Thesis research report note – Uncertainty management of projects from the owners' perspective, with main focus on managing delivered functionality

Abstract

Purpose
This paper reports on the work on a doctoral thesis studying uncertainty management of projects. The thesis was in particular studying uncertainty regarding the functionality that the project should deliver. The research also addresses how the project owner's views and interests are taken care of, and the relation between the project management and the project owner in this uncertainty management. The purpose of the paper is not only to report the research findings and conclusions, but also to give insight into the research process - the researcher's 'journey' in his work with the thesis is described and also some main issues regarding the context of the research.

Design/methodology/approach
The research work that is reported on was carried out applying a combined research approach utilizing both quantitative and qualitative data. The research was mainly based on two case studies - one made up of two projects in the railway sector, and one consisting of seven projects in the energy sector. In both the studies qualitative techniques were applied: interviews, observations and documentation studies. In the study in the energy sector there was also made a quantitative study using data from the risk registers of the seven projects, with a total of almost 1500 risk items.

Findings
The study shows that the projects' uncertainty management did not have a project owner's perspective, but was mainly focused on the success factors of the project management. In the quantitative part of the studies it was found that a great majority (91%) of the risk elements in the projects studied were operational risks; i.e. risks mainly concerning the projects' operational goals. Also, most of the projects' risk elements were threats (67%).

Research limitations/ implications
The studies gave a rich and deep understanding of the relation between project management team and project owner in the uncertainty management of projects. They gave an insight into – and both quantitative and qualitative data on – the management of threats versus opportunities and of strategic versus operational uncertainties.

Practical implications
The main contribution the research makes is to gain an understanding of the extent of influence the project owner's perspective has in the way that uncertainty management may be handled on a project. The findings and implications from the studies should form the basis for changes to how uncertainty management of projects is done. The thesis suggests that this

should be a combination of changes in project management frameworks, education and training, and changes in attitudes and project culture.

Originality/value
There appears to be a paucity of similar studies of uncertainty management in projects undertaken in the project management research literature. Developing a better focus on the project owner and uncertainty regarding the projects' effects was found to be the main value of the work. The quantitative part of the study reveals an unusually large number of risk items and these were used to create criteria for a risk categorisation framework spanning an operational–strategic scale. This categorisation can be used to unveil/clarify the present focus within uncertainty management of a given project or set of projects. This should be used as a basis for considering modifications to the risk management frameworks and attitudes in that project.

Keywords
Uncertainty management, risk, project ownership, project objectives, operational risk, strategic risk.

Paper type
Research paper.

(Footnote – bottom of first page:

Reference to accessible full-text electronic version of the thesis – http://folk.ntnu.no/krane/THESIS-HPK.PDF)

Introduction

It is often claimed that projects do not produce the effects or deliver the functionality that's expected from them (Flyvbjerg, Bruzelius, & Rothengatter, 2003; Samset, Berg, & Klakegg, 2006). For large and complex projects, the uncertainties regarding the functionality that the project should deliver are considerable (Miller & Lessard, 2000). Uncertainty management will hence be an essential contributor to determine whether a project is a failure or a success. The project owner will have the power and responsibility for both resources used in the project and effects or functionality delivered from it (Olsson, Johansen, Langlo, & Torp, 2007). The project owner should therefore also play a central part in managing uncertainty influencing the project success.
There are two intentions of this research note. First, we intend to give the reader an insight into the process it was for the main author to develop the PhD thesis, or the 'journey' that he made from achieving a scholarship for the work to the finished thesis and final dissertation. In addition the intention has been to share the insights of the PhD thesis – a thesis that deals with the issues just mentioned, regarding project owner influence on uncertainty management of the project. It will explore how the uncertainty management of projects is supporting/ serving the project owner's goals for the project – or *not* doing so. And finally the paper will give a description of the setting/context for the PhD thesis.
We will first give a presentation of the main contents of the thesis, the research questions, the research approach, and the main findings. This is then followed by a brief explanation of the background and development of the PhD thesis. Here the background of the main author is

also described, followed by some words about the university and academic framework/ context around this PhD thesis journey.

