**Electronic Health Records: Will Privacy Concerns Hinder Adoption?**

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Electronic health records (EHR) constitute a significant technological advance in the way medical information is stored, communicated and processed by the multiple parties involved in the delivery of health care. Although they offer the potential to dramatically transform the health care system and mitigate problems related to patient safety, quality of care and continuity of care, there is widespread concern that privacy issues may impede the diffusion of this technology.

We define EHR systems as the software platforms that physician offices and hospitals use to create, store, update and maintain EHRs for patients. This distinction is subtle but important due to the fact that these terms are often used interchangeably. Our interest is in the use of EHR systems by health providers, and how patients react to the fact that their EHR is stored in these systems and can be made available via Internet connections.

We conducted experimental research to understand (1) whether individuals are concerned about the privacy of their health information when it is digitized, (2) how this concern influences their attitudes toward the use of an EHR, and (3) how they can be persuaded to change their attitudes toward EHRs in the presence of privacy concerns. In this recent study, we found that while concerns about privacy related to the use of electronic health record systems can be significant, people can be persuaded to accept their use if exposed to strong, value-based arguments.

**The Concept of Privacy**

Although the practitioner literature surrounding the adoption of EHRs is growing, no study has examined a key component of the adoption equation—what happens if health systems and providers adopt EHR systems, but patients refuse to allow their medical information to be digitized?

With the advent of the Health Insurance Portability and Accountability Act (HIPAA), privacy and security of health information has been elevated to the forefront of medical informatics research. Much evidence suggests that privacy and security of health information is of focal concern for individuals. Recent years have witnessed increased media coverage of privacy issues, including several high-profile cases of data theft from large corporations such as CitiFinancial and CardSystems who collectively lost or exposed the sensitive financial information of more than 40 million customers.

Researchers have debated the conceptualization of privacy as a social and/or psychological construct. In this study, we do not use the term “privacy” to assume any legal or constitutional concept. Instead, we view information privacy as a belief that is malleable to internal and external stimuli.

**Influencing Attitudes About EHRs**

In the psychology literature, the Elaboration Likelihood Model (ELM) provides a theoretical perspective on how attitude can be modified. We integrate the Concern for Information Privacy (CFIP) construct into ELM to examine attitude persuasion regarding the use of EHRs in health systems when concerns about privacy of information are present in patients.

When a message is presented to various individuals in different contexts, the recipients will vary in how much cognitive energy they devote to the message. In some situations, message content will be read, cognitively processed and given consideration by one recipient, while another may ignore the message content altogether. The two factors that must be present in a recipient for elaboration to occur are ability and motivation. Not surprisingly, variations in cognitive elaboration affect the success of the message’s influence. The ELM suggests that when elaboration is high, the recipient is experiencing a central route of persuasion, but when elaboration is low, a peripheral route is present. In the latter route, influence typically acts through very simple decision criteria and cues such as celebrity endorsements, charisma, or the attractiveness of the sender. Individuals use these cues either because they do not want to devote the necessary cognitive energy to elaboration or they are unable to expend the effort.
Several factors such as Argument Quality (AQ) and Issue Involvement (II) have been shown to affect the amount of influence a given message has on the recipient. Argument Quality refers to an individual’s perception that a message’s arguments are strong and cogent as opposed to weak and specious. Issue Involvement has been defined as the extent to which recipients perceive that a message topic is personally important or relevant. Prior research suggests that under conditions of high elaboration likelihood, AQ is the critical determinant. In other words, the content of the informational messages that individuals are exposed to has a strong influence on how much cognitive elaboration and subsequent attitude change occurs.

**Concern for Information Privacy**
The CFIP variable was developed to measure attitudes and beliefs about individual information privacy related to use of personal information in a business setting. It includes four distinct, yet correlated factors, labeled Collection, Errors, Unauthorized Access and Secondary Use; and an additional set of secondary factors.

**Research Framework**
The overall research model tested in our study, as shown in Figure 1 below, incorporates the CFIP construct and positions it within an ELM framework. The key outcome of interest is Attitude Change (AC). We examined three variables that influence AC: argument quality, issue involvement and the interaction between the two.

![Figure 1. Research Model](image)

**Attitude Change**
An attitude has been defined as a “complex mental state involving beliefs, feelings, values, and dispositions to act in certain ways,” and “positive or negative views of an ‘attitude object’: a person, behavior, or event.” Attitudes are important because much evidence suggest that they have a key influence on actual behavior. Research has also shown that attitude towards using a system such as an EHR is more predictive of behavior than attitude towards the technology artifact itself.

No work we are aware of, aside from descriptive opinion-poll surveys, has empirically investigated the privacy concerns associated with using EHRs. As a first step to addressing this gap, we hypothesized and empirically studied the existence of a moderating effect of CFIP between the AQxII interaction and AC.

