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HABILITATION THESIS REVIEWER'S REPORT

Masaryk University

Applicant	RNDr. Martin Komenda, Ph.D., MBA
Habilitation thesis	Empowering a Data-Driven Approach in Medical Education and Healthcare
Reviewer	Doc. Mgr. Martin Nečaský, Ph.D.
Reviewer's home unit, institution	Department of Software Engineering, Faculty of Mathematics and Physics, Charles University

The submitted habilitation thesis deals with two fields in the healthcare domain – medical and healthcare education (MHE) and Health Information and Statistics (HIS). The part related to MHE deals with building an educational platform for healthcare, and the other part related to HIS deals with specific data management methods in healthcare. These two research directions seem quite unrelated at first sight, but the opposite is true. Building comprehensive infrastructures that are sustainable in the long term is important in both fields. These infrastructures must be well-grounded technologically and methodologically. Moreover, in both directions, a strict data-driven approach is critically important. In the thesis, the author presents his work in both directions and demonstrates that he has built such infrastructures with his team. He has also built working solutions with real user communities on top of the infrastructures. His work has a great societal impact. At the generic level, the thesis does not propose any completely novel software or data engineering techniques. However, it shows how to use them, combine and extend them to working solutions in both healthcare subdomains.

In the MHE field, the author emphasizes three main highlights of his work here: a collaborative framework for sharing educational resources, an education integration platform, framework, and platform implementation. The chapter "*Results: Medical and healthcare education*" provides a more detailed summary of the author's contributions to the field. It demonstrates the complexity of building the healthcare education platform. This includes solving problems with publishing and sharing educational materials in a systematized way, connecting different groups of stakeholders (not only teachers and students, but also physicians involved in the life-long learning, etc.), integrating pedagogical methods into the platform, data-driven decision-making, and also solving various architectural questions that are hard in such a heterogeneous environment (availability, modifiability, usability, etc.).

In the parts of the thesis devoted to the HIS field, the author presents his contributions to managing, sharing, and publishing health data. The author's contributions in this field are impressive. We can say without any doubt that they are shaping the field of health data in our country, including a great impact on healthcare professionals and the general public. This includes not only various technological and engineering aspects of data management but also, which is very important from my point of view, a clearly defined methodological framework for sharing and working with health data and overall data-sharing architecture. The developed solutions support various data management stages, including data collection, reporting, processing, analysis, modeling, and visualization. The work includes not only data

solutions hidden in the background and for the experts. This includes solutions available to the public. The most visible example is the portal with COVID-19 epidemic data.

For the overall assessment, it is important to say that the presented work is not only the author's work. The thesis describes many large-scale working solutions and information systems, which are the work of large teams. However, the author was and is the leader. He has demonstrated the ability to devise solutions, manage their construction, and clearly communicate the results. I have found the thesis to be well-written and with a clear vision. Its content is original.

From a purely academic point of view, he has co-authored a significant amount of scientific publications presenting the methodologies and techniques behind his solutions, systems, and applications. He was often the first author in the authoring team. His work is well-cited. Unfortunately, he does not have a profile on Google Scholar, so we need to go to the closed citation databases. The Scopus database records 190 citations (without self-citations) and h-index 6. This indicates that the author's publication work is well-recognized in the scientific community. He participated in many academic and research projects as a team member and also as a leading person. This clearly demonstrates his ability to secure funding through research projects and also to deliver results.

Reviewer's questions for the habilitation thesis defence (number of questions up to the reviewer)
1) Can you please highlight the most difficult problem you faced in preparing to share health data? Is it more of a technical or security issue? Or is it more of a communication and motivational issue?
2) Is there a problem with heterogeneity in the structure or semantics of data? Did you consider using ontologies to describe the semantics of the data separately from describing the technical metadata? Would this ontological description help in the healthcare data?

Conclusion

The habilitation thesis entitled Empowering a Data-Driven Approach in Medical Education and Healthcare by RNDr. Martin Komenda, Ph.D., MBA **fulfils** requirements expected of a habilitation thesis in the field of Informatics.

Date: 28.1.2025   Signature: