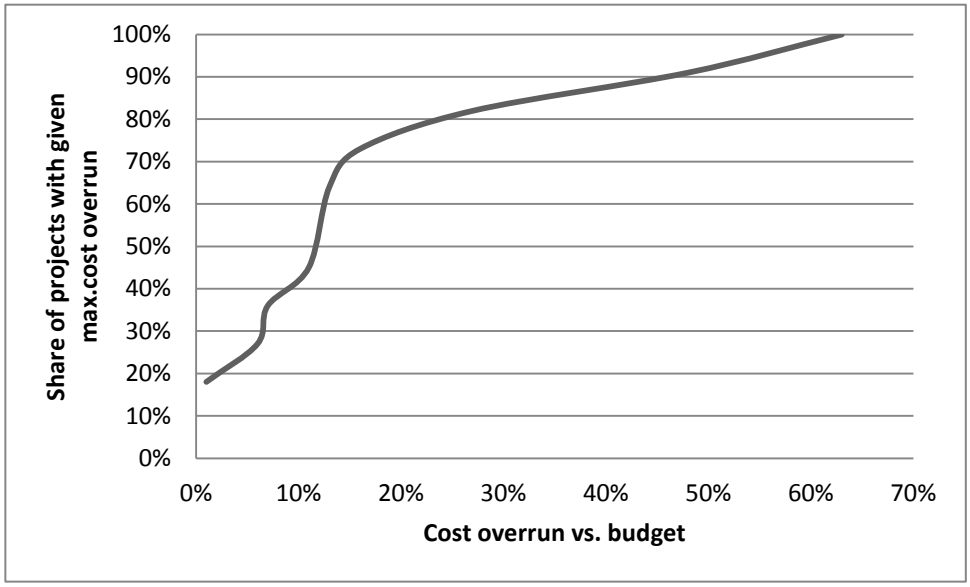


Figure 25. Probability distribution of cost overrun for reference class 2 – Fixed links, *N*=11 (Contractor).

Figures 5 and 6 show the required uplift as a function of the maximum acceptable level of risk. These figures apply to Reference Class 1 – Roads and show the required uplift that should be added to ICERA's and the contractor's cost plans.

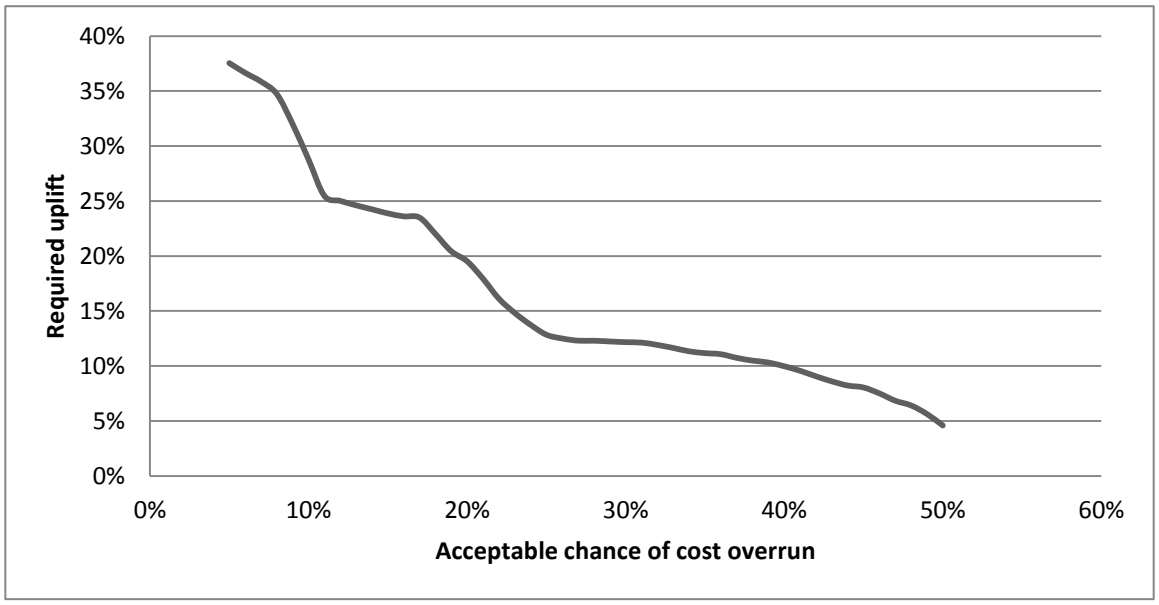


Figure 5. Required uplift as function of the maximum acceptable level of risk for cost overrun – Roads (ICERA).

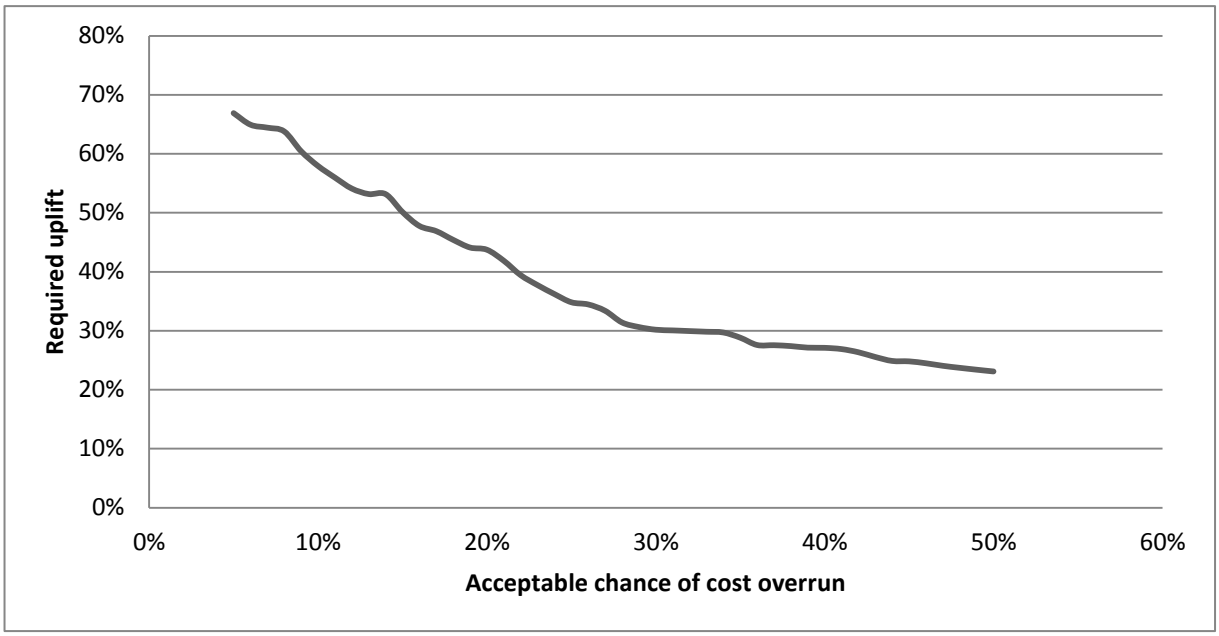


Figure 6. Required uplift as function of the maximum acceptable level of risk for cost overrun – Roads (contractors).

Figures 5 and 6 indicate that, if it had been decided the risk of cost overrun for a road project should be less than 50% (having a 50% chance to be within budget), it would be necessary to use an uplift of 5% on ICERA's primary cost plan with an uplift of 23% on the contractor's primary cost plan. If it had been decided that the risk of cost overrun should be less than 20% (having a 80% chance to be within budget) then an uplift of 20% should be added to ICERA's primary cost plan with 44% added to the contractor's primary cost plan.

Figures 7 and 8 apply to Reference Class 2 – Fixed Links and show the required uplift that should be added to ICERA's and the contractor's cost plans.

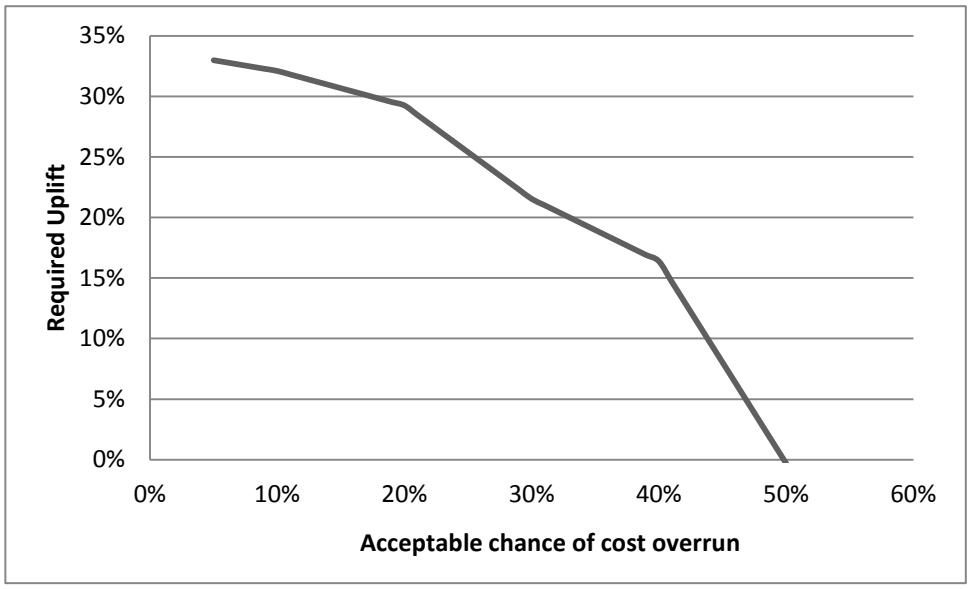


Figure 7. Uplift as function of the maximum acceptable level of risk for cost overrun – Fixed links (ICERA).

