Digital technology in healthcare – An integrated theoretical framework and application to artificial intelligence for surgeries

Extended Abstract

Using digital technology in healthcare applications is a topic with increasing popularity. Individuals often use technological support which is not digital (e.g. to treat diabetes) and organizations rely on technical equipment that is not connected with each other (e.g. standalone intensive-care beds). New digital technologies offer opportunities to provide more digital and connected healthcare services with e.g. more support for patients in daily life or enhanced interpretation of radiologic pictures. In this regard, artificial intelligence (AI) based software has become a promising option in healthcare as well, providing opportunities by allowing for a new form of an independent actor. AI-based software is different to traditional software by being able (independent of the various technical forms) to perform self-learning and thus updating of its algorithms. As such, it can adapt to new situations and has the potential to act as an independent actor. This holds especially true for operations, in which actions are performed while the patients are not included in the process as decisions are made based on the evidence found. Next to technological advances, it is however always the question whether individuals accept such options to improve their health status. This holds especially true for AI-based software as it is updating and parameters as well as decision making can become less transparent. While this often also holds true for actions of medical personnel or traditional software from the perspective of a non-expert individual, research shows that AI-based software in general is perceived and accepted differently. The acceptance of healthcare-related digital technology can be viewed from two perspectives. On the one hand, the health perspective is important according to which an individual has to decide whether she/he is going to accept a certain treatment or show a certain behavior with the aim to improve the health status. On the other hand, the technology perspective which targets whether an individual is accepting a certain type of technology. Both go hand in hand, but are addressed in two different streams of theories/models. The acceptance of technology on the one hand is often addressed with the technology acceptance model (TAM) which has been deducted from general psychological theory related to the Theory of Reasoned Action (TRA) and Planned Behavior

(TPB). On the other hand, theories in the domain of healthcare have been developed independent of technology adoption and TRA/TPB. However, while there have been various applications mixing healthcare and technology using theories from each domain, the discussion is separated in different streams of literature, but there are similar elements that these theories share. As a result, there is no research combining aspects from healthcare and technology on a theoretical level and the literature is also short on the acceptance of AI in the domain of surgeries. To fill this gap, we ask two research questions. First, on a theoretical level, which factors are influencing the intention to accept digital technology in healthcare-related situations? Second, on the applied level of AI for surgeries, how are the factors relating to perceived threats and efficacy influencing the intention accept?

We review the literature on relevant theories and identify the health belief model, protection motivation theory and extended parallel process model from the healthcare perspective, Technology Acceptance Model and Unified Theory of Technology Acceptance and Use from a technological perspective and the general psychological theories of psychological reactance theory and the Reasoned Action Approach (combining TRA and TPB). Summing up the different theories, models and approaches, it becomes evident that they share common elements while these are partly arranged in different ways. However, the duality approach of separating adaptive and maladaptive appraisals within the healthcare theories is consistent and thus also the fundamental line of argumentation in our integrated theoretical framework. Maladaptive appraisals start with perceived threats leading to fear and intention while being moderated by maladaptive rewards. Attitude serves as a mediator between fear and intention. Adaptive appraisals start with perceived efficacy which influence attitude and intention. Behavioral evaluation is moderating both of these relationships. The social influence is included as a third line of argumentation which influences all the other predictors in the model, but also intention directly following the argumentation of RAA. Since we cover the influence of social norms in general, this variable is not referring to any of the two reference objects. Hence, we develop an integrated framework that allows to explain the acceptance considering digital technology in healthcare-related contexts.

Applying the framework to the context of the acceptance of AI for surgeries, we focus on two prominent types of surgeries. One is cataract operations, an operation that is conducted with standard procedures for a large amount of individuals, the other one is arthrosis, which is following less standardized protocols as it is more risky and not conducted that often. We adapt existing measures for the constructs in our integrated framework and survey individuals using online

platform data. The data is currently gathered and will be analyzed and ready for presentation at the conference.

References upon request!