Methodology

The thesis was an investigation into how uncertainty management is actually performed in large and complex projects. Since the contribution from stakeholders to uncertainty is often important (Olander & Landin, 2005; Ward & Chapman, 2008), the influence of stakeholder management was also important to study. The interaction between project management team and project owner was examined, and their relation to strategic and operational risks in the project was also taken into consideration. The research was made through two case studies – one in the railway infrastructure sector (in public sector) and one in the energy sector (in private sector).

The work had to build on literature studies from a range of fields that would together establish state of the art within the field. That meant that works within areas as project success literature, project governance, and stakeholder theory, stakeholder interaction, conflicts and trust, on project ownership and (not at least) on risk and uncertainty – to mention some of the most central areas. Through the literature studies it was found that the research should mainly go deeper into the following areas:

- project ownership
- delivered functionality and the project's scope
- stakeholder management
- risk categorisation and criteria

For each of those four research areas, the links from the state of the art to the area of our research were described, focusing on how the research could make a contribution. It was found that few empirical studies regarding project ownership related to uncertainty management have been documented in the literature, but also that some recent works have discussed possible descriptive models for the area (Klakegg, Williams, & Magnussen, 2009; Olsson, Johansen, Langlo, & Torp, 2008). As a consequence, it became an aim of the research presented in the thesis to include empirical studies of project ownership related to uncertainty management. This was done by studying the project owner role specifically related to uncertainty management, and the interaction between project owner and the project management team, and also their relation to the project objectives.

Regarding the state of the art, it was found that not much work has been done on the connection between delivered functionality and uncertainty management. Neither was there found many empirical studies regarding the combination of project scope and uncertainty management. With regard to the latter, it was found that far more had been written with a normative approach than descriptive (see for instance (Jaafari, 2001)). It thus became an aim of the thesis to examine uncertainty management of the functionality delivered, and to do so from a project owner's perspective. There was found to be a number of more recent writings regarding projects and stakeholder relations, in particular addressing trust/distrust and conflicts (see for instance (Diallo & Thuillier, 2005; Karlsen, Græe, & Massaoud, 2008; Zaghloul & Hartman, 2003)). However, not very much of this was related to uncertainty management, and in particular not much was found to be relevant to management of functionality delivered by the projects and focusing on the project owner's perspective. Still, a few recent studies have looked more generally into the possibilities of combining uncertainty management and stakeholder management (Ahmed & Bakhsheshi, 2009; Ward & Chapman, 2008), and have concluded that what is most important is probably that those responsible within the two areas are aware and knowledgeable of one another.

Hence, such a categorisation of risks should be used in the studies in order to investigate how different categories of risks are handled in the projects that are studied. Studies should also be made of how the different categories of risks are viewed by the main stakeholders to the project, in particular the project owner and the project management team.

These research questions were addressed:

RQ1: How is the uncertainty management of the functionality that the projects should deliver actually performed?

RQ1.1: How does the management of stakeholders influence this type of uncertainty management?'

RQ1.2: How does the interaction between project owner and the management team of the project influence this uncertainty management?

RQ1.3: Comparing the project owner and the management team of the project, what are their interests in and influence on the above-mentioned uncertainty management?

RQ2*:* How do the project owner and the project management team regard and prioritise operational and strategic risks?

The findings, the discussion and the conclusions in the following sections of the article will be made with references to those research questions.

Figure 1 shows a conceptual model of the research process. The process generally had more iterations and mixed techniques than the model indicates. In the methodological approach to the study, key elements were the use of combined qualitative/ quantitative studies, two multi-project case studies and a mainly explorative and descriptive approach (Creswell, 2003; Grenness, 1997). Figure 1 depicts it as a voyage from an explorative phase via a qualitative/ quantitative to a descriptive phase. Each of those three phases had separate stages of problem formulation, data collection and data analysis, and each of them based on a research problem or identified possibility for improvement in the existing research literature, and/or to some extent identified through empiricism. The research was basically performed as qualitative research (interviews, documentation studies), supplemented by a quantitative study (basically use of risk register data).

