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Uncertainty analysis – Context and foundations

Concept report No 10

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Summary:

This report is concentrated on uncertainty as a phenomenon, sources of uncertainty and decisions under uncertainty. The context around these issues; the project management regime and economic analysis is also brought to attention.

The report discuss different main sources of uncertainty in projects. These are defined as:

conceptual uncertainty, operational uncertainty, contextual uncertainty and scenario uncertainty.

The uncertainty analysis' place in planning and execution of public projects is shown through a survey on the government need for uncertainty analysis. This survey show needs in five main areas. These areas are needs, benefits, cost, progress or time, and the procedures around the choice of alternatives. The report looks at the connection between needs and benefits in an economic perspective, and discuss some sides of prognosis, needs assessments and future demands.

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Summary

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Uncertainty analysis - Context and basis

Concept Report No. 10

This is the first report in a series of five that have been developed in the sub-project 'Uncertainty Analysis'. The reports are published as Concept Report Nos. 10 to 14.

This report's main purpose is to create a foundation for understanding the following reports in the series, and to help understand why it is important and appropriate to perform uncertainty analysis. The report focuses on uncertainty as a phenomenon, sources of uncertainty, and decisions under conditions of uncertainty. In addition, the report looks at uncertainty about a project's justification and the uncertainty related to the demands of the project result. The context surrounding these problems, namely the project's steering regime and socio-economic analysis, are also given attention.

The suitability of uncertainty analysis in public project execution has also been looked at by conducting a survey of the Government's need for uncertainty analysis. Uncertainty analysis is often actuated on the background of the following four purposes:

- To be a part of the decision basis at the decision points which determine whether a project will proceed to the following phase.
- To come up with conditions in a project's future that demand advanced measures to be avoided or limited, or the demands of building up a readiness.
- To be of support during the determination of the steering regime of the project, especially in relation to dimensioning contingencies, and explaining the conditions for triggering the release of the contingencies.
- To be of support in the management of projects by increasing the actors' awareness of risks and possibilities, and by making clear where it is most important to concentrate attention.

The majority of uncertainty analyses performed on projects are about uncovering and quantifying the uncertainty of the investment costs. In this context the development of the cost estimate from a base estimate to expected cost, and subsequently to when framed cost is discussed. To this discussion also pertains to the question of how safety versus cost overruns develops. The most important elements of the analysis are a good and well-defined process, good methods for ensuring valid and reliable results (herein lies the construction of a good model) and to provide for correct and relevant input (qualitative and quantitative), and a presentation of the results that reflects the true conditions to the extent that they have been explained.

The report also discusses the different main sources for project uncertainty. These are defined as:

Conceptual uncertainty. The uncertainty that is related to the analysis and the analysis model.

Operational uncertainty. Inner uncertainty that is mainly related to the project execution.

Contextual uncertainty. This type of uncertainty has its origins in the projects' surroundings.

Scenarial uncertainty. Uncertainty related to objectives, decision criteria and decision rules. And that is mainly caused by the scenarios that are the foundation of the project not being able to foresee the changes that the future will bring.

A central theme in the sub-project 'Uncertainty analysis' has been the interview survey. This has been undertaken with the goal of determining what are the most central elements of uncertainty in large public investments, and, following this, what elements should be subjected to an uncertainty analysis. This survey revealed five main areas where the respondents believed the largest uncertainties were to be found: need, benefit, cost, schedule or time, and the procedures for choosing alternatives. The first four coincide with the most important elements in the decision basis for the project, while the procedure for choosing alternatives is about how this decision basis is treated and presented, and about obtaining the decision criteria.

One of the main sources of uncertainty, especially in public projects, is the changing demands and expectations that the public has as to what a project should cover in terms of needs and what can be tolerated in the form of inconvenience caused by projects. In this context, the phrase 'it is difficult to predict, especially about the future' comes into its own. The report discusses some conditions about prognoses, needs analyses and the demands of the future.

What have so far have been unjustly treated in uncertainty analysis are the questions of the project's benefit, and the question of the costs of running the project result. In the interview survey it is pointed out that the running costs must be accorded a lot more significance than they are today when choosing concepts and projects. The report also looks at the connection between needs and benefits in a socio-economic perspective.

Choosing between alternatives is one of the most important questions to arise in many of the project phases, and perhaps the most important question in the front-end phase, especially in relation to selection of concept. What is the best alternative is defined by a combination of quantitative comparison between costs (both investment and running costs) and the economically measurable benefit parameters, as well as a qualitative analysis of benefit parameters that are not economically measurable. The process of obtaining a basis for selecting the best alternative consists of defining and ranking the selection criteria, and weighting the different alternatives against the criteria in such a way that the most important criteria receive the most weight. The report shows a method for 'multiple objective analysis'.

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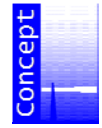
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