# Mat-2.177 Seminar on case studies in operation research

## Nokia Networks: Product release definition
Project plan

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# 1  Introduction

The client for whom this research project is being conducted is Nokia Networks Ltd. Nokia Networks is a leading provider of network infrastructure, service delivery platform and related services to mobile operators. This project is being done for the R&D unit. The aim of this project is to improve the product release definition decision process.

The product release definition process begins with determining the requirements of different stakeholders, i.e. defining the business requirements. These stakeholders include the operators who are the customers, their customers who are the end users, administrators, etc. These stakeholders may have functional or architectural requirements. In addition to the business requirements, the system places certain limitations on the final product that must be taken into account. These are called system requirements.

Based on these requirements a list of possible features to be included in the product is made. A feature is a functionality or part of architecture that fulfills one or more of the business requirements. Implementation of each feature has a fixed cost. Also the value to the customers and effect on market share is determined for each feature. There may also be dependencies among the features. This means that a certain feature may exclude the inclusion of another; two features may only be of value when both are

implemented; or the value of a feature may depend on the implementation of another feature. Based on these values, the feature specification for the product must be chosen. A certain budget is given and it serves as the maximum limit to the costs of the features specified to be implemented. An overview of the decision process is given in Figure 1.
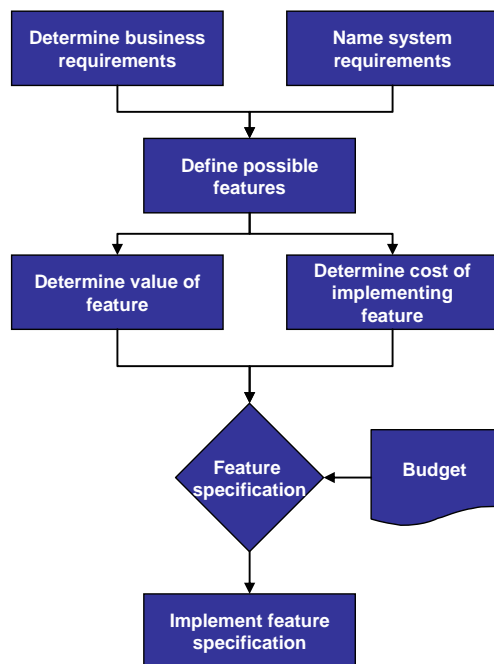


**Figure 1.The product release definition process**

When realizing the decision process now, dependencies between the features are not taken into consideration or modeled. The values of the features specified for the product release are not optimized. Also a sensitivity or risk analysis is lacking. This would be important because the value of the features cannot be determined objectively and subjective judgments are never certain.

## 2  Theoretical background

A theoretical decision analysis process is presented by Clemen. This is shown in Figure 2. This process will be used as a theoretical background when improving the product release definition process. In addition a follow-up of actual value to customer and effect of market share will be included, so that a learning experience is possible for the value determination step.
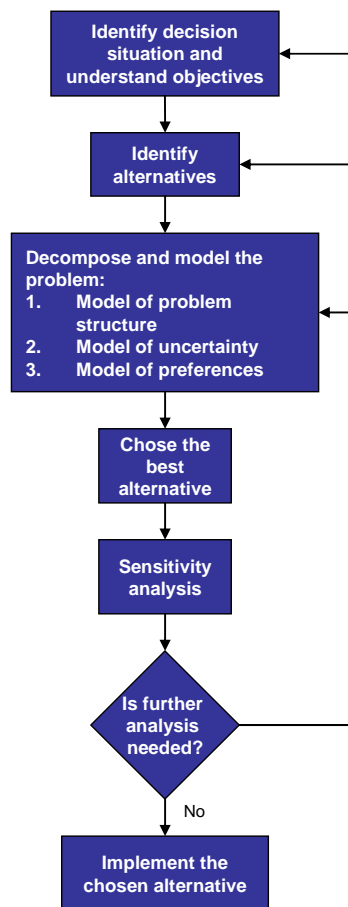
Figure 2. Decision analysis (Clemen, 1996)

