Uncertainty management in a project owner perspective; case studies from governmental projects in Norway
Jan Alexander Langlo 1, Agnar Johansen 2, Nils Olsson 2
(1. Norwegian University of Science and Technology, NO-7491 Trondheim, Norway
2. SINTEF Technology and Society, NO-7465 Trondheim, Norway)

Abstract — This paper addresses the need for using a project owner perspective in project uncertainty management processes. Traditionally, literature and actual practice have focused on risk management, i.a. the negative effects of uncertainty. Recent published knowledge reflects a change in attitude, as it acknowledges that uncertainty management both has an upside and a downside. Most literature, however, is using a narrow project perspective when analyzing and describing uncertainty management processes, even when thinking in terms of lifecycle.

We claim that projects should also use a project owner perspective and bring the project owner closer into a shared and continuous uncertainty management process. We support this claim by presenting results and viewpoints from current research on recent and ongoing Norwegian projects. Our research is based on case studies and an extensive literature and document study, as well as experience from action research.

1. INTRODUCTION

Uncertainty management in project context has traditionally been synonymous with risk. Risk has been treated as a threat that should be prevented, avoided or eluded. Uncertainty is often said to have its root cause in lack of available information, available knowledge or competence (e.g. [1], [2]). Traditionally both project literature and project practice have focused on identifying, evaluating and managing risks (e.g. [3], [4], [5]). Recently there has been a shift towards focusing on how to manage the opportunities facing the project. Ward & Chapman [5] introduce the term uncertainty management to be used in preference to both terms risk management and opportunity management. Supported by Hillson [6], they forward a theory focusing on utilizing opportunities as well as managing risks.

Taking advantage of the upside possibilities (or opportunities) have in recent years been a growing issue for practitioners, at least on an executive level. Traditionally, projects are often established in order to manage risks that a line organization is not capable or willing to undertake. Hence, traditional contractual and cooperation models have been based on a principle of transferring risks to other parties [7].

The aim for the research presented in this paper is to establish a better cooperation and integration of uncertainty management processes between project owner 1 and project organization.

2. RESEARCH METHODS

The research presented in this paper is based on case studies in Norwegian governmental projects. The case studies are of a longitudinal and qualitative nature, as the authors have been involved as researchers and process contributors repeatedly in all the cases, and in large number of other industrial and governmental projects.

In addition to practical and professional experience as researchers through action research and involvement in projects, we base our research on an extended literature survey carried out in conjunction with a research project named “Practical project uncertainty management in an owner perspective” [8].

3. UNCERTAINTY MANAGEMENT IN PROJECTS

Christensen and Kreiner [2] defines uncertainty as the difference between currently available information and required information when making a decision. They also provide two strategies for reducing uncertainty; 1) to reduce the necessary information (e.g. by preferring a known solution), and 2) to increase the existing information basis (e.g. by gathering more information, bringing in more competence, or gather more experience by launching a test pilot).

Figure 1 Strategies for reducing uncertainty [2]

Simister [4] has developed a generic risk management model based on publications from national standards associations (British Standards Institute, Canada Standards Association, and Standards Australia), professional institutions (Institution of Civil Engineers [9], Japan Project Management Forum [10], Project Management Institute [3], and Association of Project

1 Project owner is in this paper defined as the actor funding the project or the future user of its product(s).
Simister underlines the importance of undertaking risk management as a structured, formal process aligned with the overall project management approach. Simister says the risk management process should be commenced as early as possible in a project life cycle, and that the process has to be undertaken on an iterative basis since each assessment is a snapshot in time.

Ward and Chapman [5] elaborate on Simister’s risk management process, and considers how risk management can be made more effective in a given project context. They divide project uncertainty into five areas [7]:

1. Variability associated with estimates.
2. Uncertainty about the basis of estimates.
3. Uncertainty about design and logistics.
4. Uncertainty about objectives and priorities.
5. Uncertainty about fundamental relationships between project parties.

All areas of uncertainty are important, according to Ward & Chapman, and generally they become more fundamentally important to project performance as they go down the list, and the areas affect on one another. In the context of this paper, we claim that project uncertainty in at least the last two areas in the list depend upon involvement of project owner and other stakeholders in the uncertainty management process.

