Information Accountability and Usability: Are There Any Connections?

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Abstract. Availability of health information is rapidly increasing and the expansion and proliferation of health information is inevitable. The Electronic Healthcare Record, Electronic Medical Record and Personal Health Record are at the core of this trend and are required for appropriate and practicable exchange and sharing of health information. However, it is becoming increasingly recognized that it is essential to preserve patient privacy and information security when utilising sensitive information for clinical, management and administrative processes. Furthermore, the usability of emerging healthcare applications is also becoming a growing concern. This paper proposes a novel approach for integrating consideration of information accountability with a perspective from usability engineering that can be applied when developing healthcare information technology applications. A social networking user case in the healthcare information exchange will be presented in the context of our approach.

Keywords. Information Accountability, Usability Testing, Healthcare Information Technology (HIT), Health Informatics, Information Governance, Electronic Healthcare Record (EHR), Electronic Medical Record (EMR)

Introduction

The creation of health information silos, and the generation of thousands of Electronic Healthcare Record (EHR), Electronic Medical Record (EMR) and Personal Health Record (PHR) systems around the globe are seemingly unstoppable. Furthermore, the explosion of information sharing using public social networking and related links is accelerating in an ever-increasing rate. Recent statistics show that around 3.7 billion people around the globe are using the Internet [1] (this is >50% of world population), while 40 billion photos are deposited [2] in Facebook. An important aspect of capturing the positive impact of such developments is to integrate those social activities with health information exchange (HIE), a powerful tool [3] yet to be realised fully. Health information sharing in a general context is not new, however, in the digital world, this increasing social interaction demands further scrutiny for several reasons. Health information sharing in clinical settings [4] is timely, and supporting informed qualitative clinical decision-making processes in digital medicine is needed.

Research evidence shows that Healthcare Information Technology (HIT) can make a positive impact on reducing healthcare costs, for example real-time remote diagnostics and health monitoring (e.g., telemedicine) by using smart mobile devices

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and Internet technologies. Although HIT is becoming part of the critical infrastructure for improved digital health scenarios, the evolving process of adoption and use is slow among practitioners and patients, with both groups indicating concerns about information security and privacy. One of the key inhibitors is patient liability when using HIT for medical and health related decision-making processes, whilst another main barrier is physician dissatisfaction with these systems. This dissatisfaction is often related to time commitments for unfamiliar and sometimes unreliable (e.g., the technology not being user friendly) computer applications and the time taken to learn such new processes, protocols and how to use new information systems. Furthermore, adoption of HIT leads to demands for social value, like user acceptability where there are compelling reasons why the system must be used. However, a number of issues continue to arise, including cost factors (e.g., time commitments, potential loss of productivity and efficiencies of using the system) and poor levels of usability (e.g., user friendliness), which have been cited as being some of the biggest obstacles [5]. These factors often do not receive enough consideration when HIT applications are developed and integrated with healthcare systems that aim to improve the healthcare processes in long run. This is predicted to change as physicians and medical practitioners become more comfortable with computers and web-based healthcare offerings and in conjunction with telemedicine vendors devising more convenient technology and helpful applications. However, in order to support these endeavours, it is important and timely to evaluate factors such as HIT usability and information accountability when developing healthcare applications, which will form the focus of this paper.

1. Information Accountability

Information accountability focuses on the concept of monitoring use of personal information and holding the users of that information accountable if that information is misused [6][7]. Information accountability is not a new concept but rather this phenomenon had been used for other systems like accounting and financial systems for a longer time. Information accountability in the digital healthcare paradigm is bedrock for effective clinical governance and a catalyst for healthcare information technology [7]. In general, accountability for processes can form a good building block for further work, such as measuring actual outcomes of care [6] [7].

2. Usability

Broadly speaking, usability can be defined as a measure of ease of use and usefulness of an information system in terms of its: (1) effectiveness, (2) efficiency, (3) enjoyability, (4) learnability, and (5) safety [8]. These attributes or dimensions of usability are useful in focusing attention on key aspects of the use of systems in the design and evaluation of health information systems. For example, to lead to uptake and adoption by end users, health information systems need to both effective and efficient. Learnability is also essential, as is safety in order to ensure that information systems in healthcare do not inadvertently cause users to make medical errors. Furthermore, systems must be satisfying for end users. Poor usability has been cited as being one of the main reasons for lack of end user adoption of systems and health professional dissatisfaction with HIT [9]. To ensure that systems are usable, a variety
of methods from the field of usability engineering have been applied to HIT and continual evaluation of the usability of systems under development has been recommended through iterative cycles of design and testing [9].