The problem will be modeled as an optimization problem. There will also be uncertainty in the values to be optimized. A theoretical model that is similar is the portfolio optimization problem. The mean-variance portfolio theory presented in Luenberger's book maximizes the profit from a portfolio based on mean values of profit from individual assets and allows for sensitivity analysis through variances (Luenberger, 1999). The problem structure of the release definition is however complicated by the dependencies between the different "assets" and a budget limitation on overall cost. A more advanced approach to this kind of problems is robust portfolio modeling, which is extended to include dependencies and constraints in the paper "Robust Portfolio Modeling with Project Interdependencies and Balance Constraints" by Liesiö, Mild and Salo (Liesiö et al, 2005). This approach leads to the need to solve a multi-objective zero-one linear programming problem with interval

valued objective function coefficients. This kind of problems can be solved using the appropriate software.

## 3 Goals

The aim of this project is to improve the product release definition decision process. This aim can be divided into the following goals:

1. Model the current decision process and its data inputs

2. Redesign the process according to best-practices

3. Develop a practical tool to help in the decision-making

The main purpose of this project is to develop a tool to support decision making when choosing features for a new product release in Nokia Networks. To do this it is first necessary to investigate the procedure and people that specify the values and characteristics of possible features. Furthermore, there is need to understand where constraints and interdependencies come from and how they affect the features. After all input data is understood we are going to develop a mathematical model that optimizes feature selection. The model must take the interdependencies between the features into account. Based on this model the final tool will be created with suitable PC software or programming language. It should be possible to make some sensitivity analysis with this tool. After the tool is created it should also be tested with real feature data from Nokia Networks. This verifies the suitability of the model and the tool for Nokia Networks.

## 4 Action Plan

Preliminary actions have already been completed after the assignment of the project. After the introduction session at the school, we visited the client Nokia Networks and discussed with Soili Haapala how to proceed with the project. When we had received information and all the group members had an idea on what the project was all about, we went to see our course professor Ahti Salo. He gave us good advice on what we should keep in mind when defining the project plan. He also told us what literature and course material could be useful. After the two meetings we decided to study the

whole process of product release definition instead of just developing an optimization tool for feature specification. "Value definition of the product features" and "feature dependence analysis" were included in project plan and this was approved by Soili Haapala.

The action plan for rest of project is as follows. First, all the group will deepen its knowledge by studying literature on value definition of the product features, making decisions and the whole product release process. Then we will study RPM (robust portfolio modelling), portfolio optimization and defining dependencies in optimization problems. Our meaning is to get information from Nokia, clarify the value definition and product release processes, and find out what the incentives behind valued definition are and what the source and format of the input data into the optimization tool will be.

After the analysis, our intent is to create new method for defining the feature value. We also aim to model the task as a mathematical optimization problem which includes feature dependencies. After this, we will analyse different computer programs to see which is most appropriate for our purposes (e.g. Excel, matlab, RPM expert, Xpress). The chosen program will be used to create a new tool to help decision making in the new product release process. When the tool is ready, we will verify it with test data from Nokia Networks.

## 5  Resources

An important part of the project plan is to identify the available resources for the project. The group consists of five persons, and the aim is to divide the tasks as evenly as possible. One of the members is a project leader, who will be managing the communications, but who must also be aware of how the tasks are progressing in each field.

We have identified two main tasks in this project: literature research and mathematical research. There are two persons assigned to each of these main tasks. The project leader will have a smaller part in both tasks to ease staying updated. All

the members of the project group must have basic knowledge of how things are progressing.

Instead of defining the accurate hours how much each task in the project will take, we have defined each team member's expected contribution to each task. It is up to the team members decide how much research on particular subject is required. Resource allocation between the tasks is presented in the table below.

