The complexity in projects in the process and energy industry is increasing fast, putting conventional project approaches under stress. In this thesis a concept model is developed for early identification and measurement of project complexity.

The increase of project complexity is not unique to the process and energy industry. Many industrial sectors are increasingly confronted with projects under global pressures, with more stakeholders, multiple cultures and more challenging technological circumstances. Still, industry and universities are in the early stage of developing theoretical frameworks and models to respond to complexity in projects. Research into project complexity has thus far not yet led to a thorough understanding of project complexity.

The findings in this thesis were developed by a literature analysis and a case study around five projects. Four results were established as a basis for a project complexity model:

- Definition framework: A clear project complexity definition framework was created that defines project complexity in the two basic areas of Variability and Differentiation, Dependencies act as a related entity to both.
- Area framework: The definition framework was complemented by the complexity area framework. This framework divides project complexity in an Internal and External area. These areas contain three sub-areas of which Organizational complexity is shared, and Technological is assigned to internal, and Environment to the external complexity area (i.e. OTE). The three OTE sub-areas are each divided into the areas established in the definition framework; Variability and Differentiation.
- Elements: A list of 35 project elements, contributing to complexity, was established by a selection out of 62 elements from the case study and verified with 52 elements from literature. The list provides the inputs for the project complexity model.
- Element relations: It was shown possible to determine the strength of the project element relations and use these as weight factors in a project complexity model.

The Organizational, Technological, and Environment Complexity-model, or OTEC-model, is the project complexity model developed in this thesis. The OTEC-model combined the four results into a construct to measure a projects complexity and increase the understanding on a projects
complexity. The model uses the frameworks to order the project complexity elements. The elements are rated on their contribution to project complexity and expressed in the areas of variability and differentiation. In addition, it was shown that complexity elements that are related can be assigned a weight factor, in practice these weight factors can be seen as dependencies. The complexity score is now measured by variability, differentiation and dependencies. No project complexity model found in the literature is able to score complexity by these basic means of the project complexity definition.

The popular mechanical puzzle, the Rubik’s cube, is by its appearance and mechanism similar to the OTEC-model that is also visualized by a cube. Both can change their surface colours, and, by doing so, related surfaces are influenced. These colours express the separate project complexity found in one of the 35 project elements. Under influence of element dependencies, related elements are able to change each others colour, that is, each others complexity. No overall complexity number is generated, but project complexity is measured and made visible in the OTE areas and the project elements.

The OTEC-model is a conceptual model that is now at the point where further action is needed. It is recommended that complementary to this thesis the following steps are taken:

- Perform statistical analysis: The project complexity elements identified should be validated and, where possible, further complemented. In addition, the element relations are to be established with the use of larger data samples.

- Select respondents: It is recommended to use in further research respondents with the function of project manager to ensure consistency in the research information. In addition, members of project review committees could complement the research well with an alternative view.

- Establish a grid: A complete project element grid needs to be established with the OTE-areas and the project complexity elements to rate each element on its complexity.

- Develop an element selection mechanism: A selection mechanism is helpful to adjust the list of project elements from this thesis to a projects specific character.

- Align with project front-end loading: It is recommended to align the OTEC-model with the front-end loading of a project. Information gathered by the OTEC-model not only relates to project complexity but can also be useful to improve the fit of the front-end loading process and organization to project complexity.

- Relate research more to industry: It was found that hardly any research is available on project complexity from within the industry. Many studies are based on the knowledge of single experts, of which many have their roots in the academic world.

This thesis recognizes that the use of the OTEC–model will always be a reflection of the reality of project complexity. However, by establishing and simplifying that what one could not grasp before, a door is opened that can improve models on project complexity and project management in general.