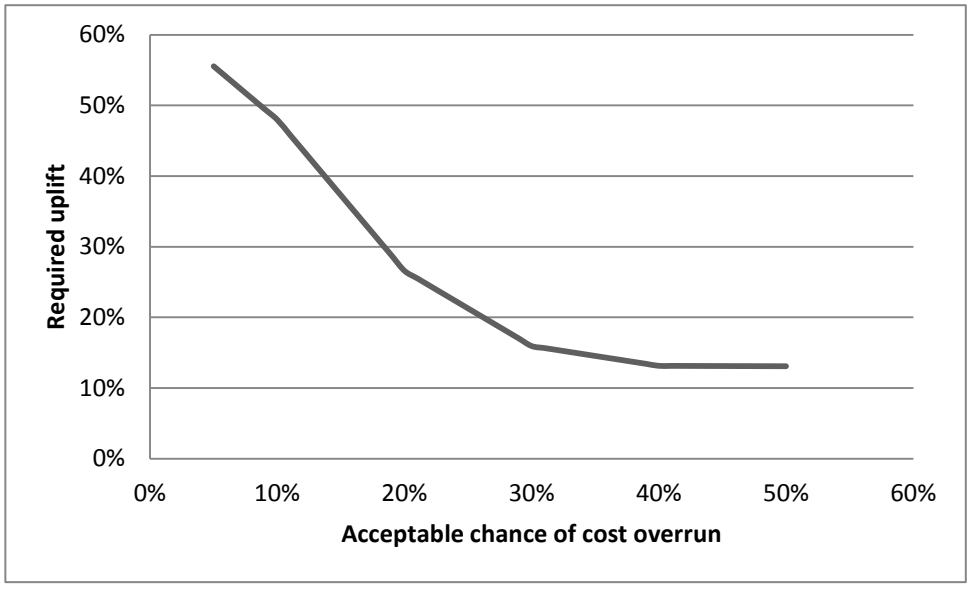


Figure 8. Uplift as function of the maximum acceptable level of risk for cost overrun – Fixed links (Contractors).

Figures 7 and 8 show that, if it had been decided that the risk of cost overrun for a fixed link project should be less than 50% (having a 50% chance to be within budget), it would not be necessary to add an uplift on ICERA's primary cost plan. However, an uplift of 13% would be required on the contractor's primary cost plan. If it had been decided that the risk of cost overrun should be less than 20% (having a 80% chance to be within budget) then an uplift of 29% should be added to ICERA's primary cost plan and 27% should be added to the contractor's primary cost plan.

Table 4 summarises the required uplift for selected percentiles for both reference classes for ICERA and contractors.

Table 4. Required uplifts for selected percentiles.

| | | *Applicable optimism bias uplifts* | | | | |
|---|---|---|---|---|---|---|
| *Category* | *Types of projects* | *50%* | *60%* | *70%* | *80%* | *90%* |
| *ICERA* | | | | | | |
| *Roads* | *Main roads*<br>*Connecting roads*<br>*Region roads* | *5%* | *10%* | *12%* | *20%* | *29%* |
| *Fixed Links* | *Bridges*<br>*Underpasses* | *0%* | *16%* | *22%* | *29%* | *32%* |
| *Contractors* | | | | | | |
| *Roads* | *Connecting roads*<br>*Region roads* | *23%* | *27%* | *30%* | *44%* | *58%* |
| *Fixed* | *Bridges*<br>*Underpasses* | *13%* | *13%* | *16%* | *27%* | *48%* |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Links* | | | | | | |

**Discussion**

In Reference Class 1 (Roads), the shape of the distribution indicates overrun and is similar for ICERA and contractors. In all cases, however, the uplift that has to be added to the contractor's primary cost plan is higher than the uplift that has to be added to ICERA's primary cost plan. This indicates that ICERA, in general, makes more realistic cost plans for road projects than contractors. The reason for this difference is probably attributable to the following reasons.

Contractors are in competition with each other to win projects, so it is in their best interest to have the bid as low as possible to increase the likelihood that their tender offer is accepted. The contractor's primary cost plan is the cost plan of the contractor who was awarded the project. Normally, the successful contractor has one of the lowest tender offers. In addition, ICERA prepares a cost plan for all road projects that are executed whilst each contractor undertakes a cost plan for just those road projects for which they have bid. For that reason, ICERA has much more experience when preparing a cost plan for a road project and has a good overview of all road projects.

Both ICERA and contractors base their primary cost plan on unit prices. Contractors use unit prices they know they can achieve with a quantity discount included. ICERA bases its primary cost plan on unit prices obtained by taking the average unit price from all contractors over a 3-4 year period. In this way, ICERA evens out fluctuations and, in most cases, bases its primary cost plan on a higher unit price than the contractor with the lowest bid.

If Reference Class 1 is compared to the road reference class for transportation projects in the UK (Flyvbjerg and COWI, 2004), it can be seen that the shape of the distribution of cost overrun for the reference class is similar to the distribution of cost overrun that is obtained both for ICERA and for contractors in this research. When comparing the uplifts, it can be seen that the uplift in UK projects for optimism bias is higher than the uplift required for ICERA's primary cost plan but lower than the uplift required for the contractor's primary cost plan. It can also be seen that approximately 60% of ICERA's primary cost plan suffers from overrun, 95% of the contractor's primary cost plan suffers from cost overrun and about 80% of UK road projects have suffered from cost overrun. This indicates that forecasts are significantly more accurate as the project passes beyond the initial stage and enters the planning stage but, as previously stated, the UK studies are primarily based on the initial cost forecast.

Other reasons for the differences are that ICERA has included for some uncertainty in its primary cost plan by basing it on higher unit prices. In the UK projects, the forecasted cost is most likely based on a plan that has not included uncertainty; however, this position is not entirely clear. The UK database is much larger than the database used in this research. The road reference class in the UK projects includes both more diverse and a larger number of projects (172 projects when compared with the 65 Icelandic projects).

The projects provided by ICERA for this study were mostly executed after the economic collapse in Iceland in 2008. Increased risk aversion was one of the immediate consequences. It is also possible that ICERA simply completes more accurate cost plans than is the case in the UK.

In Reference Class 2 (Fixed Links), the shape of the distribution of cost overrun is different for ICERA and for contractors. It depends on the risk of cost overrun chosen and whether a higher uplift is added to ICERA's primary cost plan or the contractor's primary cost plan. If the probability of staying within budget is 50% or 90% then a higher uplift is needed for ICERA's primary cost plan. However, if the probability of staying within budget is from 60%-80% then a higher uplift is needed for the contractor's cost plan. The reason could be that Reference Class 2 contains relatively few projects and because of that pre-qualification was not as strict as for projects in Reference Class 1. Seven of the 11 projects in Reference Class 2 did not have a precise actual cost due to the inclusion of additions. It is therefore not possible to place reliance upon this reference class when comparing all fixed link projects. If Reference Class 2 is compared to the fixed links reference class for UK projects, it can be seen that a much higher uplift for projects is proposed which tends to lend some support to the concerns expressed above. In the UK, just four projects were found for this reference class, perhaps confirming that it is hard to collect reliable data for this type of project.

## Conclusions

The research was motivated by the question: *"could the Icelandic Road Administration (ICERA) improve its cost forecasting by using reference class forecasting at the planning stage of a transportation project?"* The short answer is that there is no urgent need for ICERA to adopt reference class forecasting as its current methodology based on time series data seems to work well enough. Projects completed over a five-year period record an average overrun of 6%, which could be considered a moderate indicator of success. The ideal position is to have an average overrun as close to zero as possible. To reach this position, ICERA could add a 5% uplift for optimism bias to all its primary cost plans for road projects, but it is questionable if the effort is worthwhile for such small reward.

Even though the research did not succeed in finding a sufficient uplift for the proposed two reference classes, it is still the best estimate of the chance of cost overrun that currently exists for Icelandic transportation projects. If data were collected, the reference class forecasting is easy to adopt. For this reason, we expect that the forecasting model presented here will be further developed to reduce the incidences of inaccurate forecasting and cost overrun.

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**BENCHMARKING ICELANDIC PLANNING & DECISION-MAKING IN PUBLIC PROJECTS**

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## Útdráttur

Áhætta vegna opinberra fjárfestingarverkefna er um sumt ólík áhættu við einkafjárfestingu. Í fyrrnefnda tilfellinu eru þeir sem taka ákvarðanir um fjárfestinguna ekki að hætta eigin fé sem getur leitt til þess sem nefnt er freistnivandi. Þá háttar þannig til að verkefnisábyrgðin færist frá löggjafarvaldi til framkvæmdarvaldsins eftir að ákvörðun um verkefnið hefur verið tekin. Sökum þess að sá sem upphaflega ýtti verkefninu hefur lítið með sjálfa framkvæmdina að gera gæti hann byggt upphaflega forspá um kostnað á óhóflegri bjartsýni. Við þessu hafa ýmsar þjóðir brugðist með því að útfæra stjórnsýsluhætti sem miða að því að tryggja hagsmuni almennings. Þessi rannsókn er samanburður á stjórnsýsluháttum vegna opinberra verkefna í þremur löndum; Íslandi, Noregi og Stóra Bretlandi. Niðurstöðurnar benda til umtalsverðs tækifæris til að gera betur ef Ísland borið saman við framgreind lönd. Stjórnsýsluhættir vegna fjárfestingaverkefna á vegum hins opinbera þarf að efla og væri vel til fundið að leita fyrirmynda í Noregi og á Stóra-Bretlandi.

Efnisorð: Opinber verkefni, ákvörðunartaka, stjórnsýsluhættir, verkefnisstjórnun

**BENCHMARKING ICELANDIC PLANNING & DECISION-MAKING IN PUBLIC PROJECTS**

## Abstract

The investment risk in projects financed by public capital is different from those financed by private means for several reasons. In the former case, the decision-makers are not risking their own resources which might lead to what is commonly referred to as moral hazard. Another difference is the accountability of the decision-maker subsequent to the go/no-go decision. In the later stages of the project, accountability will have shifted from the legislative power to the executive power. This change in accountability can lead those with primary accountability to make unrealistic or overoptimistic forecasts of project outcomes because they will not be responsible for delivering the project. Many developed countries have responded with a governance framework to provide the public with some assurance that there will be optimal use of public capital. The study presented here

examines and compares the governance framework in three countries – Iceland, Norway and UK. The findings highlight significant room for improvement in Iceland concerning strategic intention as introduced under Icelandic law. Specifically, the Icelandic governance framework on decision-making and planning procedures lags far behind two countries with which it can be reasonably compared. The governance framework for capital projects needs to be strengthened and would benefit from considering the practices adopted in those countries.

Keywords public projects, decision-making, governance framework, project management

# Introduction

Over the last two decades, a change can be seen in the received doctrines of public accountability and administration (Winch, 2010). An approach aimed at increasing the quality of public governance has now been widely implemented and is generally referred to as the New Public Management (NPM). NPM was a response to the assumption that politicians are inherently venal and likely to abuse their authority to enrich themselves and their friends leading to high-cost, low quality products (Hood, 1995). One of the doctrines for ensuring public interest via NPM is the use of an elaborate structure of procedural rules designed to guarantee integrity, transparency and professional service to the public. This makes sense as it is impossible to manage without reference to a conceptual set of rules to form a governance framework. Only what we know can be managed and controlled.

