Towards Managing and Organizing Research Activities

Angelika Kaplan[1], Martina Rapp[2], Sofia Ananieva[2], Hamideh Hajiabadi[1],
Romina Kühn[3], Manar Mazkatli[1], Larissa Schmid[1] and Snigdha Singh[1]

[1] Karlsruhe Institute of Technology, [2] FZI Research Center for Information Technology, [3] Technische Universität Dresden
firstname.lastname@kit.edu, *lastname@fzi.de*, *romina.kuehn@tu-dresden.de*

Motivation

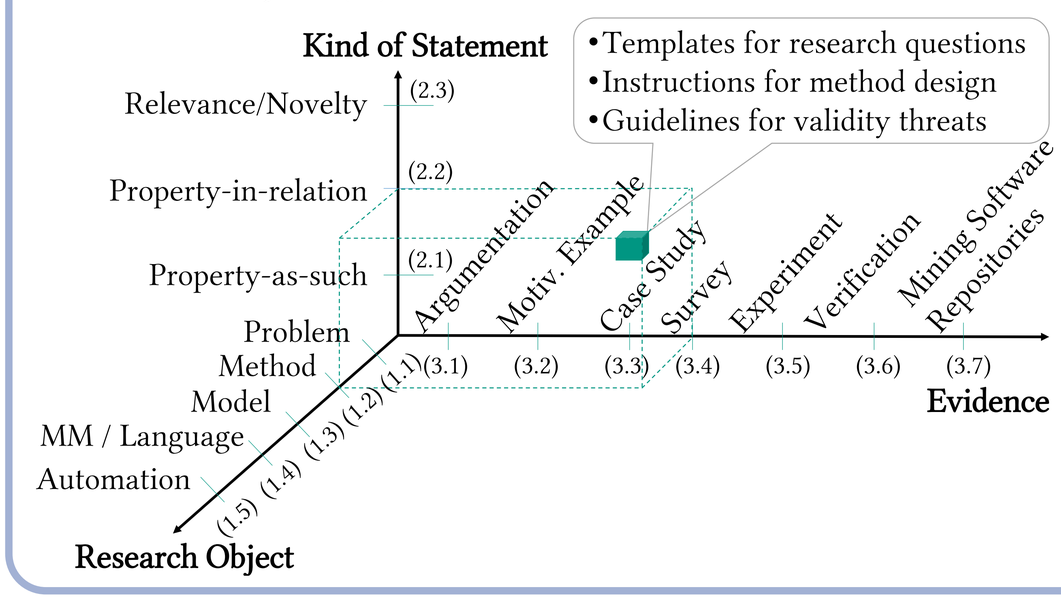
Researchers face several **research activities and challenges** during their research life time, which includes:

- **identifying** related work and research gaps to justify the **relevance** of own research work,
- **planning** how to conduct research **and choosing an appropriate research design** for a scientific problem,
- understanding how to **evaluate and assess research work** of other researchers,
- **communicating research results** in an understandable, comparable, and trustable way.

To support researchers during these activities, we present a **multidimensional classification scheme** for software engineering (SE) research.

Classification Scheme

The classification scheme to support the aforementioned research activities contains 3 **dimensions**:
(i) **Research Object**, i.e., object of research to be investigated. (ii) **Kind of Statement**, i.e., specific property of a research object. (iii) **Evidence**, i.e., research method and statement validity.



Each dimension is further subdivided into several **classes**.
Example: The Kind of Statement dimension (i.e., specific property of a research object that is a fact, a hypothesis or conclusions out of data results of a research object) is divided into the classes Property-as-such (2.1), Property-in-relation (2.2), Relevance or Novelty (2.3).
Details and descriptions on classes per dimension can be found in [2].

