

HABILITATION THESIS REVIEWER'S REPORT

Masaryk University

Applicant

Mgr. Čeněk Šašinka, PhD.

Habilitation thesis

Cognitive Processing of Spatial Information with Respect to Various Visualization Methods and Individual Differences

Reviewer

Arzu Çöltekin, PhD., Prof.

Reviewer's home unit, institution

Institute of Interactive Technologies, University of Applied Sciences and Arts Northwestern Switzerland

This habilitation thesis consolidates author's various contributions on visualization as a communication paradigm, especially in the case of spatio-temporal data such as maps, 3D city models, immersive navigational experiences, and other forms of geovisualization. The author takes mainly a cognitive science perspective, but also brings in views from technology and design related geospatial domains to a degree, due to the interdisciplinary nature of the examined phenomena. Dr. Šašinka groups his scientific contributions into three main thematic areas: 1) effect of visualization type and design, 2) individual and group differences in information processing that emerge in visualization studies, 3) cross-cultural differences in these tasks. Besides these three key areas in which author offers significant contributions, he offers a reflection on the research methods, and we are presented with an effort in grounding all of the above into a theoretical framework.

The thesis includes results from 13 published studies where author is the first author in four, second in five and presumably senior author in some of them. The findings broadly suggests that the visualization type and design does matter for participants' performance (accuracy, speed) as well as preferences; and there are indeed some individual and cross-cultural differences in e.g., people's cognitive styles, preferences or information processing strategies. Many of the studies are quantitative, though some of the publications are based on explicitly qualitative methods. As a specific method, eye tracking has been also used in some of the studies, where one can obtain quantitative and qualitative insights. Authors demonstrate trends and broad-stroke differences in cross-cultural differences, though more studies are needed to better understand how established these differences are and what might be the reasons behind them.

The text is overall well written and thoughtful. The depth of reflection varies from chapter to chapter, but overall author clearly demonstrates expertise, experience and critical thought. At the end, a modified version of the Lens model is proposed as an encompassing theoretical framework which sounds plausible.

Reviewer's questions for the habilitation thesis defence (number of questions up to the reviewer)

- 1) Author states "The specific nature of the researched content, i.e., visualizations and their corresponding task types, does not allow for the use of procedures common in

experimental psychology... “ and thus proposes "new" methodological framework. Please elaborate where the shortcomings of the methods in general psychology are, what is unique to geospatial / maps? Furthermore, does proposing a new research design introduce new uncertainties?

- 2) Somewhat connected to the above author states “Experimental research in the field of external graphical representations (maps) cannot be narrowed down to methods, techniques and task types that measure only partial sections of cognitive processes and isolated cognitive functions”. Is this really different in other domains?
- 3) Throughout the manuscript, it appears that author takes Kirsh's (2010) position that external representations enhance the cognitive power of an individual. We also hear opposing views on this topic, e.g., such representations become a crutch and thus weaken the spatial abilities. What would be author’s response to the debate on the role of cognitive amplifiers / cognitive prosthetics to human intelligence?

Conclusion

The habilitation thesis entitled “Cognitive Processing of Spatial Information with Respect to Various Visualization Methods and Individual Differences” by Čeněk Šašinka, PhD.] **fulfils** – requirements expected of a habilitation thesis in the field of General Psychology.

Date:

Signature:

31 July 2023

