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Expanding usability analysis with intrinsic motivation concepts to learn about CDSS adoption: a case study

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Abstract

Objectives: Despite many clinical decision support systems (CDSSs) being rated as highly usable, CDSSs have not been widely adopted in clinical practice. We posit that there are factors aside from usability that impact adoption of CDSSs; in particular we are interested in the role played by MDs intrinsic motivation to use computer-based support. Our research aim is to investigate the relationship between usability and intrinsic motivation in order to learn about adoption of CDSS in clinical practice.

Methods: Following the evaluation of a CDSS, 19 MDs completed a 2 part questionnaire about their intrinsic motivation to use computer-based support in general and the usability of the evaluated CDSS.

Results: The analysis of MDs motivation to use computer-based support demonstrated that MDs are comfortable using computer-based support and in general find using it quite easy (a motivation rating of 0.66 on a (0, 1) scale was computed). However MDs also reported a perceived lack of competence associated with a lack of prior experience using technology in practice, which results in pressure and tension. The considered CDSS scored highly on all usability dimensions and a usability rating of 0.74 was recorded. The examination of the relationship between motivation and usability suggested that users who were motivated to use computer-based support experienced better usability than those who reported low levels of motivation.

Conclusions: Our small case study suggests that an important factor supplementing the usability of CDSSs is intrinsic motivation to use computer-based support in general. We posit that the lack

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of such a measure thus far in CDSS evaluation may to some extent explain seeming MD satisfaction with CDSSs on one hand, but their limited adoption on the other. We recommend that clinical managers responsible for deploying CDSS should invest in training MDs to use technology underlying computer-based support applications instead of focusing only on the features of the specific CDSS to be deployed.

Introduction

CDSSs have been defined as "systems that apply knowledge to patient data in order to generate patient-specific advice" [1]. Despite the fact that CDSSs have been shown to improve MDs performance [2], reduce prescription errors [3], and improve adherence with recommended standards of care [4], actual use of CDSSs in practice is still relatively limited [5]. Research on the adoption of technology in general has established that usability is an important factor [6–10], and studies on the adoption of CDSSs have largely focused on usability issues where the ISO 9241-11 standard defines usability as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" [11]. Evaluation of CDSS usability is often guided by Bates et al.'s "Ten Commandments" for effective clinical decision support [12], which put forward features such as speed, delivering information in real-time and seamless integration with workflow as critical success factors for usable and acceptable systems. Others have examined usability factors specific to the clinical environment that hinder acceptance of CDSSs and major impediments include discomfort in patient–doctor communication, lack of time to use CDSSs, a lack of evidence in guiding decisions, a lack of user control, disruptiveness, poor fit with workflow and decreased support for face-to-face dialog when using technology at the point-of-care [5,13,14].

Studies on technology adoption outside the clinical domain report that user attitudes are an important success factor. The Theory of Reasoned Action (TRA) posits that behavior is predicted by a person's attitude [15]. Davis [6] adapted the TRA in the development of the Technology Acceptance Model (TAM), which has gained widespread acceptance within the information systems research community and has been applied in the evaluation of CDSSs [16–19]. A key criticism of TAM and its successor TAM2 has been the lack of a factor addressing user motivation. In order to address this shortcoming, Venkatesh et al. [20], formulated a unified model, the Unified Theory of Acceptance and Use of Technology which brings together a motivational model of user acceptance with the TAM. However, the model focuses on extrinsic motivational drivers while ignoring an individual's intrinsic feelings towards information system usage [21]. Extrinsic motivation is external to the individual and includes measures such as rewards and incentives [22] whereas intrinsic motivation refers to an individual's likelihood to engage in activities for the inherent satisfaction the person derives from the activity [23]. According to self-determination theory, intrinsic motivation is the core type of motivation driving participation in many types of activities including those involving computer-based tools [24].

The literature cites many attempts to measure intrinsic motivation. Webster and Martocchio [25] conceptualized intrinsic motivation as "computer playfulness" and a game context was introduced to computer-based training to make the task more intrinsically motivating. Their scale has been used to examine the role of intrinsic motivation in using decision support for real estate, property management, and financial services [6,26,27]. The Intrinsic Motivation Inventory (IMI) [28] is a theory that assesses intrinsic motivation in terms of participants' interest and enjoyment, perceived competence, effort, value and usefulness, felt pressure and tension, perceived choice, and relatedness to others while performing a target activity. Studies using the IMI have assessed subjects' intrinsic motivation to perform a wide range to tasks from computing [29] to participation in sports [30].

Motivation is commonly considered a necessary construct in encouraging workers to move away from their normal work practices and towards improved technology adoption. For example, Malhorta and Galletta [31] found that users with higher intrinsic motivation for the end goals of a computer system tend to make a greater effort to master the system. The authors concluded that "even the best-designed systems are not used if they are not aligned with users' intrinsic motivations". Interestingly they point out that poor understanding about motivation could lead to an overemphasis on schemes for fostering extrinsic motivation such as incentives (which are commonly used to encourage CDSS adoption) and that such incentives may actually be detrimental as users can perceive them as controlling.

Based on evidence from other domains, we posit that a better understanding of MDs attitudes towards CDSSs, in particular the factors that intrinsically motivate them to use such systems could lead to improved levels of usability and thus adoption. To this end we describe the results of a case study where MDs used a CDSS in the Emergency Department (ED) for a period of 12 months. We use these results to examine the relationship between usability and motivation in order to learn about adoption of CDSS in clinical practice. The remainder of this paper is organized as follows. In the methods section we include a description of the evaluation of a CDSS for estimating asthma exacerbation severity. In the results section we present an analysis of responses from questionnaires administered after the evaluation of the CDSS. We conclude with insights gained into MDs motivation to use computer-based support, and provide some recommendations for improved adoption of CDSSs.