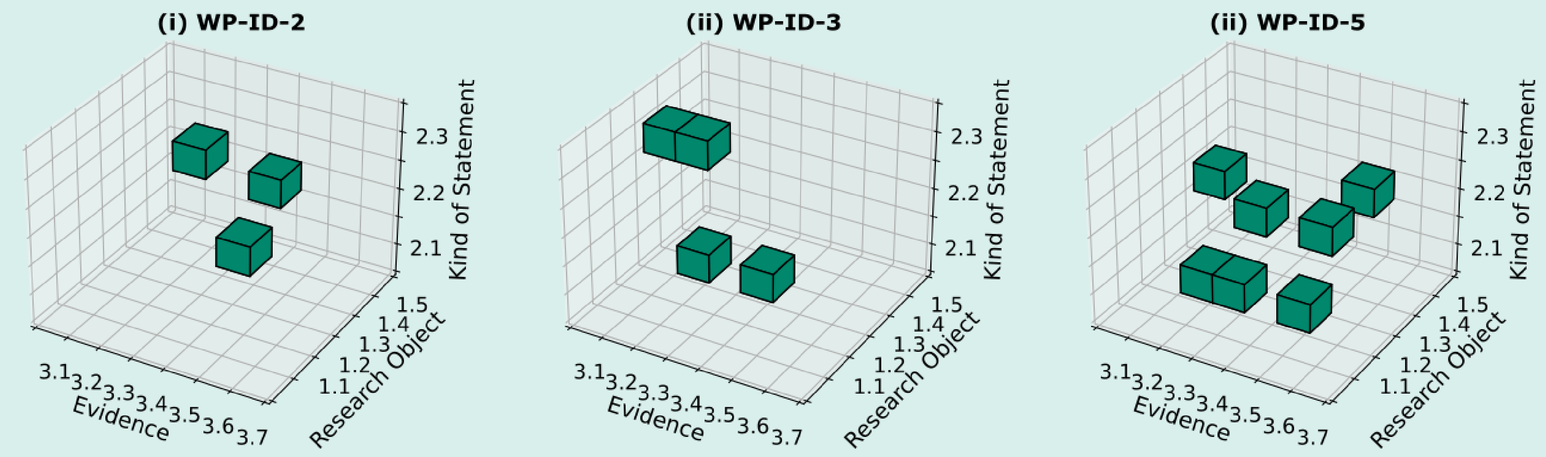
Research Design

Our **Aim** was to evaluate the applicability of the classification scheme construction, to assess strongest and weakest aspects of the classification process, and to get insights into the usefulness of the scheme.

Research Method: We conducted an empirical validation of the classification scheme based on a survey via questionnaire and semi-structured interviews of research scientists (PhD candidates) using a quantitative and qualitative analysis. We publish an open-access repository comprising our artifacts (cf. QR-Code):

Results of Classification Process – A Visualization

The following graphics represent the results of the classification process according to our proposed scheme using PhD students working packages (WP)s in (i) **planning phase** or in (ii) **conducted phase and already published**.



For illustration purpose, we use the following WPs:

(i) **WP-ID-2**: "White-box Performance Modeling of Numerical Parameters"

(ii) **WP-ID-3**: "A Conceptual Model for Unifying Variability in Space and Time" [1]

(ii) **WP-ID-5**: "Continuous Integration of Architectural Performance Models" [3]

Results of WP Planning Phase and Conducted Phase

The **strongest aspects** in (i) **planning phase** lie in showing the variability of research strategies and supporting the refinement of contributions. The **weakest aspects** are given in an unclear granularity of classifying and statement definitions in early planning phases.

The **strongest aspect** in (ii) **conducted phase** lies in the applicability of the approach. The classification scheme also helped to clarify the research artifacts retrospectively with organizing and orchestrating the final dissertation and finding research gaps.

Conclusion and Ongoing Work

Conclusion: In this work, we presented a classification scheme for SE research to support researchers in organizing and managing their research activities and evaluated the scheme using a questionnaire-based survey as well as semi-structured interviews based on PhD students research proposals.
Ongoing Work: We plan to evaluate ongoing research of the PhD proposals according to the proposed classification scheme (1) in order to refine and consolidate its construction, and (2) to monitor and evaluate the quality of the WPs in the planning phase, while actually conducting the research. Furthermore, an extension of the classification scheme on a conceptional level is planned: each coordinate in the three-dimensional scheme should be assigned to corresponding templates for research questions, instructions for method design (e.g., choosing appropriate metrics according to a statement and its underlying evidence), and validity threats to be discussed regarding the research design.

References

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