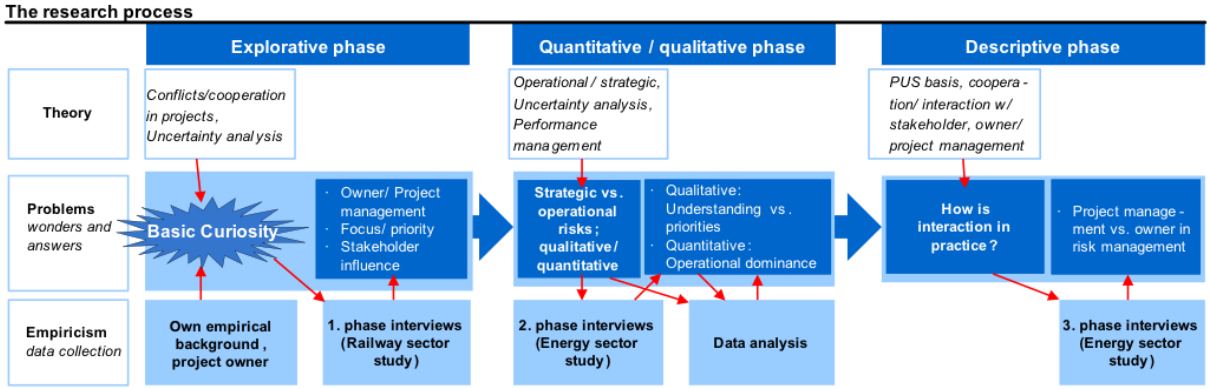

Figure 1 – The research process

In the first phase, the explorative phase, my own empirical knowledge from projects similar to the ones studied was brought together with documented empirical evidence from the project literature and other related fields. This formed a 'basic curiosity' – the background for

asking questions regarding what are the basic mechanisms in uncertainty management of projects This in turn provided the basis for the first study of the railway projects. The analysis and discussion focused on the questions regarding the relations between project owner and project management team, the focus and priorities within the uncertainty management, and the stakeholders' influence on the uncertainty management.

The next phase included interviews in the energy sector projects, and collecting and analysing data from risk registers. The analyses and discussions especially focused on the question of distribution of operational and strategic risks in projects, and the questions of the existing understanding versus priorities among the different stakeholders.

The third phase, the descriptive phase, started out from a general question regarding the interaction between stakeholders and the project, and in particular between project owner and the project management team. For these studies, the focus was narrowed down to the question of what the nature of the interaction is in practice (research question 1.2). This question formed the basis for the third collection of empirical data, namely interviews in the energy sector projects. Together with the material from the earlier parts of the study, these data gave a richer basis for addressing the problem of how the project management team and the project owner address and prioritise strategic and operational risks (research question 2).

Results

One research question was related to how is the uncertainty management of the functionality that the projects should deliver actually performed. The uncertainty management of the projects was done in procedures conducted and performed by the project management team and for their purposes. It was not the project owner or his representative who performed the uncertainty management regarding delivered functionality in any of the studied projects. In practice, the projects' risk management was based on risk workshops performed early in each project phase. This was mainly because the uncertainty management was run and based on the project management team's interests. The 'iron triangle' was particularly important for how priorities were decided in the large railway project. These issues have not been found covered in earlier studies. There are also quite clear indications that the necessary close and strong relations between the project owner and the process owner in the project owner organisation had not been established.

The next research question addressed how the management of stakeholders influenced uncertainty management. The influence from stakeholder management was, for the majority of the projects, mainly noticeable on operational risks, while little influence was observed on strategic risks. (Here, the term stakeholder includes both internal and external stakeholders.) There was not any influence found from the project owners on how stakeholder management was done. Risk management and stakeholder management were run as two parallel management processes, and few linkages were found between them. Stakeholder management was quite strongly based on the early stage stakeholder analyses, which meant that a connection in the other direction than the one mentioned in the research question did not exist. It was also noted that there was little focus on internal stakeholders. These issues have not been found covered in earlier studies, particular regarding the split between the project's operational objectives and questions regarding the functionality delivered by the project.