Bevir et al. (2003) referred to NPM as a focus on management over policy. They emphasised the necessity of performance appraisal and efficiency as a consequence of fiscal pressures, determination to redraw the boundaries of the state, increased international regulation due to trends in geopolitics, public expectations to government performance, international management fashion and improvements in information technologies. In a similar vein, Bovaird and Löffler (2003:316) noted that NPM " is about ensuring that the outcomes are right" and, furthermore, that one of two criteria for "good governance" is "implementation by all stakeholders of a set of principles and processes by means of which appropriate public policies will be designed and put into practice".

OECD emphasises the need for an effective governance framework to impact overall economic performance (OECD, 2004:17). "Corporate governance involves a set of relationships between a company's management, its board, its shareholders and other stakeholders. Corporate governance also provides the structure through which the objectives of the company are set, and the means of attaining those objectives and monitoring performance are determined" (OECD, 2004:11). On the corporate level, the economic objective of governance is to reduce transaction costs in a project by the most efficient organization of resources (Müller, 2012). Public governance is defined by the OECD as: "the formal and informal arrangements that determine how public decisions are made and how public actions are carried out, from the perspective of maintaining a country's constitutional values in the face of changing problems, actors and environments" (OECD, 2003:16). Principles and

processes may well differ from country to country but it is reasonable to assume that a detailed conceptual framework will reduce the risk of corrupt, unrealistic and overoptimistic forecasts when public capital is invested. The official procedural guidelines on how to manage and control projects are important source documents as they set the standards for decision makers, planners, consultants and other stakeholders involved in the lifecycle of a public project.

The study reported in this paper focuses on Icelandic government strategy and how it ensures that sound practices, in keeping with those found in other developed countries, are applied. Two countries, Norway and the UK, were selected for comparison. Iceland is by far the smallest with a population just exceeding 300,000 inhabitants. Norway is a Scandinavian country with a government and legislature almost identical to Iceland and a population of 5 million people. The United Kingdom has a population of 63 million people. The UK is also the second largest importer of Icelandic products (Hagstofan, 2013) and British influences on Icelandic business life and attitudes are significant. Williams et al. (2010) and Klakegg et al. (2008) investigated public governance principles in Norway and the UK and found both had clear similarities and differences.

## Governance and project management

In the context of project management, it can be reasonably assumed that the principles of good governance will increase the quality of project planning and clarify the accountability on different levels of the project lifecycle. It may be argued that, in the case of public projects, a solid procedural foundation is even more critical than for private projects because public capital is being invested. In spite of the NPM paradigm, public projects are frequent victims of controversy and overruns (Flyvbjerg, 2011). A decade ago, Flyvbjerg et al. (2003:110) found that the main shortcomings in the appraisal of a large project were the lack of mechanism to ensure accountability, a shortage of objective driven performance specifications instead of technical objectives and the lack of explicit formulations of the regulatory regime.

Recent trajectories in the development of project management as a discipline are sometimes referred to collectively as the “third wave” (Morris et al., 2012). From the 1950s, project management has evolved from being foremost a scheduling tool to include a wide range of management disciplines, professional associations and bodies of knowledge (Morris, 2012). Söderlund (2012:41) identifies the current period as the “Decision School” referring to the importance of investigating the interplay among decisions makers in projects from the perspective of psychology and political science. Jugdev and Müller (2005:23) named this period “strategic project management”, emphasising the significance of the initial steps of a project.

## Public procurement

When the Icelandic law on public project procurement (no. 84/2001) received ascent in the Parliament in 2001 (Althingi, 2001), the Minister of Finance stated that “[the] objective of this legislation [was] to ensure optimal use of capital invested in public projects” (Haarde, 2001). The legislation outlines the government’s goals regarding the conception, planning and execution of public projects. The law notes that the Minister of Finance will issue further guidelines for planning and other procedural work on projects. The official guideline on the methods and procedures to apply in this case is the Public Procedure Policy on Conception, Planning and Implementation of Public Projects (PPC ) for the pre-study, planning and execution of public projects in Iceland (Ministry

of Finance, 2002). The PPC is used by the GCCA (Government Construction Contracting Agency) specifically named in the legislature as the control agency. It can therefore be said that the governmental strategy in Iceland on how to conceive and manage a public project is outlined in law and the PPC. Norway and the UK also have a relatively new governance framework brought forward and enacted in the same period as that in Iceland.

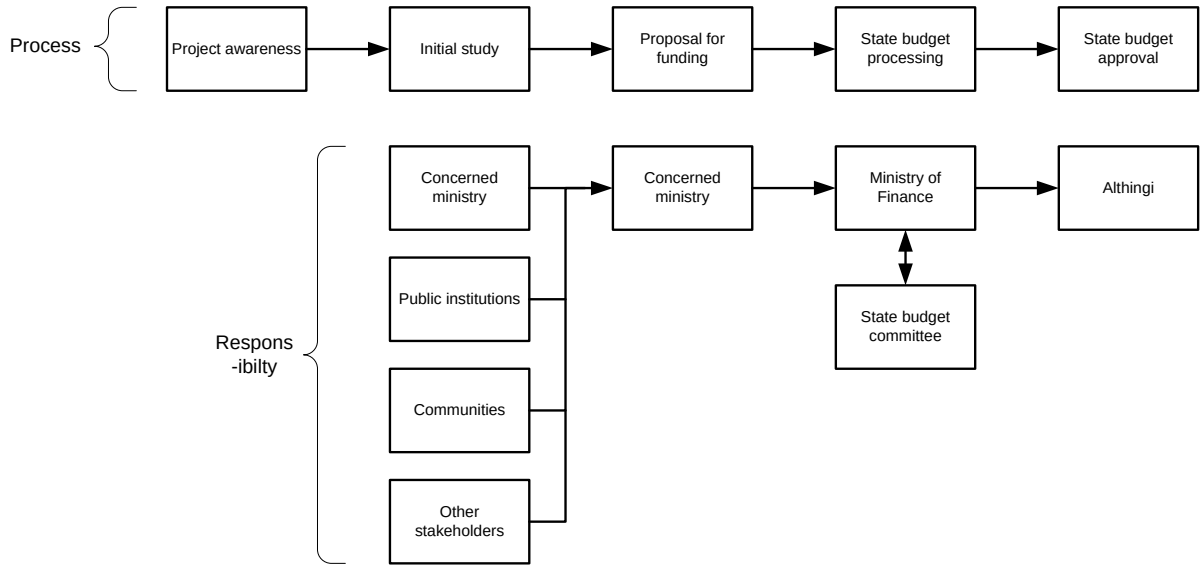
The Norwegian Ministry of Finance requires a quality assurance procedure to ensure ”adequate quality at entry, compliance with agreed objectives, management and resolution of issues that may arise during the project, etc., and standards for quality review of key governance documents” (Samset et al., 2006).

In the UK, HM Treasury has adopted the Green Book where the following phrasing can be found: “[the] Government is committed to continuing improvement in the delivery of public services. A major part of this is ensuring that public funds are spent on activities that provide the greatest benefits to society, and that they are spent in the most efficient way” (HM Treasury, 2011:v).

It is apparent from these quotations that the aforementioned governments’ intentions are broadly similar, i.e. to ensure optimal use of public capital by introducing professionalism and integrity and is well in line with the NPM paradigm.

According to Icelandic law, public projects begin with a project idea or awareness of a project proposal. The idea is then subject to some initial studies, usually within the respective ministry. Once these pre-studies have been completed, the executive power prepares a proposal for funding and if the project is considered feasible it enters the state budget as a liability. This process is shown in Figure 1. Beyond this stage, accountability for the project is anchored in the Ministry of Finance or other concerned ministries. As a rule, accountability is transferred to a public institute or a public agency via a contract at this stage (Althingi, 2001: article 6).

Figure 1. The path from awareness to approval for public projects in Iceland.



In the international project management arena much effort is invested in how to ensure professionalism and understanding of methods and principles that work. Part of this development is the issuing of detailed protocols in regard to project portfolios and project programs to connect strategy, tactics and operations. In the UK, the Association for Project Management (APM) issues the APM Body of Knowledge an up-to-date collection of topics that should be knowledgeable to practitioners, academics and experts. However, APM body of knowledge is not a set of competencies or methods (APM, 2006).

The most detailed conceptual framework on project management is issued by the Project Management Institute (PMI) in the USA. PMI currently issues standards on project portfolios (The Project Portfolio Standard) which specifies that a portfolio is a component collection of programs and projects applied to achieve strategic objectives. PMI also issues standards on project programs (The Program Management Standard) providing guidance to manage multiple projects (PMI, 2006). Furthermore PMI issues standards on projects (Project Management Body of Knowledge) (PMI, 2008). Although PMBOK is mainly focused on the management techniques, tools and processes to manage project for a successful outcome the standard also emphasises the role of projects to achieve a strategic plan and how projects, programs and portfolios interact (PMI, 2008:8-10).

## Research method

The methodological approach is based on document analysis or, more specifically, comparative content analysis. As a part of documentary research, it has advantages over other methods – insofar as it is unobtrusive and non-reactive – and is a viable technique for making reliable, replicable and valid inferences (Robson, 2011). Documents can also be used for triangulation and for longitudinal studies, where the latter has a relevance to the longer-term study of the Icelandic case.

Official documents have provided data and insights for the analysis of official definitions and explanations of management and decisions-making with regard to public project procurement. The research aimed at analysing a problem for further understanding and clarification. On a more detailed level, the research method represents a qualitative, structured content analysis resulting in a quantitative appraisal. A rating-scale was adopted for the purpose of quantitative comparison. We also estimated the extent of treatment by a simple word count and searched for particular terms by word search.

This approach is generally named multi-strategy research design and is becoming increasingly popular (Robson, 2011:28). Multi-strategy research design comes not without some scepticism. One critic, Guba (1987:31), claims, “The one [paradigm] precludes the other just as surely as belief in a round world precludes the belief in a flat one”. Howe (1988:12), on the other hand, argues that combining quantitative and qualitative methods is a good thing and denies that any epistemological incoherence is found by the wedding of these methods.

First, we analysed the written and publically-available documents describing how projects should be prepared initially in Iceland and Norway. The result was expected to reveal if there were differences

in the strategic and tactical requirements in relation to the first stages in the project lifecycle in terms of assuring the quality of the decision-making and conception prior to project commencement.

Second, we analysed how the PPC in Iceland and the Green Book issued by HM Treasury in the UK address best practise project management as outlined in the PMI standard on project management practises (PMBOK). The result was expected to reveal if there were differences between the operational requirements and methods used to ensure sound project planning and implementation in Iceland and the UK.