**Table 1. Tasks and planned use of resources.**

|  | Tomi | Eino | Maria | Johanna | Samu |
|---|---|---|---|---|---|
| **Literature research** |  |  |  |  |  |
| R&D Generally |  |  | 40 % | 40 % | 20 % |
| Desision making |  |  | 40 % | 40 % | 20 % |
| Feature/Product valuation |  |  | 40 % | 40 % | 20 % |
| Modelling |  |  | 40 % | 40 % | 20 % |
| **Mathematical research** |  |  |  |  |  |
| Modelling | 40 % | 40 % |  |  | 20 % |
| Methods | 40 % | 40 % |  |  | 20 % |
| Test existing tools | 40 % | 40 % |  |  | 20 % |
| Tool creation | 40 % | 40 % |  |  | 20 % |
| Tool testing | 40 % | 40 % |  |  | 20 % |
| **Project leadership** |  |  |  |  |  |
| Contacts with client |  |  |  |  | 100 % |
| Informing and organizing the group |  |  |  |  | 100 % |
| **Reporting** |  |  |  |  |  |
| Literature |  |  | 50 % | 50 % |  |
| Background theory |  |  | 50 % | 50 % |  |
| Mathematical methods | 50 % | 50 % |  |  |  |
| Test results | 50 % | 50 % |  |  |  |
| Final reporting | 20 % | 20 % | 20 % | 20 % | 20 % |

## 6 Schedule

The planned schedule of the project is presented in figure 3. The schedule is a guideline for the project team to see how the planned tasks are progressing. When the tasks get completed and more accurate information is available, the schedule will be updated in rolling manner.

| Task                         Week | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Familiarization to the subject | | | | | | | | | | | | | |
| Define the problem | | | | | | | | | | | | | |
| Set goals | | | | | | | | | | | | | |
| Make project plan | | | | | | | | | | | | | |
| Literature research | | | | | | | | | | | | | |
| Method research | | | | | | | | | | | | | |
| Tool construction | | | | | | | | | | | | | |
| Testing the tool / sensitivity analysis | | | | | | | | | | | | | |
| Report the results | | | | | | | | | | | | | |
| Final Reporting | | | | | | | | | | | | | |
| MilesStones | Meeting with the client | | Project Plan DL | | | | | Midterm Report DL | | Final Report DL | | | |

**Figure 3. Plan for project schedule.**

In the schedule bars with same color indicate certain phase of the project. The phases could be named planning, research, problem solving and reporting. In many tasks there are no dependencies on previous tasks meaning that the previously scheduled task doesn't need to be completed before later scheduled. For example, the literature research is expected to be finished on 11$^{th}$ week, but there is only a weak dependency on tool construction, thus it may still continue. This gives the group great flexibility with regard to the schedule. The project will be finished by 21$^{st}$ of April in 2006 and the last week before the deadline is dedicated to reporting and conclusions.

## 7  Risks and Risk Management

We have identified the main risks that can have a negative effect on our project. The risk management is also discussed here.

1    Inadequate data: if we do not get proper and good quality data from the client it will be difficult to specify the process of the feature selection and there is a significant risk that the tool will not suit its purpose.

2    Programs and methods: If interdependencies between the features are complex and there is a great number of possible features it might be possible that current software and mathematical algorithms can not solve the optimization problem in suitable time.

3    It is also a risk that the tool will be impractical to use and the end-users at Nokia will not use it to its purpose. So the user interface must be designed with care.

4    Schedule: In this kind of research and development project there is always a risk that the schedule made in this plan will not come true and the project will be delayed. The development of this risk should be followed by project manager.

## 8  References

1.    Liesiö, Mild, Salo, 2005, *Robust Portfolio Modeling with Project* Interdependencies and Banalance Constrains, Helsinki University of Technology

2.    Clemen, 1996. Making Hard Decisions – *An Introduction to Decision Analysis, 2nd Edition*, Duxbury Press, Cambridge.

3.    Luenberger, D.G, 1999, *Investment Science*, Oxford University Press, New York,