Hillson [6] builds on the thoughts and principles of Chapman and Ward, and forwards the idea of including handling of upside uncertainty (opportunities) as well as downside (risks). This distinction is also supported by other authors (e.g. [13], [14], [15]). Hillson, however, claims that there is no need for a separate opportunity management process, as the standard risk management process offers a framework within which both can be handled effectively together alongside each other. Why then, do so many organizations fail to gain the benefits, as we challenge the assumption that a traditional risk management process will provide a sufficient framework for opportunity management. Perhaps the opportunity management process needs another framework than the standard risk management process? We will try to throw light on and support our explanation by presenting how uncertainty management has been carried out in our chosen cases.

But first we will present some dilemmas facing project managers and line organizations as they undertake the process of uncertainty management.

4. Uncertainty Management Dilemmas

In course of our investigation, we have identified some dilemmas concerning how uncertainty management is described in existing theory and what we have observed during our action research. Six dilemmas of uncertainty management in projects were identified during our state-of-the-art analysis [8]:

1. Some uncertainties can be treated as a risk by a project organization, while the same uncertainties can be treated as opportunities by the project owner.
2. While a line organization often initiate a project to master a more complex environment or situation than normal, the project organization itself often use a closeout strategy to minimize risk. This strategy often results in less potential for including improvements and managing changes during project execution than expected by line organization.
3. Tangible project uncertainty is prone to underestimation due to two conditions. i) Contextual demands in complex and long-term projects usually develop considerably during project execution, leading to increased uncertainty. The project often finds itself in a situation where it can’t report this uncertainty without probably receiving a stop order. ii) This often leads to the project overrating the accuracy and quality of its available information and underrating the tangible uncertainty reported to line organization at decision gates.
4. In order to maximize chances to be perceived as successful, a project will in the early phases often actively work to widen its financial frames and to obscure its goals, thus hiding an increased total cost for the line organization.
5. In order to maximize benefit or return on investment in a life cycle perspective, you need to understand the project and its complexity in both totality and detail. Such an understanding requires continuous monitoring of its development, and the project owner is seldom in a position to follow the project on a daily basis.
6. When intervening or participating in project uncertainty management, there is a potential danger for a project owner to, completely or partially, take
over the responsibilities and the role of the project manager. In turn, this will most likely result in increased internal project uncertainty.

Based on these dilemmas, we raise a question regarding which perspective is to be used for analyzing and describing uncertainty (risk) management in projects. To our knowledge, the dominating body of knowledge uses a project perspective when describing the uncertainty (risk) management process, focusing on how the project should handle risks and (to some extent) opportunities to the best of the interests of the project organization, or to the best of the interests of other stakeholders as the project have defined them. Our research has substantiated that using a broader project owner perspective and bringing the project owner closer into the risk management process would benefit both the project owner and the project itself.

In a project perspective, a project would strive to access more resources, reduce its scope, increase its budget, and increase its time frame before it undertakes its mission. After the mission is commenced, uncertainties are not communicated but kept under internal control, and from a contextual viewpoint it seems as if the project exists in an ideal world with fixed uncertainties.

But how is uncertainty management carried out in practice? In the next chapter we present results and observations from some of our recent case studies.

5. Uncertainty Management in Practice

In our research we have studied a number of projects, and we choose to present three of them in this paper in order to illustrate how uncertainty management is carried out in practice in some Norwegian projects.

5.1 The “E6 Østfold” Road Construction Project

The project E6 Østfold is one of the largest road construction projects in Norway. It is a part of an ongoing upgrading of the main roads in Østfold County from Oslo to Svinesund. The output of the project is 33 km of a four lane highway. The construction is scheduled for completion in 2009. The budgeted upper cost limit is approximately 2.1 billion NOK (2006).

