

# Exploring a map-based visualization to raise awareness of the various perspectives in vitality among different domain experts

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## Research Area:

Information Visualization in Computer-Supported Cooperative Work

## Research Topic:

Fostering collaborations and collective insight generation through map-based visualizations by being aware of the various perspectives of different domain experts in the field of vitality

**Abstract.** Despite the increase interest in collaboration and human factors in visualization, empirical studies taking both subjects into consideration simultaneously in visualization research are still limited. My PhD research aims at exploring factors for collaboration in information visualizations among users with different expertise. Awareness is hypothesized as a factor to enhance collaboration by communicating the perspectives of subject matters through information visualizations. Among several different directions of awareness, the awareness of information (“data” in particular) is considered on a map-based visualization containing multiple datasets related to the concept of vitality in my PhD research. A qualitative research approach is primarily applied throughout my PhD research to understand the target users and their requirements in depth as well as to gain insights into the design of such map-based visualizations. Consequently, my PhD research aims to contribute to the fields of Information Visualization and Computer-Supported Cooperative Work (CSCW) by providing empirical evidence regarding factors which enhance collaboration with respect to data analysis through data awareness.

**Keywords:** Collaboration, Human factors, Visualization, Awareness, CSCW

## 1 Introduction and Research Problem

Visualizations, despite their advantages such as cognitive support for understanding a large amount of information in a relatively short period [1], can also become complex when huge amounts of data as available today [2] need to be represented. Understanding information visualizations tends to be more challenging when they are intended to solve real-world problems, which are often very complicated due to the various types of information and people who are involved in [2]. In this case, it is not realistic to analyze those visualizations individually. Rather, it makes sense to analyze it collaboratively among a number of committed people by sharing their expertise and perspectives [3]. There are increasing interests in collaboration [3, 4] and human factors [5] in visualization. However, to the best of my knowledge, empirical studies, which take both subjects into consideration simultaneously in visualization research such as [6] are still limited. Considering the challenge of human factors and collaboration in information visualization research, my PhD research aims at exploring factors to encourage collaboration in information visualizations among users with different expertise who have a common goal to improve vitality. As a potential solution, I propose a map-based visualization containing multiple datasets related to vitality.

The concept of vitality has been discussed in different domains such as health and physical education researches [7]. In the field of industrial design, there is an increased interest in data-enabled applications through user's behavioral data for the improvement of people's vitality [8]. My research is in line with this interest and focuses on the utilization of diverse vitality related data from various sources (including open data) through visualization.

## 2 Research Hypothesis

My PhD research primarily focuses on awareness as a factor to support collaboration as discussed in the field of Computer-Supported Cooperative Work (CSCW) [9] and Visualization [10]. Schmidt addresses that awareness is an ambiguous term and has taken many different directions (e.g., peripheral, passive, and mutual awareness) [9]. My PhD research focuses on awareness information [10] ("data" in particular) since multiple datasets are utilized to assist with solving vitality issues in the real world. Furthermore, a map visualization is specifically implemented as my previous study [11] found the advantage of a map-based visualization when targeting both technical and non-technical users. This finding was in line with the suggestions from several open data researchers [12, 13] and the concept of Public Participation Geographic Information System (PPGIS), which includes a variety of stakeholders as well as the general public as target audiences [14]. Geographic Information System utilizes multiple datasets from different sources yet communicates subject matters effectively [14]. As vitality has multiple dimensions and related data also vary [11], this PhD research implements the format of PPGIS as the way to visualize information.

Given these contexts, first, my PhD research focuses on data awareness, which is considered to support various users achieving their goals in their projects and their interests related to vitality. Based on prior studies regarding individual differences in

information visualizations, it is highly assumed that users mainly seek the datasets to achieve their goals and their preferences [5, 15]. However, during this process, I carefully investigate if users are also exposed to datasets, which are not relevant to their goals or preferences, but important to understand the holistic view of the subject matters (“vitality”), in other words, knowing different perspectives. My PhD research hypothesizes this process of knowing perspectives could be a factor to initiate collaborations.

### **3 Methods**

There are three main questions in my PhD research, which are:

1. What data is required from domain experts who are involved in vitality projects to achieve their objectives?
2. How does a map-based visualization containing various vitality data support the visual analysis process among different domain experts?
3. What design factors on a map-based visualization raise awareness of the perspectives on vitality data among different domain experts?

A qualitative research is primarily applied throughout my PhD research. To answer the first question, semi-structured interviews were conducted with domain experts who are involved in vitality related projects, and also citizens who are considered to have less domain knowledge regarding vitality. Based on the findings from this study, a map-based visualization containing multiple vitality datasets will be developed for a user study to explore the second research question. Lastly, to understand the factors to enhance awareness, different designs and stimuli (e.g., animations based on the studies such as [16]) will be explored in a future study. In this phase, mixed methods could be considered by obtaining quantitative data such as gaze position and duration from an eye tracker as well as qualitative data through interviews and open-ended questionnaires.

### **4 Work to Date and Open Questions**

Currently, my PhD research is in the phase to investigate the second research question described above by conducting a user study. By the time this doctoral consortium will be held, the results from the experiments will be available. Based on the results, I would like to discuss the further direction of my PhD research, such as if data awareness is a potential factor for initiating a collaboration and if there are any other factors necessary to take into consideration in my particular PhD research context. Since INTERACT has been considering information visualizations as an area of foci in Human-Computer Interaction research, I am very much interested in this particular conference. Furthermore, the expertise of the chairs of this year’s doctoral consortium, which includes awareness in the context of visualization, is well aligned with my research. Therefore, I strongly believe the doctoral consortium at INTERACT in 2021 will be an important one to inform and steer my further PhD research.

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