The content of the documents was compared to best practices as defined by PMI Organization Project Management Maturity Model (OPM3). A best practice is defined as: "… an optimal way currently recognized by industry to achieve a stated goal or objective" (PMI, 2003:13). A benchmark is sought in OPM3 with reference to what are termed key performance indicators (KPIs). A KPI is a criterion by which an organization can determine quantitatively or qualitatively whether or not an outcome is sufficient. OPM3 cross-references the PMBOK standard (2008:43) where eight management "knowledge areas" are defined: scope, time, cost, quality, human resources, communication, risk and procurement. These knowledge areas are attached to the following "process groups": initiating, planning, executing, monitoring and closing. This arrangement rhymes well with the PPC (Ministry of Finance, 2002). The PMBOK maps knowledge areas and process groups to identify the methods applicable at each stage.

## The Icelandic approach

The aforementioned law no. 84/2001 (Althingi, 2001) is four pages and approximately 1,700 words. No specific reference to best practice project management or procedures can be detected in the document. The content is mainly generic descriptions of terms such as cost plans, planning and construction without clarification of what is considered a minimum requirement in terms of rigour or quality of deliverables. The main purpose of the law is to place the accountability for the delivery of public projects in various ministries with overall responsibility at the Ministry of Finance. The official guideline on methods and procedures is, as noted earlier, the Public Procedure Policy on Conception, Planning and Implementation of Public Projects (PPC) (Ministry of Finance, 2002), which covers of the following requirements.

1. Project inception, including project argumentation, stakeholder analysis, feasibility study, appraisal of alternatives, estimate of initial investment cost and operation cost, comparison of alternatives and decision-making. At this stage the initial scope is determined and the cost baseline and schedule are prepared with a detailed report on the decision.
2. Planning which moves the project to the next stage, with further information on design, cost, materials and tender preparation.
3. Implementation describing how contracts are made, accountability and the project control mechanism.
4. Close down evaluation and audit, with study on the differences on planned results and actual results together with a close down report.

No information can be found on the PPC's authorship. Neither is it possible to detect the identity of the author(s) nor whether the guideline is subject to formal revision and regular modification. No further definitions or explanation of the various management terms used in the PPC can be found and there are no references or suggestions on further reading or sources of information. The PPC is 11 pages or approximately 3,700 words.

## The Norwegian approach

In Norway, a "quality-at-entry" regime has been developed to improve governance of large projects. Projects are subject to a quality assurance and uncertainty analysis prior to the parliament's appropriation of the project. This regime consists of two gateways, QA1 and QA2. The focus for QA1 is the rationale for the project. It covers the early choice of the concept/project where the objective is to ensure that the chosen project is appropriate and viable, particularly regarding cost-benefit and social terms (Christensen, 2009). QA2 is, on the other hand, "aimed at providing the responsible ministry with an independent review of decision documents before Parliamentary appropriation of funds. This is partly a final control to make sure that the budget is realistic and reasonable and partly a forward-looking exercise to identify managerial challenges ahead" (Samset et al., 2006:6). Regime decisions and analysis are conducted in a logical and chronological sequence that eventually leads to the selection and implementation of the preferred project without unforeseen interventions or conflicts.

The responsible ministry/agency is required to prepare a concept evaluation (known as the KVU), which should include the following: needs analysis, overall strategy and goals, overall requirements, possibility study and alternatives analysis which should include the zero-option and at least two alternative main concepts.

Additionally, independent consultants are used on a strategic level to provide an external view and a set of documents are required as a minimum decision object (Samset et al., 2006). There is no requirement in the PPC to use consultants for quality assurance purposes. The role of consultants is not discussed here.

Certain general descriptions do not have much significant meaning unless some clarification is provided to explain the minimum demand for such an activity. The definitions are clarified in detailed public guidelines from the Ministry of Finance on cost-benefit analysis (Norwegian Ministry of Finance, 2012). These guidelines are prepared by an expert committee of 21 people from industry, academia and the government. The committee revises the work and arranges seminars with international participation on related issues. Moreover, the affected ministries submit written inputs to the committee. The Norwegian guidelines were last revised in October 2012. The cost-benefit analysis guidelines also provide a list of references to the technical approach adopted in other countries, including The Green Book from the UK (HM Treasury, 2011). Overall, the guidelines run to 178 pages or approximately 120,000 words.

A key determinant in the Norwegian guideline is the economic principle of the "willingness to pay" for the perceived project outcome when seen from the public perspective. The guideline describes at length economic and managerial terms including utilities, stakeholder analysis, time value of money, growth theories, pricing of uncertainties, risk assessment, the capital asset pricing model, project lifecycle cost, NPV and environmental impact.

It is difficult to compare the guidelines from Norway with those from Iceland as the conceptual difference and level of detail between them is enormous. Simple observation of the differences in quantity of material makes formal comparison almost meaningless in regard to usability and guidance for decision makers, planners and other stakeholders.

## The UK approach

The OGC Gateway Process was introduced by the Office of Government Commerce (OGC) in the United Kingdom (UK). The OGC does not exist today as an independent agency as it was absorbed by the Efficiency and Reform Group of the Cabinet Office with effect from June 2010.

The OGC Gateway Process examines programs and projects at key decision points in their lifecycle to provide assurance for successful progress to the next stage (OGC, 2007). A crucial element of the OGC Gateway Process is an evaluation from independent practitioners (consultants) from outside the project, which is similar to the Norwegian approach. These practitioners use their experience and expertise to examine the progress and likelihood of successful delivery of the project. Their role is to provide a valuable additional perspective on the issues facing the internal team and an external challenge to the robustness of plans and processes (OGC, 2007).

Another document used to define what is expected in context of a methodological approach for decision-makers and planners is the Green Book issued by HM Treasury (HM Treasury, 2011). The Green Book is a guide to how project proposals should be appraised, before significant funds are committed, and how past and present activities should be evaluated. This is done to ensure that government funds provide the greatest benefits to society and that they are spent in the most efficient way. The Green Book runs to 114 pages including appendices, or approximately 43,000 words and cites several other sources of knowledge and reference materials.

## Comparison of practices

Two objectives of the research were to produce and analyse measurable outputs describing the consistency of the guidelines with best practice and an internal comparison of two guidelines from the Icelandic Ministry of Finance (PPC) and the HM Treasury (Green Book). This was done to analyse the degree to which the guidelines were likely to aid decision-makers in making well-founded decisions regarding the preparation and management of public projects.

The project management key performance indicators (KPI) in the PPC and the Green Book that were benchmarked against the practices in PMBOK are referred to in the following knowledge areas: project integration management, project scope management, project time management, project cost management and project risk management. These knowledge areas overlap and interact during the project lifecycle. Three knowledge areas, namely human resource management, communication management and quality management were intentionally left out of the benchmark analysis as they were considered to introduce a bias towards conventional project management disciplines under investigation in the research. They are not considered in the Green Book or the PPC and so the absence of these knowledge areas is not considered to impact the results.

PMBOK is a comprehensive 500-page standard on the project management discipline. The standard is organized into knowledge areas on the required management activities within the project lifecycle. The knowledge areas are mapped against process groups addressing the management techniques

and methods to apply in each knowledge area. The principles of each management method are also described making the PMBOK ideal for benchmarking against the governmental procedures under screening for consistency (or alignment).

The rating scale for consistency was from 0 to 3.

0 = no consistency

1 = limited consistency

2 = some consistency

3 = full consistency

Table 1. Comparison of the Green Book and the PPC with PMBOK knowledge areas.

| PMBOK knowledge areas | Green Book | Rating | PPC | Rating |
|---|---|---|---|---|
| Project integration management | Some consistency | 2 | Limited consistency | 1 |
| Project scope management | Full consistency | 3 | No consistency | 0 |
| Project time management | Full consistency | 3 | Some consistency | 2 |
| Project cost management | Full consistency | 3 | Some consistency | 2 |
| Project risk management | Full consistency | 3 | No consistency | 0 |
| | Overall | 93% | | 33% |

Document analysis reveals close to full consistency between PMBOK and the Green Book. The structure of the PMBOK and the Green Book is similar, but the terminology referring to procedural arrangement is different. The terminology referring to methods and techniques is similar.

The consistency between the PMBOK and the PPC is mostly on the procedural level, i.e. general requirements. The methodology and techniques are not addressed significantly. Some methodological areas have been omitted and one knowledge area, project risk management, is missing. In addition, the word “risk” is not to be found in the body of the text of the PPC or Law no. 84/2001.

## Discussion

The NPM wave has reached Norway and the UK and this evolution in project management disciplines is supported by a detailed conceptual framework. Other than the publications previously mentioned one can mention the OGC's guidance manuals on PRINCE2, Managing Successful Programs and Management of Risk. These publications where issued in the beginning of the century and have proved highly influential (Morris, 2012). In Norway the Ministry of Finance funds the Concept Research Program to support good governance. It can arguably be assumed that in a developed country one would expect to find governance framework with this purpose even if they are named differently (Klakegg, 2010:101).

Iceland seems to lag significantly behind. In a study by Fridgeirsson (2014), the author benchmarked the pre-requisite reports for an Icelandic road tunnel project against Norwegian standards for projects of similar size in monetary terms. At the time of writing, this is the latest large public project in Iceland in progress. Problems in financing meant that the Icelandic government had to step in and finance the project by guaranteeing the investment capital. As the required private equity was not available the Icelandic parliament had to approve, by law, a divergence from the general rule. In the written argumentation for the law, a number of reports by consultants and specialists were cited. These reports, and some additional ones, were compared with the Norwegian "at-entry" standards for a large public project. The objective was to investigate if this project would have been approved in Norway on the grounds of the accessible collective studies of the kind prepared in Iceland in the decision phase. Compliance with the Norwegian standards was less than 40% and the authors concluded that if this project had been Norwegian it would not have been approved.

Kristinsson (1999) argues that Iceland is somewhat different from many western countries. The power of the parliament to decide projects and public investments is strong and the governance structure is weak. This is traced to the arrangement during the nation's struggle for independence. Iceland was given the right to pass independent laws – the resurrection of Althingi in 1871 – before the nation acquired the rights to execute them with local governance infrastructure. When the executive power became Icelandic (1904), the Althingi had superior position against the governance (Kristinsson, 1999:144).

This arrangement seems to be in place still today, at the least partly, indicating that NPM has not lead to mandatory use of modern project management methods when investing public capital.