3. What is the connection between Information Accountability and Usability Testing?

Both information accountability and usability have a number of similarities when considered in comparison. Firstly, both can be considered as being key requirements for development of effective HIT. Along these lines, both can be considered as being “non-functional requirements”, i.e. critical requirements that need to be considered for system success that are neither functional requirements nor technical requirements [10]. In order to lead to improved chances of HIT success and adoption, information accountability and the key aspects of usability (i.e. system effectiveness, efficiency, learnability and safety) need to be considered. Furthermore, both high levels of information accountability and good usability can be considered as being “soft goals” to be achieved through successive planning and iterative analysis [10]. Both are ultimately required to lead to uptake and adoption of HIT by both patients and health professionals. In this regard, methods for usability testing that focus on user experience can be expanded to include consideration of user perceptions, comments and thoughts about the accountability of information contained in health information systems they are interacting with during usability testing.

4. Healthcare Information Technology, Information Accountability and Usability Testing

In considering the broad definition of usability given above, it is argued in this paper that adding information accountability to the list of attributes/dimensions of the concept of “usability” could practically lead to improved systems and consequently more effective user adoption of HIT. From a practical point of view, studies can be designed to assess the following from the perspective of end users interacting with HIT: (1) effectiveness, (2) efficiency, (3) enjoyability, (4) learnability, (5) safety, and (6) information accountability (this non-functional requirement is a critical consideration for HIT applications that adequately protect information privacy and security). This will be essential as systems that have been deemed to have met requirements of the first 5 attributes above may still not be accepted by end users without explicit consideration of making information accountable to all classes of end users. Nowhere is this more important than in designing systems intended for end users who are patients or citizens, as described in the next section.

5. Use cases and Scenarios

Our preliminary experiences to date in integrating the concept of information accountability with usability have involved planning for evaluation of PHRs and social media. Issues related to both usability (as it has been described above [8]) merged with
a perspective from information accountability are being explored [7]. In terms of modeling system requirements for PHRs, we are working on including information accountability as an essential non-functional requirement (along with the other “classic” usability dimensions discussed above).

The approach we are working on is more towards a patient, public partnership (depicted in the use case scenario in Figure 1) by identifying partner participations as social interactions. Figure 1 depicts a general use case for the public with several social networking accounts. The approach is to develop protocols to integrate them all within one profile (e.g., MPM: Multiple Profile Manager) when using health information sharing and exchange (e.g., HIE). This scenario is already active without public knowledge of information sharing in the digital world (e.g., sharing through interconnected EHRs, EMRs, and PHRs). While, this social interaction is value added to health information exchange (HIE), without considering appropriate information accountability (e.g., authentication, authorization and synchronization) and without applying usability testing to obtain user input and perceptions about accountability, the acceptance of such HIT applications (e.g., the Multiple Profile Manager, MPM [11-13]) and the sustainability of the approach will be jeopardized.

![Figure 1: User Case scenario in a multiple social networking set-ups [12][13]](image)

Along these lines, we are also including assessment of the end user’s perceptions about needs for information accountability within the design of upcoming usability testing of several PHRs being implemented in Canada and in Australia.

6. Discussion

Healthcare is an information intensive, complex, large-scale, adaptive, distributed and evolving system [14]. With advancement of technologies in particular information and
communication technologies (ICT), digitalization of healthcare processes and protocols are developing in an alarming rate. While this advancement represents positive growth for the digital economy, information privacy and security are still open ended questions and there is a long way to go to for assessing end users needs. A simple approach would be to empower the patient with usability and information accountability protocols where patient become a partner in the healthcare decision making processes as well as HIE processes. This attempt might be debatable for some clinical settings however establishment of practicable usability testing and implementation of active and accurate information accountability protocols would help the sustainability of HIT and thereby lead to a reduction in mounting healthcare costs.

We have proposed a novel approach to consideration of HIT and HIE where there is integration of usability analysis with analysis of information accountability needs, with both being considered as essential non-functional requirements for patient centric HIT applications that must not be ignored. Further studies assessing end users’ perception and the need for information accountability are being planned within the design of upcoming usability testing of several PHRs.

References