It was also studied how the interaction between project owner and the management team of the project influence this uncertainty management. The interaction between project owner and project management team in the energy sector study was characterised by cooperation, while in the railway study there were more conflicts. However, in both studies the interaction

between them in practice worked on the project management's premises, an issue not found mentioned or covered in earlier research.

To find out what had the strongest influence on this type of uncertainty management (in the relation between project management team and project owner, the owner and project management team were analysed regarding their power and interests. The project management team had the strongest interests in and power over the operational risks, while the project owner had the strongest interests relating to the strategic risks. However, the project management team also had the strongest power regarding strategic risks, particularly in the case of the largest railway project. This use of a 'stakeholder power/interest matrix' on project owner and project management team and on operational and strategic risks has not been found in use earlier in project research. For the purpose of this thesis it has been of great help to have a tool for visualising the effects of the project management's governance over project risk management.

The thesis studied how project owner and project management team regarded and prioritised operational and strategic risks. From the management literature it might be assumed that the project management team clearly gives priority to operational risks, while the project owner would, in most of projects, focus more on the distant future and more often give priority to strategic risks. However, a vast majority of the risks in the studied projects' risk registers were found to be operational. This was due to the risk management largely being dominated by the project management team; hence, an operational dominance was found. There was not found any incidences of risk management performed on the project owner's initiatives in the case studies, although one example was found where the project management had used an opportunity to utilise strategic opportunities. The operational/strategic categorisation of risks that is done here has not been found in use in earlier research. This categorisation should be utilised further in order to separate the responsibility for operational and strategic risks more clearly, and also to conduct further investigations into how operational and strategic risks are handled in projects.

Discussion

The main results from the research are here given for each of the research questions that we had defined for the research.

Regarding RQ1, "How is the uncertainty management of the functionality that the projects should deliver actually performed?", the most important empirical evidence from the research was perhaps that such management was most clearly performed through the start-up 'analysis sessions' for each main project phase. Examples of involvement of stakeholders in risk management were mainly only seen in the energy projects, involving the owner, and this was basically regarding the top ten risks. Risk priorities were made based on 'probability x consequence', but in the railway study priorities were also made based on project reputation and performance, and in the energy study on the project team's top ten assessments. When it comes to special considerations that were made regarding functionality, one example was found in each study, where the project team identified and implemented improvements to functionality delivered by the projects.
Implications from the findings: There will most likely be a need for a well-composed combination of measures on both the human and system side in the projects/ organisations

involved. In summary, relations between project owner and process owner in project owner organisation should be enforced.

Regarding RQ1.1, "How does the management of stakeholders influence this type of uncertainty management?", the main empirical evidence found in the research was in the railway study. There, two examples of stakeholders with large influence were found. In the energy study there were no good examples found. The examples were basically only found of management of operational risks. In the energy sector, risk management and stakeholder management were identified as parallel processes that were not well coordinated.
Implications from the findings: Further work should be done on possible 'symbiotic' effects between the risk management and stakeholder management processes of projects.

Regarding RQ1.2, "How does the interaction between project owner and the management team of the project influence this uncertainty management?", empirical evidence from the research was that different owner roles were identified in both studies. In the railway study there were examples of large conflicts, while the energy study had examples of cooperation between the owner and project management team. One railway example showed the project management team convincing the owner to utilise an opportunity.
Implications from the findings: The project owner should be a key part in both defining and ensuring project success, and uncertainty management is a key to project success. Therefore, uncertainty management should be performed more on the project owner's premises than was observed in the studied projects. Also, the interaction between the project management team and the project owner should take place more on the project owner's premises. For this to occur there is most likely firstly a need for training both the project owner and the project management team regarding the basic criteria for the risk categories operational and strategic risks.