The project organization early recognized that this project would be challenged by strong stakeholder interests, especially by politicians and local authorities. The old E6 is heavily exposed to traffic accidents having one of the highest death tolls in Norway. It was probable that politicians in both government and parliament would be interested in an acceleration of the completion date. In addition, the market situation was strained as there was a lot of construction work taking place in the region. The potential for cost overruns was considerable. Hence, the project organization took action to ensure that an appropriate opportunity management process was established. Representatives for project owner were invited to take part the initial risk management processes. As a result of the risk management process, the project was divided in three separate sections, and the contract model implied for contracts to be awarded in a successive manner for each section. Iterative uncertainty management processes were carried out biannually, supported by continuous monitoring and control by the project team. The team focused on utilizing opportunities for cost reductions and time savings, and could, as the government later on wanted to speed up the construction, provide accelerated time schedules ready for implementation. The project completion was accelerated from 2015 to 2009. Thanks to the opportunity management process this could be accomplished without increasing the total cost, just by advancing the planned funding.

5.2 Construction of the New St. Olavs Hospital

The Norwegian health care system has been through some major changes the recent decades; i.a. it has resulted in construction of new, efficient and future-oriented hospitals. One of these hospitals is St. Olavs Hospital in Trondheim. Plans for a new university hospital in Trondheim were made in 1991, which was approved by the Norwegian Parliament in 1993. In the beginning, the project was organized under the regional county and funded by the government. In 2002 the parliament decided to build the university hospital at its current location based on the plans for Phase 1 of the building program. The first phase of the construction of the new hospital in Trondheim, consisting of four centers making a total of app. 90 000 m², was completed on August 6th 2006. Phase 2, consisting of six centers is planned for completion in 2013/2014 [16].

Early on in this project, the project organization realized the massive complexity of this project. They came to realize that this was not just about building a large up-to-date and future-oriented agglomeration of buildings in the same area as the existing hospital, without disturbing the running and effectiveness of the old hospital. It was in fact at least three separate projects in one; one project responsible for building the ten centers, one project responsible for implementing ICT technology and educating personnel in using this technology, and finally one project responsible for integrating the ten centers and bringing them as close together as one effective unit as possible. In an uncertainty management perspective, it was important to take into consideration this complexity in addition to technology development and market fluctuations due to the long time span from initial planning to completion. Together with project owner it was decided to carry out the project in an iterative manner, using two phases and smaller contracts instead of larger EPC² contracts. In order to facilitate this interaction between project owner, project organization, contractor and suppliers, an interaction based contract model was implemented. The contracts were awarded in a successive manner based on experiences from previous contracts, and uncertainty analyses were carried out for each contract. Based on these analyses, control limits and reserves for time and funding were given to contract level, project level and management level (project owner). These limits and reserves made it possible for each organizational level to utilize

² Engineering, Procurement and Construction
opportunities and handle risks as soon as they surfaced or emerged. Training in uncertainty management principles was given to project management and top management (project owner) throughout planning and construction phases, contributing to operationalizing uncertainty management in all parts of the organization.

This approach has allowed the project to use time as a flexible cost saving variable instead of an unalterable and cost increasing factor. It has also allowed the project (in close cooperation with the project owner) to use successive planning and estimation of each contract, drawing on experiences and recent and more accurate information than would have been the case if EPC contracts would have been used. EPC contracts would actually have removed all opportunities from project owner to make adjustments as the project evolved. By using the successive contract model and the successive planning approach, the project owner took upon himself greater risks. But it also introduced greater flexibility to the project, provided both project owner and project organization paid close attention to integrated uncertainty management.

A prime driver for this development has probably been the recent change of ownership for health care services in Norway. Previously, the counties were responsible for providing the health care services, but they depended on funding from the central government and had no or little power to influence neither development and efficiency of hospitals, nor the funding from the government. A few years ago, the government took ownership of the health care services and established five regional health care authorities. Each regional authority is responsible for providing efficient health care services to its inhabitants, operating hospitals and other institutions, developing new infrastructure and services, and investing in new technology, all within the budget provided by the government. This resulted in a clear ownership of both operational cost and investment cost, and a clear responsibility for balancing these cost against the budget. Hence, this has forced the regional health care authority to take on a more active role as project owner in our case.

5.3 Construction of the new Governmental block R6

The Norwegian Government is extending its office area in Oslo, and has decided to erect three new buildings (R6) to house the new offices. One building will be demolished and replaced, one building is of high antiquarian value and will be renovated, and the final building is to be partially renovated. The construction area is situated in a sensitive agglomeration of buildings, thus involving a number of stakeholders with strong interests to negative consequences of the new building and the reconstruction. The new buildings will house two ministries and a governmental ICT support unit. The project started its preparations just recently (in 2006). Statsbygg (Directorate of Public Construction and Property) is responsible for carrying out the project. Total cost is estimated to 900 mill NOK.

