Usability Design in Medical Informatics: A Prospective Research Project

David REINERT [a,1,2], Katja SCHUELER [a,1,2] and Holger STORF [a]

[a] *Medical Informatics Group, University Hospital Frankfurt am Main, Germany*

Abstract. This short paper aims to raise awareness of good usability design in medical computer sciences. We present a research plan about developing usability design guidelines for web application development in medical informatics. Following a nimble creation process we shall create a guideline tailored for software developers, that aims to improve communication between the developer and the medical professional. Results are therefore expected to impact the way applications are being developed within the medical sector.

Keywords. usability design, web development, medical informatics, human perception, human-computer-interaction, research plan, open science

1. Introduction

Software developers and clinicians (users) need to collaborate effectively to achieve progress in medical research. Yet, effective user-developer-relationships and continuous user-centered design procedures are still underused [1]. Thus, the potential benefits of many medical informatics projects seems not yet fully exploited. To counteract this circumstance we present here a comprehensive research plan for a multi-level and multi-disciplinary usability research project. Our main motivation is to help our target group, software developers, to better understand the need for usability design, evaluation and testing in the field of medical informatics. Building upon current usability methods and standards [2], we wish to enhance three motivational factors in software developers: First, the intrinsic reward associated with the development of high-quality software; second, the personal fulfilment resulting from meaningful tasks in healthcare; third, the economic motivation of cost-efficient web-development [3].

2. Methods

We started our agile creation process with intense brain-storming sessions between scientists from medical informatics, usability, and psychology. One major outcome was the importance of adhering to an open and agile research process as the foundation for solid results. In weekly multidisciplinary meetings, we refined our understanding of the research purposes and explored deeply the obstacles in interpersonal communication between developers and users. A first concept includes, but is not limited to a literature

---

[1] Corresponding Author, David Reinert dreinert.mig@outlook.com and Katja Schüler

[2] contributed equally

review on the essential state-of-the-art in human-computer-interaction, usability design, and usability evaluation principles [4][5]. As a next step, we shall iteratively create a usability design workflow for our target group. The resulting usability design workflow will then potentially be applied in multiple upcoming software development processes, which will later be evaluated using methods created and refined by this usability guideline and the results published in a peer-reviewed medical informatics journal.

3. Results

We expect our prospective project to yield the following results: a) a comprehensive literature review on current usability research in medical informatics, b) a user-centered process model tailored for the design and development of web applications in the medical informatics field, c) a practical hands-on guide using an example from our target group, a research lab in the field of applied medical informatics, d) an empirical usability study based on a use case in the field of rare diseases. The latter includes comprehensive evaluation and refinement of the aforementioned expected results. Our current work status has already revealed the importance of the physiology and psychology of human perception and interaction as well as a suitable choice of usability evaluation methods.

4. Discussion

Publishing prospective research is a crucial part of open and reproducible science. Providing a literature review and practical guidance for everyday software development, our planned results are of manifold nature and are expected to contribute to the medical informatics community on several levels.

On the other hand, we may encounter unforeseen obstacles or have to refer to future publication events. Following a nimble approach, we will take this into account and adapt our research accordingly.

5. Conclusion

To conclude, we aim to improve the relationship between software developers and users and thus provide practical benefits for medical software development. Further, we will work on continuous refinement, setting a common ground for interdisciplinary collaboration in medical computer sciences.

References

[1]   Ghazali M, Ariffin NA, Omar R. User centered design practices in healthcare: A systematic review. 3rd International Conference on User Science and Engineering (i-USEr), 2014.
[2]   Bevan N, Carter J, Earthy J, Geis T, Harker S. New ISO Standards for Usability, Usability Reports and Usability Measures. International Conference on Human-Computer interaction, 2016.
[3]   Taivalsaari A, Mikkonen T, Ingalls D, Palacz K. Web Browser as an Application Platform. 34th Euromicro Conference Software Engineering and Advanced Applications, 2008.
[4]   Johnson J. Designing with the mind in mind. Morgan Kaufmann, 2014.
[5]   Card SK, Moran TP, Newell A. The Psychology of Human-computer Interaction, 1983.