

Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Dominik Johannes Knoll


PhD Program: Engineering Systems

Title of Thesis: Model-based Processes and Tools for Concurrent Conceptual Design of Space Systems

Supervisor: Associate Professor Alessandro Golkar

Date of Thesis Defense: 31 January 2019

Name of the Reviewer:

<p>I confirm the absence of any conflict of interest</p> <p>(Alternatively, Reviewer can formulate a possible conflict)</p>	<p>Signature:</p>  <p>Date: 15-01-2020</p>
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The purpose of this report is to obtain an independent review from the members of PhD defense Jury before the thesis defense. The members of PhD defense Jury are asked to submit signed copy of the report at least 30 days prior the thesis defense. The Reviewers are asked to bring a copy of the completed report to the thesis defense and to discuss the contents of each report with each other before the thesis defense.

If the reviewers have any queries about the thesis which they wish to raise in advance, please contact the Chair of the Jury.

Reviewer's Report

Reviewers report should contain the following items:

- Brief evaluation of the thesis quality and overall structure of the dissertation.
- The relevance of the topic of dissertation work to its actual content
- The relevance of the methods used in the dissertation
- The scientific significance of the results obtained and their compliance with the international level and current state of the art
- The relevance of the obtained results to applications (if applicable)
- The quality of publications

The summary of issues to be addressed before/during the thesis defense

Dominic's thesis is very well written and nicely formatted. It is well structured and easy to read. It is quite long (275 pages!) and consists of 9 chapters and 4 Appendices. All figures have annotations. Since this is one of the first defenses here at Skoltech, we can use it as example for future graduate students.

The topic is relevant to today's development in the field of Systems Engineering. A general process in building a product includes stakeholder needs elicitation, technical requirements writing, system design, implementation, validation and verification, operations and disposal. This thesis deals mostly with the system design and how it interfaces with stakeholder requirements. It describes a method to raise effectiveness of system design in terms time spent and quality of the final product. The approach, known as concurrent design, has been in use in space agencies for quite a while and Dominic's work is a very good reflection on what have been done and what actions can be taken to improve this approach. This topic is actively discussed at meetings such as International Council of Systems Engineering (INCOSE), International Astronautical Congress (IAC) and many others. This technique is also gaining stronger foothold in Russia. Dominic studies various approaches to concurrent design and studies their effectiveness based on studies done at Skoltech. The work also includes review of Concurrent Design facilities in other places. It is an interesting part, since Dominic actually solicited inputs via a questionnaire from many groups outside Russia.

Methods used in the dissertation are appropriate. Dominic has created his own Concurrent Design tool, which help to study problem in every detail. Analysis of studies and statistics are also appropriate and valuable.

This work contributes greatly to art and science of systems engineering. This work can be presented at the international level at conferences such as SECESA 2020 and INCOSE IS 2020. The results will be of use to many practitioners in field and can help further advance effectiveness of concurrent design studies.

The field of systems engineering is extremely practical. It get a lot of critics that it generally slows down the process of product design. Dominic's work address this issues and shows with experimental data how to improve effectiveness of system design and come up with a better product. He also offers a tool (CEDESK) that can be used by many.

Dominic has a great publications record, that I believe satisfy Skoltech requirements. Given that the field is mostly practical and there are not many publications, Dominic has published in peer-reviewed journals as well presented his work in relevant workshops.

Provisional Recommendation

I recommend that the candidate should defend the thesis by means of a formal thesis defense

I recommend that the candidate should defend the thesis by means of a formal thesis defense only after appropriate changes would be introduced in candidate's thesis according to the recommendations of the present report

The thesis is not acceptable and I recommend that the candidate be exempt from the formal thesis defense