## Conclusions

It is apparent that the NPM has had significant impact in the UK and Norway. Detailed standards and guidelines on management practices are in place and have been validated by experts. This is not the case in Iceland. The results of document content analysis and comparison of current practice and procedures adopted in Iceland with those of Norway and the UK highlight room for improvement in regard to strategic intention as introduced by the Icelandic Law. No 84/2001. The Icelandic governance framework on decision-making and planning procedures lags far behind. Formal procedures can be considered negligible as no formulation of the content is in place, merely generic descriptions of technical terms to be interpreted at will. It would seem appropriate, therefore, that Icelandic decision-makers should respond to the opportunity to improve the procedural guidelines.

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# DOES THE PERCEIVED RISK ATTITUDE AMONG ICELANDIC DECISION MAKERS COMPLY WITH THE REALITY OF COST OVERRUNS?


## Abstract

Iceland was severely hit by an economic depression when the entire financial system of the country collapsed in 2008. The aftermath has resulted in various investigation reports attempting to understand what went wrong and why. A part of the explanation offered is that politicians and other stakeholders are influenced by psychological factors named cognitive biases. Cognitive biases can lead to judgmental errors and misperceptions of the real state of nature. This research investigates if the perception of personal risk attitude among Icelandic parliamentarians facing investment decision rhymes with the statistics available on cost overruns in Icelandic public projects. The results are paradoxical as Icelandic parliamentarians observe themselves as very risk averse decision makers while there are clear indications of high risk of cost overruns in public projects.



Keywords; Governance, cognitive biases, public projects, risk attitude


## Introduction

Public governance and public projects are often subject to criticism in Iceland. The most critical aspect of Icelandic governance is arguably a nine-volume work called the *Report of the Special Investigation Commission* (Hreinsson et al., 2010). This report (SIC) was requested by the Icelandic parliament (Althingi) to clarify and explain the rise and fall of the Icelandic banking system which collapsed in October 2008 with dire consequences for the country's economy. In short, the SIC report is a cry for improvement on how decisions are made and on the management integrity of the governmental system. In this report politicians are even directly accused of neglecting their responsibilities (Hreinsson et al., 2010,Vol 1., p. 43)[26]. Two other large investigation reports have been issued on behalf of the Icelandic parliament both extremely critical on public governance[27] (RNA, 2013; 2014). In addition investigation reports

[26] The Report of the Special Investigation Comission is available at http://www.rna.is/eldri-nefndir/addragandi-og-orsakir-falls-islensku-bankanna-2008/skyrsla-nefndarinnar/.

[27] A report on the Housing Financing fund (2013) avaliable at http://www.rna.is/ibudalanasjodur/skyrsla-nefndarinnar/ .

on regarding certain companies have been published.[28] The SIC report is primarily focusing on the interface between the financial system and the government and offer explanations and clarifications on how and why things went so wrong. In one of the appendixes to volume 8 of the SIC report some of the social and psychological factors that arguably impacted the public governance and lead to risk behaviour are discussed and put into context with what is generally known as cognitive biases. It is stated that in spite of clear evidences of problems politicians and other stakeholders are victims of planning fallacies and misconceptions regarding the true state of nature (Thorisdottir, 2009, 277-280). Theories of biases in human judgement are based on the initial work of Herbert Simon (1955). Daniel Kahneman and Amos Tversky later conducted a number of studies in the 1970's resulting in the *Prospect Theory* (Kahneman and Tversky, 1979). Prospect theory contradicted the *Expected Utility Theory* which, at the time, dominated the analysis of decision-making in risky domains (Gilovich and Griffin, 2002). Prospect theory is today generally recognised as important behavioural economic theory to understand better how decision makers behave under condition of uncertainty (McDermott et al., 2008).

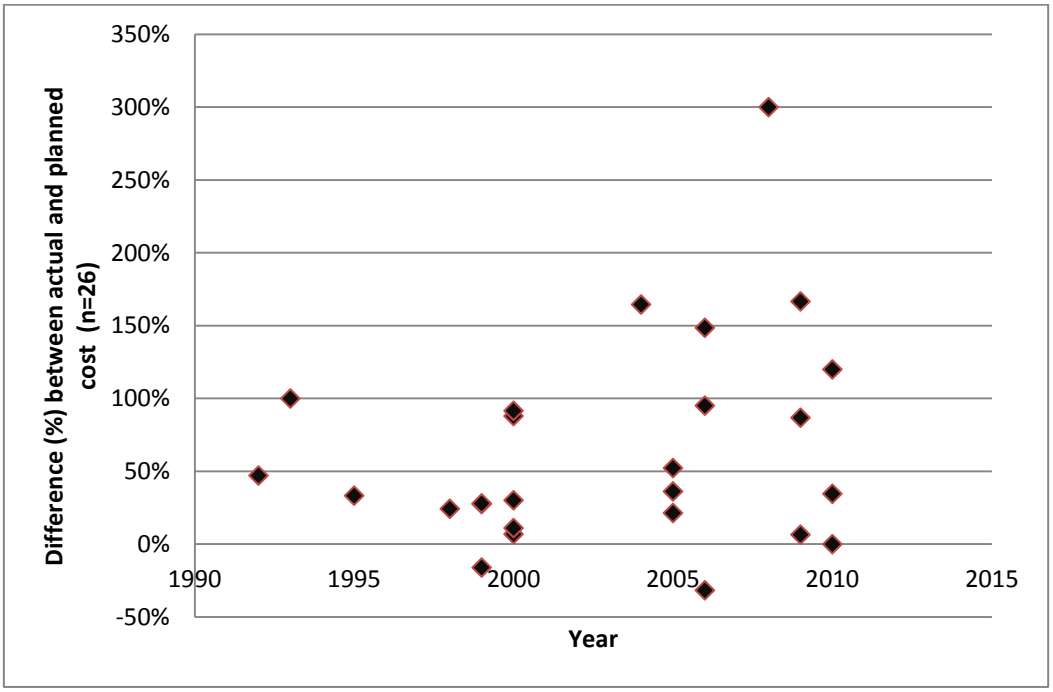
## Research background

Since the financial collapse in 2008, there have been relatively few major public construction projects in Iceland. Exceptions include a concert and conference centre in the capital Reykjavik, a ferry harbour on the south-east coast, a conception phase of a new national hospital in Reykjavik and some two tunnel projects at the north coast. These projects have been openly criticized both before and after their execution. Examples include cost overruns (Blondal, 2013), operational dysfunction (Siglingastofnun, 2011), overly optimistic cost projection ignoring past experience (Olafsdottir, 2012) and risks outweighing public interests (Gretarsdottir, 2012) to name some few examples. The criticism is arguably rooted in the allegation that public projects in Iceland have abnormal problems as a rule rather than exception. Large projects that have been finished and delivered post the financial meltdown do indicate a problem. One project had 300% cost overrun[29], another 170%[30] and it is difficult to find a large infrastructure project not suffering from the symptom of cost overrun. The

[28] Examples are report on Reykjavik Energy (2012) available at http://eldri.reykjavik.is/portaldata/1/Resources/or-uttekt/OR-Uttektarskyrslan_2012.pdf and the SP-Kef bank (2013) available at http://kjarninn.is/gogn/spkef.
[29] ERP software forThe Financial Management Authority delivered in 2008.
[30] Music and conference hall Harpa delivered in 2010

exemption is a ferry harbour[31] that seems to have been on budget and on schedule but has suffered difficult operation problems and higher operation cost than projected (Gretarsson and Sigurdsson, 2013). We also screened large projects from the last two decades. The process was a documentary review where a database[32] containing all (or mostly all) Icelandic newspaper and magazines during the last century where searched.

Figure 1. The distribution of difference in percentages between actual and planned cost in public projects (n = 26) over two decades.




It is to be noted that his review technique was chosen because a database of public projects is not accessible. Statistics of total project cost or other project data cannot be retrieved from the governmental fiscal budget or any other governmental sources. The Icelandic national budget in any given year excludes a complete list of accepted projects despite being registered under initial capital expenditure along with investment in machinery, equipment, software etc. In addition, many projects are included in the total funding for various institutions making it difficult to see which projects have been approved. To obtain some estimate if cost overruns are frequent in Icelandic public projects it was therefore necessary to use this approach. In total, 26 large projects were identified

[31] Bakkafjara-harbour delivered in 2010
[32] The database is accessable at www.timarit.is

mostly construction projects (24). The average value of all projects is 7.4 billion ISK (62 million USD) and the mode is 1.2 billion ISK (11 million USD). Only three projects were on target or had expenditure less than the budget, meaning that close to 90% experienced cost overruns. The average cost overrun of all projects is close to 60% and the total difference in monetary values between the actual cost and the planned cost at fixed prices is 63%.

Document analysis of this sort has its drawbacks. It cannot be ruled out that projects with cost overruns are more frequently in the news and therefore some projects were missed out that would improve the statistics. Statistical significance is therefore not claimed but the evidences of the risk of cost overrun are clear. Another observation is that from this project portfolio a very large public project, the geothermal power plant at Hellisheidi, is missing. The reason is that apparently no cost projection was submitted at the point of decision (Petursdottir et al., 2012, p. 255) and therefore impossible to find out if there is a difference between planned and actual values. It can be added to this that Fridgeirsson (2009) analyzed 78 close-out reports from Iceland's Government Construction Contracting Agency (GCCA)[33]. The study revealed that 73% of the projects under the supervision of GCCA had cost overruns. It is therefore reasonable to assume that cost overruns are frequent in Icelandic public projects and therefore of interest to the Icelandic tax payer who eventually pays the difference. It is also reasonable to assume that public projects are subject to debates regarding their merits to the public. It is therefore interesting to investigate if the hard criticised decision makers in the eye of the storm perceive themselves as risk takers? The alternative is that, in spite of the severe critic in investigation reports and media coverage, the decision makers think that they are conservative. If the latter is the general perception they decision maker are wrong about their real behaviour. All evidences points towards large forecasting errors at the decision stage. In that case might be argued that radical changes are needed in public governance to reduce impact from underlying psychological and managerial reasons that contribute to the forecasting errors. Procedures and practises to ensure cost- and risk awareness must be improved to ensure the optimal utilization of public capital investments which is stated as the purpose of the law on the arrangement of public projects (Althingi, 2002).

[33] GCCA is a state agency, which is directly under the Ministry of Finance. GCCA administers government construction projects and does consulting on technical matters, procurement and preparation of projects.

