

## Jury Member Report – Doctor of Philosophy thesis.

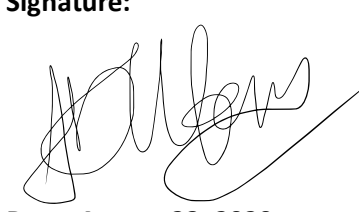
**Name of Candidate:** Yaroslav Menshenin

**PhD Program:** Engineering Systems

**Title of Thesis:** Model-Based Framework for System Concept

**Supervisor:** Prof. Edward Crawley

### 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><b>Signature:</b></p>  <p><b>Date: August 23, 2020</b></p>
---	--

*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:

Yaroslav Menshenin has submitted the thesis "Model Based framework for system concept" which consists of 7 chapters on 364 pages. Thesis is very well written, structured and consistent. All pictures have proper captions.

The topic covered in this work is relevant to the field of Systems Engineering. Mr. Menshenin is suggesting a framework for complex concept evaluation and comparison. The work describes an ontology of 27 items, which are used as a basis to analyze a concept. Extensive analysis of various cases, spanning many different disciplines.

This work used appropriate methods to present the hypothesis and analyze the results.

Currently, very simple (but practical) methods are used to compare concepts. For example, Pugh matrix is used quite intensively. This method is quite subjective, but useful. In many other

cases, an objective cost function is determined by the stakeholders via requirements (e.g. total cost of the project, or some performance characteristic, but usually both). All concepts are evaluated relative to this cost function. This work offers a basis of essentially 27 vectors, which magnitudes can be quantified and used not only for comparison but also detailed view of differences between suggested approaches.

This approach indeed can be used to compare complex concepts, especially for large projects where study of architecture is important. It also allows to evaluate architectures that are quite different between each other.

The quality of publications is excellent, all works have been published in peer-reviewed journals.

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

1. While comparison of architectures is studied in detail, evaluation is not addressed at all. In practice, the systems engineer wants to offer a quantitative way to evaluate suggested concepts.
2. It is not clear how requirements will play into comparison between concepts. I would like to see a feedback loop in your diagrams between, for example, cost or some other elements of the system and stakeholder needs. Constraints of the system do not play into comparison of concepts. Somehow they need to be reflected in assessment.
3. Philosophical remark. Model Based conceptual Design is used throughout. Great name, but you don't have a single model in your work. By a model, I mean some calculations in the same Matlab or Python. In INCOSE I see this very often and beautiful diagrams are also called a model, but this is still a presentation diagram. Here, of course, you don't need to do anything, this is an established practice, but I don't like it.

**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*