All Good Things Come in Threes: A Digital Platform for Data-Driven, Interdisciplinary, and Replicable Research

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Keywords: Replicability, Interdisciplinarity, Data-Driven Research, Digital Research Platform, Design Principles.

1 Introduction

In the age of digitalization and global networks, all areas of the economy and society are undergoing a profound change. In this context, research with its primary goal of gaining knowledge is not only investigating many aspects of this transformation, it is

and technology-driven research methods that focus on large data sets and apply computerized analysis; (3) New types of research infrastructure and research organization supported by digital tools; as a result, research activities are more and more shifting to digital platforms that support location- and time-independent collaboration as well as the exchange of research data within and between various scientific disciplines.

In addition to such multi-faceted digitalization phenomena in research we can observe three major trends affecting the way of how researchers gain insights and collaborate. On the one hand, data-driven research meanwhile complements theory-

(integrated) contributions to one's own and other disciplines or in their common intersections [3]. The success of interdisciplinary projects depends on various factors. A mutual understanding of research methods and results, as well as a consistent vocabulary among researchers from different disciplines, are seen as key success factors [2]. Consequently, we formulate **(LR2):** The design of a digital interdisciplinary research platform should reduce the cognitive discrepancy between the heterogeneous users.

Our third perspective refers to the replicability of research. Replicability constitutes a fundamental requirement in physical sciences, and its relevance in social sciences continuously grows [6, 7]. In general, replicability in IS refers to the capability to solve a problem by reproducing or verifying the same artifact (model, theory, or principle) with different data drawn from a different sample (or sampling) of the same population (or socio-economic environment) in the same spatio-temporal context [8]. Thus, the main focus lies on the actual repeatability of studies and calculations rather than on the sole traceability of results [6, 8]. The availability and completeness of documents and data, especially on theory, method, and context of the research to be replicated, must

requirements engineering will continue, and an agile development of the platform is planned. The evaluation will follow the human risk and effectiveness strategy, starting with an artificial evaluation (e.g., testing against our defined requirements) and quickly moving to a naturalistic evaluation (e.g., interventions in our project setting) [13].

4 An Interdisciplinary Research Platform for Replicability

Awareness of Problem: Our project's problem setting is that tests on physical objects and experimental setups in mechanical engineering are time and material consuming, but not sustainable and often unnecessary considering today's digital technologies, e.g. for simulating material behavior. Thus, the mechanical engineers told us they would like to store generated sensor data from their experiments "just somewhere" (CR1). The data should be used to train an AI system that can predict future experiment results (CR2). The process should be automated (CR3), and, if possible, the predictions should be used to derive suggestions for adjustments in the experimental setups (CR4).

The data are transferred to researchers from other disciplines (mathematics and computer science) to perform modeling and calculations. The scientific usage of the data researchers expressed concern in the interviews that the results could be c(ter)-4(i)erET

us in the initial design of the platform prototype and will be iteratively revised and refined. In detail, our design principles are as follows:

(DP1) Principle of Collaborative Engagement: To allow researchers in an interdisciplinary research project to engage and leverage a shared research platform, provide view-based interfaces, and enable data navigation because interdisciplinary research teams with shared world views will perform higher [3].

Fig. 1. Derivation of Design Principles.

(DP2) Principle of Archiving: To allow researchers in an interdisciplinary research project to conduct their research replicably, provide storage and archiving mechanisms at all levels of data processing because sandboxing and snapshotting enable the comprehensibility and repeatability of digitally supported research [9].

(DP3) Principle of Virtualized Research Setting: To allow researchers in an interdisciplinary research project to virtually conduct and simulate their research, provide a computerized core for simulations and prediction and a data pipeline to extract from the storage because researchers can leverage data-driven approaches to examine complex phenomena in a resource-efficient manner [5].

We could capture all design requirements and features in our design principles resulting in the first concrete recommendations for the design of the digital research platform.

5 Contribution and Future Work

In this research-in-progress paper, we address how to design a digital platform for data-driven, interdisciplinary, and replicable research. To this end, we derive three tentative design principles abstracted from six design features, which are based on five literature