This study investigates how public decision makers, in this case Icelandic parliamentarians, value their attitude in taking risks when they face options of different chances of possible cost overruns. To gain a benchmark three other groups from the private industry were also asked comparable questions. The research question can be summed up to the following: Firstly, is there a difference in the risk attitude of the members of parliament (that are responsible for passing the fiscal laws) and managers from different industry sectors? Secondly, how does the idea the parliament members have concerning their risk attitude when faced with uncertainty regarding cost overrun as consequence of their decisions rhyme with the indication of actual cost overruns in public projects?

## Literature review

The expected utility theory (EU) is derived from the work of von Neumann and Morgenstern (1944). The fundamental principle is that the rational decision maker can clearly distinguish between options by combining the probability of an event and the impact of the outcome. Risk attitude is usually described by the shape of the person's utility function derived from how the person selects between options (Weber et al., 2002). The terms of being risk averse, risk neutral and risk seeker refers to the curvature of the expected utility function (EU). The expected utility theory is a useful normative approach but the inability of the decision maker to make accurate assumptions from probabilistic data and prioritize has been verified (Schoemaker, 1982). With ingeniously arranged tests, Kahneman and Tversky demonstrated several cases where people violated the expected utility assumptions (Kahneman and Tversky, 1979).They argued that people apply mental rules, *heuristics*, to simplify the complex task of assessing probabilities and predicting values. Decisions are made by how easily events are brought to mind rather than utilising statistical evidence, what is typical rather than the law of small numbers or statistical independence of events and how data are interpreted by the human mind. Although useful in practice, these heuristics can lead to judgmental errors as Kahneman and Tversky (1974; 1979) noted in their work on judgment and uncertainty. In Gilovich, Griffin and Kahneman (2002) and Kahneman et al. (1982) it is demonstrated that even when decisions maker know the situation he makes inferential errors. The research indicated four fundamental heuristics that impact our ability to validate data and scenarios. These heuristics are called *representativeness*, *availability*, *anchoring* and *framing*. To name examples how these heuristics work *representativeness* describes the tendency to ignore the statistics of small samples, *availability* describes how we base probability estimates on

recent events rather than empirical sources, *anchoring* describes how our first estimate anchors our future estimation as we will base our forecasting deviation on the original estimate rather than new information. Lastly *framing* describes how the presentation of information can impact our judgment stronger than context of the information (Winch and Maytorena, 2012).

It also seems that even though people know that their past prediction was highly optimistic they are convinced that their future forecasting is realistic (Buehler et al, 1994). Cognitive bias and the pattern of deviation in judgment that occurs in particular situations can lead to *planning fallacies* resulting in overoptimistic forecasting.

Cost underestimation, benefit overestimation and general forecasting errors are a problem well known on the international scene. Flyvbjerg et al. (2009) offers two explanations; *deception* and *delusion*. Delusion, or the *optimism* bias as this phenomenon is also named, is the situation when decision makers make decision based on believe rather than rational calculations. The heuristics previously mentioned are at work and the decision maker primarily remembers success not problems. Problems and risks are considered unique and will not recur in the new project. The decision maker does not see the holistic picture but selects positive and favourable arguments in spite of empirical evidences pointing in different direction (Lovallo and Kahneman, 1994; Buehler et al., 1994; Buehler et al., 1997; Newby-Clark et al., 2002).

Another phenomenon contributing to flawed forecasts and ill-conceived projects is deception often called *strategic misrepresentation* (Wachs, 1989). Jones and Euske (1991) defined this phenomenon in the public domain thus: "*[strategic] misrepresentation is the planned, systematic distortion or misstatement of fact, lying, in response to incentives in the budget process"* (Jones and Euske, 1991, p. 437).

Bent Flyvbjerg (2006) claims that strategic misrepresentation is particularly widespread in conditions we find public projects in. Many projects compete for limited funding. This leads to a pressure when the decision makers feel to advocate for "their" projects when competing with other project ideas: *Here, when forecasting the outcomes of projects, forecasters and managers deliberately and strategically overestimate benefits and underestimate costs in order to increase the likelihood that it is their projects, and not the competition's, that gain approval and funding"* Flyvbjerg (2006, p. 6). This deliberate underestimation of cost

and overestimation of benefits can lead to the selection of the least feasible projects or what Flyvbjerg calls "inverted Darwinism" or "survival of the un-fittest" (Flyvbjerg, 2005).

## Research methods

The research is quantitative survey among four groups of decision makers. The groups are; Members of the Icelandic parliament, CEOs in production companies, CEOs in service companies and CEOs of seed companies (entrepreneurs). The names of the managers in the private companies were found in an archive published by the business magazine Frjals Verslun (Frjals Verslun, 2013a; Frjals Verslun, 2013b). The magazine publishes list of companies in industrial categories. The categories production, service and seed companies were selected by the assumption that different characteristics might be expected within different realms of business. The names of the parliamentarians where found at the website of the Icelandic parliament Althingi.

All survey prospects where written a personal e-mail explaining the survey objectives. In the letter anonymity was assured. The e-mail was followed by an internet survey. Of 63 parliamentarians contacted 23 responded (36%), of 73 CEOs contacted in production companies 47 responded (64%), of 91 CEOs in service companies 52 responded (56%) and of 82 entrepreneurs contacted 31 responded (38%). In the parliamentarian group 65.2% of the responses are from males, 95.6% are males in the group of CEOs in production companies, 87.8% in service companies are males and 66.7% of the entrepreneurs are males. Average age among parliamentarians is 49 years, among CEOs in production companies 47 years, in service companies 52 years and the average age of the entrepreneurs is 36 years.

The research was designed to investigate how the personal perception of risk is by asking the participants to rate themselves on the scale from 1-10 (1= never willing to take risk, 10=always willing to take risk). This personal risk attitude was checked by asking how the participant would invest having won a significant sum of money in a lottery (16 million ISK ≈ 135.000 USD). Then being confronted by a respected financial institute and offered to invest the sum as a whole or partly in a profitable but risky option[34].

[34] Imagine that you just won 16 million ISK in the lottery. Same day as you receive the 16 million a respected financial institute approaches you with an investment deal. This is the deal: There is a 50% chance that you can double the figure in two years. It is equally likely you will lose all the money. How much of the 16 million ISK would you invest on these terms?

The research was primarily designed to establish the shape of the perceived risk curve of the decision makers. We choose to define selection of investment options that might mirror an array of decision problems. The context of the survey is to demonstrate if there is a different risk attitude between investments options were a budget had been prepared and submitted to the decision maker followed by a risk estimate stating the range of possible chances of cost overruns. The project options selected were firstly a project to improve the staff facilities, secondly to invest in new production line and thirdly to improve the onsite safety[35]. The investment in staff facilities exemplifies a non profit project intended to improve working facilities. The investment in a new production line exemplifies a profit project intended to directly increase monetary income. The investment in a safety system exemplifies a non profit project intended to improve employee's safety. In the survey the participants selected the statement best describing their willingness to risk cost overrun from the point of being indifferent between two possible outcomes:

I would only approve the (..) -project if I am confident that actual cost is lower or even than the budgeted cost.

I would approve the (..) -project if the chance of cost overrun is 10% and the chance of being on budget 90%.

I would approve the (..) -project if the chance of cost overrun is 20% and the chance of being on budget 80%.

This was repeated for 30% chance of cost overrun and 70% on being on budget, 40% chance of cost overrun and 60% on being on budget, 50% chance of cost overrun and 50% on being on budget, etc.

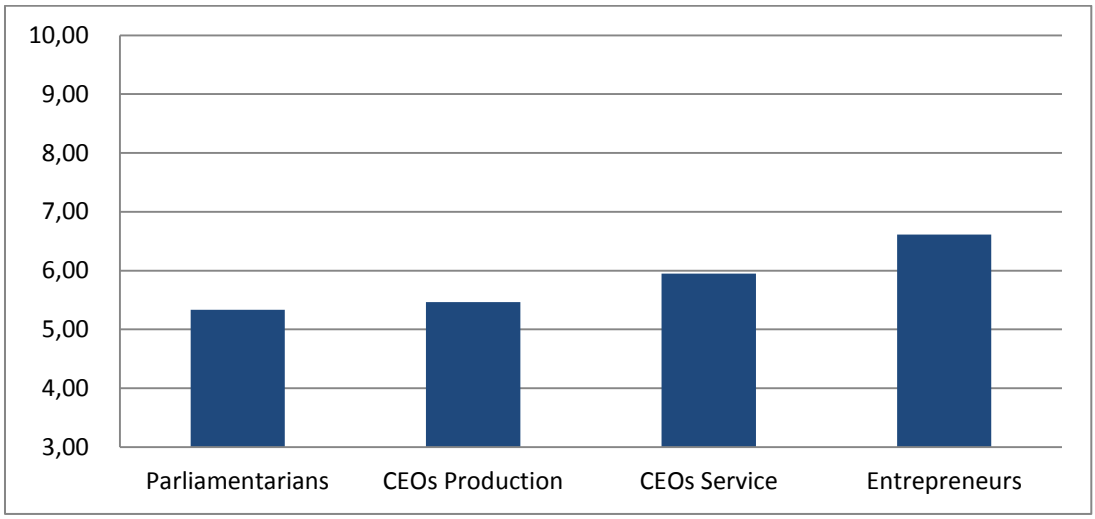
In the case of the parliament members the project categories were substituted as follows: staff facilities became health care centre, production line became power station and the security system became a rescue helicopter. The questions were the same but the investment figures adjusted to a likely number as public projects are generally larger in size.

[35] You are a part of a team expected to make an investment decision concerning three projects. The budget is accessible and also a estimate of the chance that the actual cost will exceed the budget of (...) millions ISK. Post the project approval it will be next to impossible to reverse the decision. What of the following options does best describe your attitude towards the risk of cost overrun?

## Results

According to the personal risk question the members of parliament are according their opinion the group with the lowest will to take risk (5.3) and entrepreneurs the most willing (6.6).

Figure 2. The personal risk coefficient on the scale 1 to 10.




When asked how much of the lottery prize the groups would invest members of the parliament are the most risk conservative and the entrepreneurs the most investment eager. On average only 2 million ISK (17,000 USD) (12.4%) would be reinvested in the investment option but the entrepreneurs were willing to invest 3.5 million ISK (30,000 USD) (22%).

Figure 3. The ratio of the lottery price the groups are willing to invest in a risky option (50% chance of success).