To find empirical evidence regarding RQ1.3, "Comparing the project owner and the management team of the project, what are their interests in and influence on the above-mentioned uncertainty management?", a 'stakeholder power/interest matrix' technique was used for analysis. The highest levels of power were mainly the project management teams' power over both of the risk categories. The owner's power over strategic risks was basically somewhat low in the railway study. Both the owner's and project management team's interest was as expected – owner highest on strategic, project management team highest on operational risks.
Implications from the findings: The purpose of analyses of the relative power and interests of project owner and project management teams should be to be able to take measures for increasing or reducing the power and/or influence of the project owner or project management team when appropriate.
Analyses of the relative power and interests of project owner and project management teams should also be performed in more projects, to verify whether this is a more general tendency, and also, if possible, to find which factors that seem to influence on the power/ influence balance.

Regarding RQ2: "How do the project owner and the project management team regard and prioritise operational and strategic risks?", in the energy sector study it was found that operational risks were given high priority, basically by both actors. Both studies indicated that

there were unclear priorities, probably due to the categorisations being unfamiliar to the actors. There was no evidence of distinctly different priorities between the owner and the project management team.
Implications from the findings: To achieve the necessary changes in the management of operational and strategic risks there is a need for a clear allocation of responsibility for the different risk categories between project management team and project owner organisation.

The main contributions to practice – or suggestions to changes in current practice – were that there is a need for a general change in how uncertainty management is performed. This should likely result in a combination of changes in procedures, organisation, measures for motivation, training etc. This should contribute to establish closer links between project owner and process owner. Needs for changes in risk management frameworks (procedures, defined organisational roles etc.) and needs for well-defined measures for motivation and training were identified. The aim of the identification was to improve the balance of interest and power between project owner and project management team with respect to strategic and operational risks. There is a need for training in order to develop necessary basic knowledge regarding risk categorisation, and finally there is also need for procedures/ framework for assigning responsibility for operational and strategic risks to the central actors.

The main contribution of this research to the knowledge development was that the theoretical understanding on project management and uncertainty/risk management is still insufficient, when it comes to how project owner and project management team influence on determining what is to be focused in uncertainty and risk management. Further more, the study can develop knowledge on the relationship between project owner and process owner in the project owner organisation. The study can also improve the understanding on the owner's role in connection with the functionality that the project is expected to deliver. The study also leads to developing new knowledge on power and interest of the project owner and the project management team with respect to strategic/ operational risks. And finally, based on the study, a categorisation of risk (operational, short- and long-term strategic) was suggested.

My PhD journey

The author of this article is a civil engineer, who earned his 'diploma' degree in 1984 at NTH (later renamed to NTNU) - the Norwegian University of Technology and Science in Trondheim. I started my career working in IT application/system development in the Norwegian State Railways (NSB). After more than 10 years in different roles in IT projects in NSB, I turned to other tasks in NSB, and some years later in the Norwegian Rail Administration (JBV). In the period from 1997 to 2006 I had different positions dealing with rail infrastructure project, and in particular their effects on the use and performance of the railway system.

I had during those years made quite a long travel in my view of how the project is accomplished — from the young civil engineer who once believed strongly in "deliver according to good, precise specifications" to an approximately 20 years older (and somewhat more experienced) man seeing projects as part of a complex and very dynamic context and focusing stronger on project outcomes than on project output. I did also in my later project experience see more of projects from the owner representative's perspective, and I saw that the project's political and stakeholder environment / setting will often need to be taken more care of than the more or less carefully considered technical specifications that were developed at the early project phases.

