

Improving Usability Evaluation in Digital Healthcare: A Data-Driven Approach through User-Centred Design

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Digital health products are widely recognised as essential to the sustainability of healthcare systems, and software quality, especially usability, is critical to their success and adoption [1]. Patient care can be significantly impacted by usability in digital health products; improved usability can lead to more efficient task completion, fewer errors, and improved treatment outcomes for patients [2, 3]. Conversely, poor usability can result in decreased efficiency, increased errors, and even harm to patients [4, 5]. The elderly population, in particular, faces significant challenges in using digital healthcare technologies [6]. The usability evaluation of digital healthcare technologies is critical to ensuring that they are accessible to all users, regardless of age or technical ability. Therefore, it is vital to prioritise usability during the design and development of digital health products to achieve optimal patient care outcomes. However, concerns have been raised about the effectiveness and efficiency of testing the usability of digital health products [6].

Our research endeavours are aimed at exploring innovative and novel techniques to enhance the efficiency and effectiveness of conducting usability evaluations of healthcare technologies and have a positive impact on elderly patients' lives. The research also employs multi-disciplinary frameworks that combine both quantitative and qualitative methods to ensure a comprehensive and robust approach to identifying opportunities and challenges in enhancing such evaluations.

The current research aims to gain insights into the use and application of usability testing methods, tools, and techniques in digital healthcare by surveying IT professionals. Furthermore, we are developing an Android app that records touchscreen interactions, including tapping and dragging, to examine age-related differences in performance and inform future design efforts. Our research team is also currently working on a research project that explores the use of synthetic data to develop a machine-learning model. The main objective is to simulate elderly user interface interaction and aid in usability evaluations for digital healthcare technologies in early designs. The model's reliability and accuracy will be validated through a series of experiments and validation techniques. Our recommendations, based on the research findings, will assist in making informed design decisions, ultimately leading to improvements in the overall usability of digital healthcare solutions for the elderly population.

Our work has been broad in scope and has focused on improving digital healthcare. We have conducted a comprehensive study that involved interviewing key stakeholders from the software industry to identify challenges and opportunities in the development of software solutions for the Swedish healthcare sector [7]. A recent systematic literature review (SLR) focused on exploring usability engineering methods and technologies that are commonly used in the industry and academia [6]. The review highlighted some key challenges in this area, including a lack of support for usability tools and challenges related to participant recruitment. We have also been involved in diverse projects, such as the development of a mHealth application aimed at assisting patients with eating disorders. This application, in the form of a food diary, provided tailored treatment recommendations based on healthcare provider prescriptions and user-generated data. The overarching goal of our work has been to improve healthcare through innovative and effective digital solutions.

In the future, we plan to continue exploring novel ways to improve the usability of healthcare technology. Specifically, we plan to investigate the use of Machine Learning, including approaches such as imitation learning, to develop automation tools that can support IT professionals in usability testing for diverse user groups, including the elderly and individuals with motor limitations. Such technologies have the potential to support and enhance the efficiency and effectiveness of usability testing by leveraging user-generated app interaction data to emulate human behaviour while reducing the challenges associated with participant recruitment (onboard patients) in the earlier design phases. Through this approach, we hope to inform user-centred design decisions and gain a better understanding of stakeholders' needs and user experience, ultimately leading to improved self-care management and enhanced patient outcomes.

In summary, our team is dedicated to advancing the field of digital healthcare usability engineering, and we are excited to have the opportunity to share our research and expertise at the upcoming workshop. We look forward to engaging with other experts in the field, exchanging ideas, and participating in thought-provoking discussions. Our goal is to contribute to the ongoing efforts to improve the usability and accessibility of digital healthcare solutions, and to ultimately enhance the overall quality of care provided to patients.

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