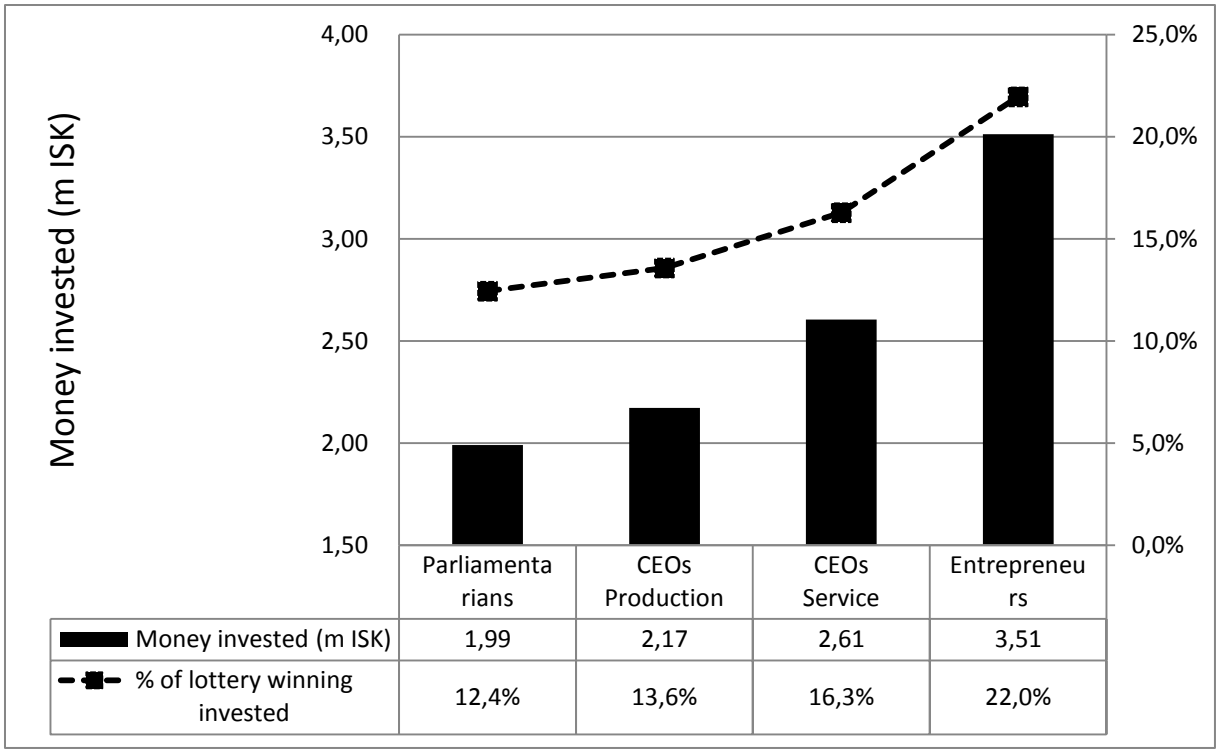



Table 1. An overview table including the responses from all groups and how the answers are distributed over the options.

| Options | Health care centre/Staff facilities | | | | Power station/Production line | | | | Rescue helicopter/Safety system | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Parliament | Production | Service | Entrepreneurs | Parliament | Production | Service | Entrepreneurs | Parliament | Production | Service | Entrepreneurs |
| No cost overrun | 14% | 20% | 14% | 3% | 18% | 15% | 12% | 10% | 14% | 18% | 10% | 10% |
| Less than 10% over | 59% | 41% | 47% | 33% | 59% | 39% | 43% | 23% | 59% | 38% | 29% | 23% |
| Less than 20% over | 18% | 24% | 22% | 30% | 9% | 24% | 22% | 27% | 14% | 11% | 35% | 13% |
| Less than 30% over | 5% | 7% | 8% | 27% | 5% | 17% | 16% | 23% | 9% | 20% | 12% | 27% |
| Less than 40% over | 0% | 4% | 2% | 3% | 5% | 2% | 0% | 3% | 0% | 4% | 2% | 20% |
| Less than 50% over | 0% | 4% | 6% | 0% | 5% | 2% | 6% | 7% | 0% | 0% | 4% | 7% |
| Less than 60% over | 0% | 0% | 2% | 0% | 0% | 0% | 2% | 0% | 5% | 4% | 0% | 0% |
| Less than 70% over | 5% | 0% | 0% | 3% | 0% | 0% | 0% | 0% | 0% | 2% | 2% | 0% |
| Less than 80% over | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 7% | 0% | 2% | 6% | 0% |

Figure 4. The frequency of answers in context of the options regarding acceptable cost overrun for *non-profit* projects on improved facilities.

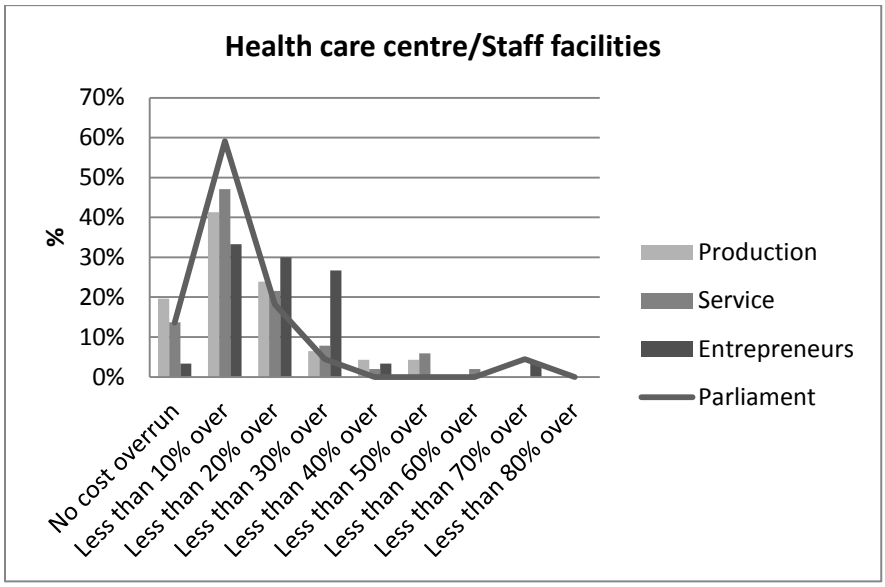



Figure 5. The frequency of answers in context of the options regarding acceptable cost overrun for *profit* projects on improved monetary income.

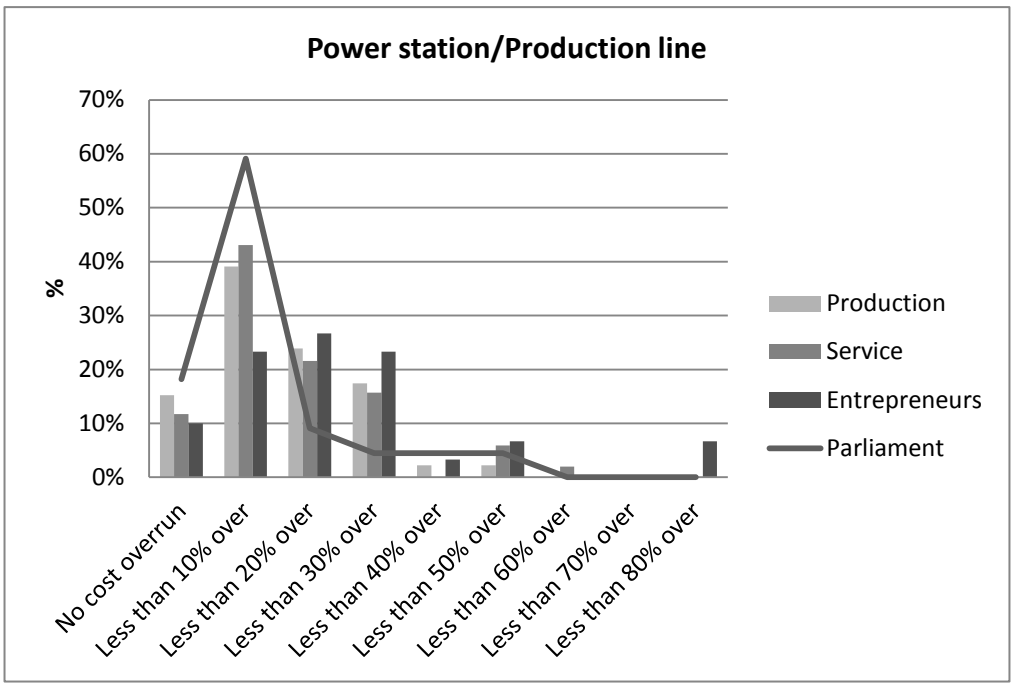
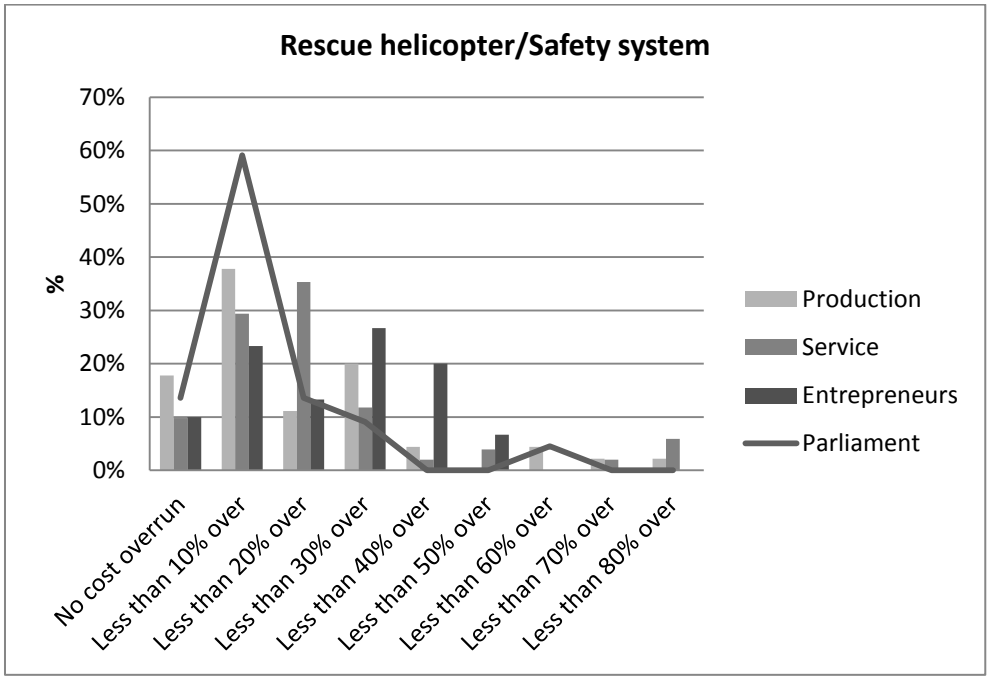


Figure 6. The frequency of answers in context of the options regarding acceptable cost overrun for *non-profit* projects on improved safety.




