

## Jury Member Report – Doctor of Philosophy thesis.

**Name of Candidate:** Sabah Farshad

**PhD Program:** Engineering Systems

**Title of Thesis:** Improving collaborative engineering design and learning through feedback systems in the age of digitalization and AI

**Supervisor:** Professor Clement Fortin

**Name of the Reviewer:** Professor Alexey Nikolaev, Skoltech

I confirm the absence of any conflict of interest

(Alternatively, Reviewer can formulate a possible conflict)

**Date: 12 – 01 - 2024**

*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

The thesis of Sabah Farshad is devoted to improving collaborative engineering design and learning through automatic measurement of team collaboration level and feedback systems. The theme is of great interest and importance from both academic and practical points of view. Recent explosion of remote and hybrid teams (caused by COVID-19 isolation) and the associated challenges to make these teams productive and efficient make this research especially timely and important. While a large portion of practical tools and frameworks in the area of team productivity deal mostly with the measurement of teams output performance, the present thesis is focusing onto the monitoring, measuring and improving process performance. This is an additional strong point of the research. Also, the novelty of the thesis is the application of data driven approach as well as the application of artificial intelligence.

The thesis has a clear logical structure. The topic of the dissertation is well-correlated with its actual content. The results, even given the limitations mentioned in this review as well as by the author, are very promising for practical application in industrial and educational settings.

As the themes to be additionally addressed by the author (may be as the directions for the further research) I would like to suggest the following two major groups of topics: (1) reliability of the performed studies (given small sample size of experimental and control groups, educational settings, single experiments) as well as the justification of the claimed conclusions; (2) expanding the review of the subject area.

In the area of the performed studies reliability and the conclusions justification, for example, the following considerations are to be addressed:

- In Case Study #2 the author makes the claim for the finding of a meaningful correlation between Active Engagement and Collaboration. The claim is based on single-time survey having 8 responses where 5 responses in 7 – 9 range and 3 responses in 2 – 5 range (see page 112 of the thesis). Generalization of the claim basing on small group size, one-off experiment, educational nature of the project, potentially not uniform understanding what “collaboration” really mean and takes, require additional justification.
- Continuing Case Study #2, the author introduces Active Participation as the combination of (1) The total volume of data in Bytes entered in the time period; (2) The number of days that the contributor recorded an activity in the specified time period; (3) The total number of times that the contributor has edited the document and the log recorded an activity. All these three components look related to solo activities performed by a contributor and do not reflect the level of collaboration. Additional explanations are required to justify that the method suggested by the author in Case Study #2 is relevant and reliable for the measurement of Collaboration but not some other construct of team work. May be, Active Participation (as presented and measured by the author) can be considered as stand-alone parameter or linked to other components of team performance (not Collaboration).
- Also, in Case Study #2 the author characterizes the team project task as mainly executing one. At the same time team collaboration and collaborative work have higher importance at the phases of decision-making, concepts generation, negotiation, etc. Additional discussion on what parameters could be measured and assessed when teams are dealing with the tasks of decision-making, negotiating, generating would be useful. Would it be Active Participation and Shared Responsibility? Or other parameters?
- In Case Study #5, for better understanding of the research design and it’s justification, I would recommend to add examples of team chat messages that were classified as (1) corresponding to Active Participation and (2) corresponding Shared Responsibility. This would illustrate how the

messages of different format, style, wording, etc. are semantically attributed to Active Participation and Shared Responsibility constructs.

In the area of the subject area review the following points can be highlighted:

- The author provides an extensive literature review with the focus on academic research. Given high relevance of the topic to practical application, a short review of emerging commercial services for teams and individuals work performance analysis and improvement would be a good addition to the overall prior art review. (E.g. services offered by corporations like Microsoft and/or startups as Yva.ai and others).
- As well the review of existing methodologies having components for the team process performance improvement would be a good addition. For example, within widely used SCRUM methodology, such rituals as Sprint planning, Daily stand up, Retrospective meeting have components intended to address and improve performance of the team not only in the output but in the process as well (including collaboration enhancement). A short review of these practices, their mapping into the concepts considered in the thesis would be useful considering connection of the research to practical application.

#### 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*