Uncertainty management in this project started somewhat different than traditional projects at Statsbygg in recognition of the fact that this would be an especially complex and challenging project. Political influence is quite strong, as the Government has had a strong interest in co-localizing the two ministries. The co-localization is vulnerable to changes in government, and completion of the building is therefore of political essence. The project decided to bring in all stakeholders as early as possible in the process of defining needs, goals and specifications. First, all stakeholders contributed in creating a stakeholder map and defining their demands, needs and expectations. Then they developed a layer to the map showing the influence of each stakeholder at different phases and milestones along the project timeline. In this manner each stakeholder gained an insight and understood other stakeholders and their demands. Normally this process is carried out by the project itself based on previous experience from handling and interacting with these stakeholders. By bringing the stakeholders into this process, the project created ownership and a positive attitude within and between each stakeholder. They identified themselves with the project and came to see the opportunities this project will provide for them. This has so far proved to be a solid foundation for further progress. The project and its stakeholders have jointly developed a communication plan, and will in the near future work out a cost estimate and a time schedule together.

We have observed that this approach to uncertainty management has greatly reduced the potential risks due to conflicting interests. In addition a shared approach to handle future divergence is established. In addition, the stakeholders are incited to use their creativity and to suggest improvements in both the new building and the building process.

6. DELIBERATIONS UPON OUR OBSERVATIONS

Our research resulted in two findings of interest for this paper: 1) that there is a difference between practice and theory when it comes to how uncertainty management is carried out, and 2) that there is a potential for further improvement by bringing project owner into the uncertainty management processes. Our research has shown that there are potential improvements in both practice and published knowledge, and both practice and published knowledge has a lot to learn and benefit from each other.

6.1 Potential for improvements in practice

Uncertainty management in practice is not yet far-reaching, and the experiences made by practitioners have not yet been documented and put under scrutiny by other practitioners and academics. It is probable that current best practice still has vast room for improvement, and the best way to accelerate this improvement is to document practice and experiences from current uncertainty management processes and to distribute this to other practitioners and academics.

According to Chapman and Ward [7], contractual parties are preoccupied with transferring risks to other parties. This preoccupation is amplified by the dominant contractual models used today. Our research supports this conclusion; however, in our cases in this paper the project owner shows increased willingness to bear risks and to use contractual, organizational,
and procedural means both to exploit opportunities and reduce the probability and impact of risks. Their good results and experiences so far imply that far more projects should adopt a willingness to bear risks.

6.2 Potential for improvements in published knowledge

During our research it became apparent that existing theory mainly focus on managing risks. And most risks identified are perceived as risk to the project, not necessarily as risks for the project owner, end user or efficiency of the project delivery.

More research should be carried out to identify and describe processes for integrating a project owner perspective with the traditional project perspective. Chapman and Ward [7] provide an alternative framework and an useful basis for this research, e.g. the SHAMPU model. Our aim is that theory should reflect the recent and emerging changes in uncertainty management practice, and hopefully reinforce, amplify and distribute the impact of these changes.

7. CONCLUSIONS

In our research we shown that uncertainty management is not about cutting project costs; it is about using the allocated funding in the most optimal manner. Uncertainty management is not about avoiding risks; it is about evaluating and making the most of opportunities that will provide the best outcome in a lifecycle perspective. Thus it could be justified that a project realization phase becomes more expensive and time consuming, provided that e.g. improved operation and maintenance or other winnings outweigh the increased project cost or prolonged duration. Uncertainty management is not about estimating; it is about managing changing contextual conditions and their influence on the project. In conclusion, uncertainty management is about the project organization acknowledging and communicating the fact that its world is uncertain, and that the project owner acknowledges this situation.

Our description of uncertainty management calls for a strong owner involvement throughout the project phase. Our cases from major governmental investment projects in Norway show that project ownership and how project owner plays his or her role has great impact on how uncertainties can be managed.

We suggest further research to be carried out in order to update published knowledge on uncertainty management processes and to bring theory and practice forward.

REFERENCES

Available from: [http://www.helsebygg.com/].