Over the years, being in close interaction with projects as a project participant, as an owner representative and in different other stakeholder roles, I got increasingly intrigued by projects not reaching their owners' goals, and often not even focusing on those goals. To use a biased formulation: Project teams in a technical-oriented environment and in an engineering tradition felt safe as long as they could focus on well-defined technical project deliverables. They were not comfortable with (more or less well-defined) project effect goals – goals that are critical to achieve in order to satisfy project owners at different levels. (Yes, project owners exist at a number of levels!). I also observed the project managers' growing frustration as the requirements to achieve those effect goals were continually evolving in a political/societal context. Working mainly in a context of infrastructure projects I moved towards a conclusion that such projects are perhaps in fact not primarily technical projects – as a civil engineer might prefer to believe (and also ***I*** had once so strongly believed). This move away from my old faith was a strong motivation for taking up the work on a PhD relatively late in my career.

In 2006 I was offered a PhD scholarship related to the PUS research project. PUS was a large research project on practical uncertainty management in a project owner's perspective. This research project had a wide approach to ensuring the wider effects that the project should produce when completed. It might then not be surprising that the subject of the PhD would be focused on how well and why projects did manage to deliver the effects (or the functionality) that the owner expected in an unstable and unpredictable world. It was also quite logical to study how the uncertainty management of the project is used in order to achieve the expected project effects.

PUS is a Norwegian acronym for "Practical uncertainty management from a project owner's perspective". The PUS research project was carried out between 2006 and 2010 with 6 participating companies in public and private sector. The PhD scholarship was a 3 years program, with no compulsory teaching. This made it possible to fully concentrate on the academic subjects and later the case studies and data analysis.
For eight months from January 2009 I had the privilege to be a visiting researcher at the University of Southampton, invited by Professor Terry Williams, head of their School of Management. For me this was an inspiring research environment, not at least their risk research group. Not only did this period offer me a rich opportunity for scientific production, but also a close experience with British culture and society. Through this exposure to both the British everyday life and academic life, I was allowed to find out whether the Anglophilia I had claimed to have was just an *illness* (which was possible to recover from) or a *leaning* (that would remain). My experience was that it not only remained, but it even got stronger.

Throughout the PhD work, I continually published results on project management conferences and in journals. After the first case study had been performed, and results had been analysed, an overview of this case study was presented on a student poster at the PMI Research Conference 2008 in Warszawa, Poland. This poster achieved the "2008 Research Conference Student Poster Award" from PMI.

The first results from the second case study, which was done in seven different projects in the energy sector, were submitted for the PMI EMEA Global Congress 2009 in Amsterdam as a student paper. The paper was awarded PMI's "James R. Snyder International Student Paper of the Year Award" at the congress, and later published in Project Management Journal (Krane, et al., 2010).

The main published outcomes from the PhD work are summarized in Table 1 below. These works were produced during the main doctoral research period. In addition the work resulted in a number of other articles for different conferences, scientific journals and magazines.

Table 1 – Some main published outcomes from the doctoral research

Title	Publication channel
Uncertainty and stakeholder management – a study of two railway projects	Conference paper presented at *EURAM Conference 2009*
A case study of how stakeholder management did influence project uncertainty regarding project benefits	Published in *International Journal of Information Technology Project Management* Vol.3, No.2, pp.21-37
Categorizing Risks in Seven Large Projects—Which Risks Do the Projects Focus on?	Published in *Project Management Journal*, Vol.41, No.1, pp.81-86
Strategic and operational risks and opportunities – how are they handled over time, in different project types	Conference paper presented at *PMI EMEA 2009*
An empirical analysis of project risk in a time perspective	Published in *International Journal of Project Organisation and Management* Vol.3, No.1, pp.36-56
How Project Manager - Project Owner Interaction can Work in and Influence on Project Risk Management	Published in *Project Management Journal* Vol.43, No.2, pp.54-67

Conclusion

The aim of this paper was to present some insights into my PhD thesis and journey. I have presented the research topic, design, research questions, approach and also summarised finding from the thesis. Interested readers can download the thesis from the link (http://folk.ntnu.no/krane/THESIS-HPK.pdf) provided in this paper. I have also explained my motivation for starting the PhD, journey, and how it came about from my previous interest in the PUS research project and my connections with NTNU. I trust that this paper will help inform others in a similar position to me who may be contemplating such a journey and that this paper is a useful resource for them.

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