The histograms in figures 4, 5 and 6 all show the same general trend. To separate parliamentarians from the other groups their distribution is drawn as line. The majority of Parliamentarians select decision options that are conservative. CEOs in Production and Service companies select options in a similar way and the entrepreneurs are most daring in their selection.

The trends can be further visualized in figure 7 were we have isolated the first two options (no cost overrun and 90% chance of no cost overrun). This is in good correlation with figures 2 and 3 that also indicate conservative risk attitude for the parliamentarians, similarities between CEOs in production and service companies and relatively risk willing entrepreneurs.

Figure 7. A summary of the frequency of answers in context of the options regarding acceptable cost overrun with a cut-off point in the option "No cost overrun" and "less than 10% chance of cost overrun".

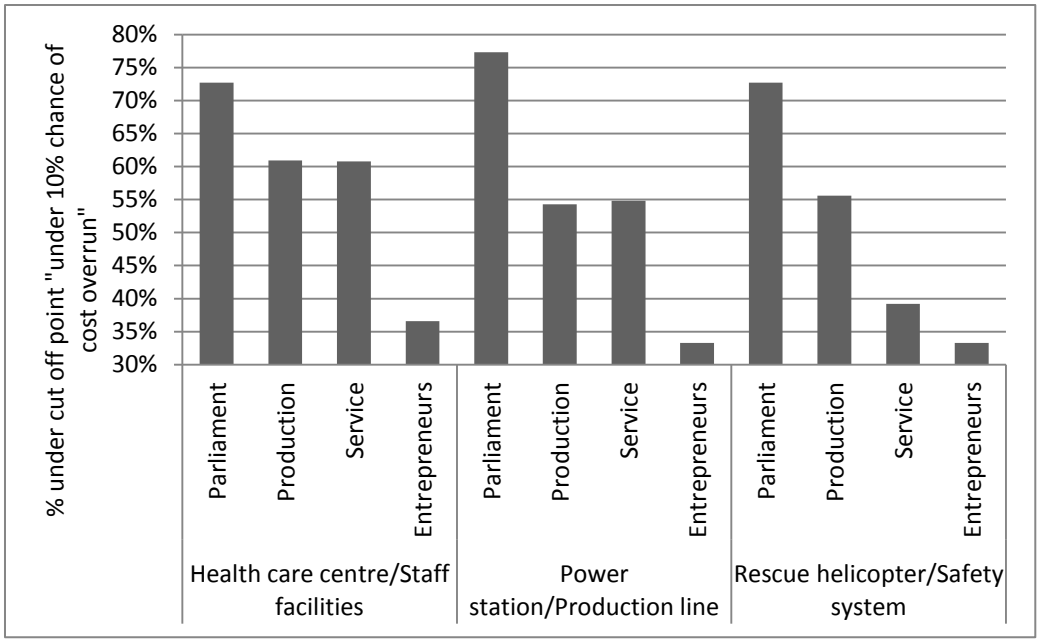
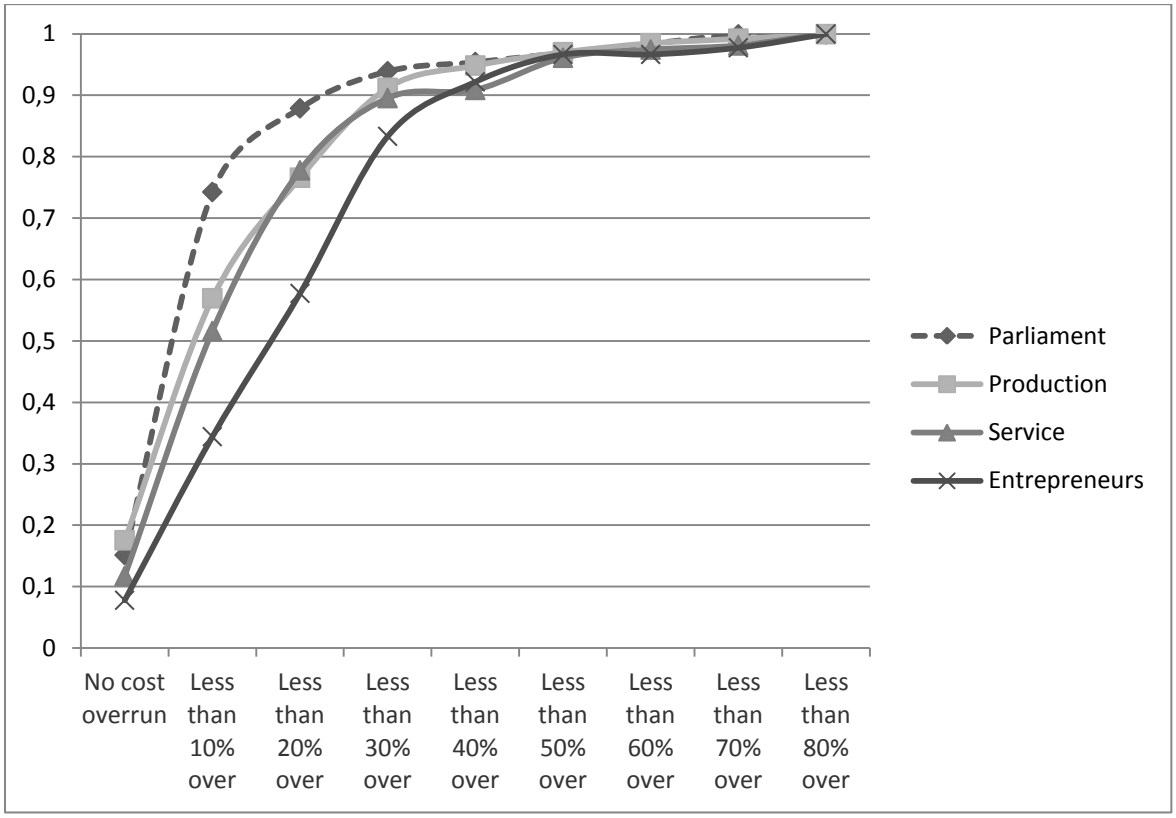



Figure 8. The accumulated frequency curves for all survey groups.




As can be seen in figure 8 the members of the Icelandic parliament are the most risk averse group according to this study and the entrepreneurs the most risk seeking group. Managers in production and service have almost identical risk attitude. The benchmark groups dominate the parliament members in all research questions. It can be concluded that

there is a significant difference between the average of the control groups and the group of parliamentarians[36] .

## Discussions

A large proportion of Icelandic public projects have cost overruns problem (Fridgeirsson, 2009; 2014) but parliamentarians are very conservative by their own judgment. The parliamentarians are allegedly the most risk averse group. However, public projects are among the riskiest projects in the light of cost overrun and hefty debates. More than 70% of the parliamentarians believe that they would not approve a public project if the chance of cost overrun is higher than 10%. The risk attitude is significantly more conservative than with any other group in the survey. However, analysis on large public projects points towards the average overrun of close to 60%. This makes no logical sense.

One possible explanation is the influence of a cognitive bias called *decision framing.* Decision framing theories claim that people react stronger to potential loss than to equivalent win (Tversky and Kahneman, 1981). The parliamentarians, just as the Icelandic public, are clearly aware of the high ratio of cost overruns in projects approved and included in the national budget. But when confronted with an array of questions descriptive of different probabilities of cost overruns they select low risk options in spite of that knowledge. Another heuristic that might affect the parliamentarians is called the *availability heuristic*. When facing the chance of overrun options the parliamentarians arguably find it easier to bring into mind favourable situations (i.e. responsibility towards all voters) than situations that did not fare well. The selection of the risk averse options might also be traced to the *representativeness heuristic*. One characteristic of this heuristic is the *gamblers fallacy* or the expectations that matters will correct themselves over time even though this group is fully aware of that many public project are promoted on other merits than risk aversion. Yet another heuristic that might have made some impact is called *anchoring and adjustment*. The first options presented serves as anchor and the decision makers adjusts his evaluation up or down. As the questions where presented from the most conservative one to the most risky one anchoring and adjustment could play a role.

The most likely explanation is probably though that the parliamentarians find it their duty to answer this in a conservative way bearing in mind their social status. They are not willing, even in an anonymous survey, to admit that they take chances on the expense of the public.

[36] Chi-square test (95% significance level).

Another paradox is interesting. There is a significant difference between the perceived risk attitude of the parliamentarians and the benchmark groups of high ranked managers in three business sectors. The former group is significantly more risk averse. Logically this might seem as a surprise as the CEOs are in most cases held accountable for their investment decisions by their management boards. The entrepreneurs are usually owners of their companies and they are the most risk seeking group although risking their own fortune. A parliamentarian is definitely not risking his own money and there is next to no chance that he will be held accountable for cost overruns later in the project lifecycle. Post the project approval the public project and the accountability is transferred from the legislation authority to the executive power. Again the perceived risk attitude of public decision makers in Iceland according to this survey makes little sense when compared to reality and how other decision makers act on the same questions.

It can be argued that the outcome of this type of research is predictable. Not many will admit taking risks of cost overruns beforehand. This is true but we believe that this research gives a hint of an attitude problem. Time after time in three large investigation reports public governance in Iceland has come under heavy criticism. Complacency, judgmental errors, lack of formal procedures and risk behaviour are named as reasons for huge losses and problems that will burden Icelandic tax payers for a long time. These reports were ordered and issued to a large extent by the same parliamentarians that still perceive themselves as risk conservative in spite of strong evidences contradicting this self evaluation more than five years after the financial collapse of October 2008.

It would be interesting to know if the perception of decision makers in other countries is similar to the Icelandic case.

## Conclusion

Theories on cognitive biases and strategic misrepresentation have provided interesting knowledge in the context of understanding why public projects have the problems of cost overruns. Apparently Icelandic governance in the current state offers interesting example how this works in practise. In spite of noteworthy attempts from the Icelandic Parliament to portray and understand why and how governance failed in the rise and fall of the financial system governance problems seem to prevail. Significant improvements in forecasting accuracy concerning projected cost cannot be detected post the economical collapse and hefty debates regarding the viability of public projects are frequent. In spite of these

evidences of limited development on the managerial aspects of the conception of public projects parliamentarians perceive themselves as risk averse compared to the benchmark groups from the private industry.

The main lesson to be drawn from this study is to encourage the decision makers instrumental on if to invest public capital to openly discuss why this disparity between the perceived risk attitude and the reality according to the statistics?

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