**The Experiment**
We tested the research framework using an experimental methodology. We compared two purposively selected groups (involvement: high/low) and two argument qualities (neutral/strong), and individuals were assessed on a third variable – CFIP (low/high).

High involvement subjects were identified through participation in a health information technology (HIT) stakeholder conference. To ensure that the subjects were involved in health information technology issues and knowledgeable about EHRs, we classified individuals as high involvement only if any one of the following conditions was met: 1) the respondent currently uses an EHR in a health setting, 2) the respondent works in the health care industry, and 3) the respondent has good or excellent knowledge of EHRs. The “general” or low-involvement group of subjects was a pseudo-random sample of people who opted-in to an online survey sample list provided by Zoomerang™. The final sample consisted of 366 subjects (102 high-involvement, 264 low-involvement). Both high and low involvement subjects were then randomly assigned to the strong or neutral argument quality condition. Descriptive data about the sample is provided below.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>46.1</td>
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<tr>
<td>PC experience (Years)</td>
<td>13.0</td>
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<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>128</td>
</tr>
<tr>
<td>Female</td>
<td>237</td>
</tr>
<tr>
<td>Chronic Illness</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>225</td>
</tr>
<tr>
<td>Yes</td>
<td>141</td>
</tr>
</tbody>
</table>

Subjects completed a set of questions related to their concern for information privacy measured using a modified scale originally developed by Smith, Milberg and Burke. We made minor changes to their instrument to reflect privacy concerns relative to health data instead of corporate data by replacing the word corporations with health care entities – defined as “any and all parties involved in the health care process, such as doctors, hospitals, clinics, health insurance providers, payers, pharmacies, etc.”
Subjects answered a set of questions to measure their pre-manipulation attitude toward the use of EHRs. After assessing subjects’ initial attitudes towards EHRs, we exposed them to either strong or neutral argument quality messages and subsequently measured their post manipulation attitude. Subjects also provided general health and demographic data.

The Messages
Strong argument quality messages typically included a statistical link between electronic health record usage, error reduction, and/or decreases in deaths attributed to medical errors. All messages were true and the literature from which the message was taken was cited. The messages selected as neutral arguments were entirely fabricated, typically anecdotal, lacking any statistical validations, and the source, if identified, was anonymous. Examples of the two types of messages follow:

**Strong Argument Quality**
1. Rates of serious errors fell by 55 percent in one study by using computerized medical system (Partners HealthCare System, Brigham and Women's Hospital – Bates, Leape, et al., 1998).
2. Implementing a computerized record system in an urban or suburban hospital could save 60,000 lives, prevent 500,000 serious medication errors, and save $9.7 billion each year (Leapfrog Group, 2004).

**Neutral Argument Quality**
1. "Electronic health records are the wave of the future," (anonymous user).
2. Most students say they would like to use electronic health records to maintain their health information (Yahoo! weblog, 2003)

Analysis and Results
We used structural equations modeling to identify significant relationships among the variables as depicted in Figure 1. In an effort to control for differences in sample size, we divided the sample into two levels of CFIP. We categorized the highest 25 percent as privacy fundamentalists and the lowest 20 percent as privacy unconcerned based on their aggregate scores on CFIP. Using this dichotomized sub-group approach, we tested for the moderating effect of CFIP. Our results showed that strong AQ messages elicited greater attitude change than neutral messages (see Figure 2). We then tested the effect of involvement on attitude change while controlling for gender and found that AC was greater in high involvement individuals. Therefore our hypothesis that AQ will affect AC across both high and low issue involvement groups is supported.

![Figure 2. Interactive Effect of II and AQ on AC](image)

Note: AC scores represent the difference between pre- and post-manipulation beliefs about the use of EHR systems. The attitudes were measured on three seven-point semantic differential scales anchored at 1 and 7 (Bad-Good, Foolish-Wise, Unimportant-Important).

**Key Findings**
Consistent with prior research, we find that people’s attitudes can be modified in a favorable way. In addition, a striking finding of this study is that the relationship between privacy concerns, AQ, and II is highly complex. This three-way interaction between information privacy concerns, argument quality and issue involvement in influencing attitudes merits further investigation.

Our results also add to a growing body of literature in support of the concept that CFIP is an important construct in belief structures of individuals as they relate to the institutional use of personal information. Equally important, this result provides evidence that privacy concerns are important issues to consider as related to beliefs about the use of EHRs. To the extent that people believe their medical information is vulnerable when input into an EHR, it is imperative that assurances about security and value are communicated to the individual, since people with high privacy concerns are more difficult to persuade. Another important finding was that anecdotal messages are very poorly received by people who are more knowledgeable and involved in the use of EHRs and therefore these types of messages should not be used as educational tools.

Results also show that in addition to having more favorable pre-manipulation attitudes toward the use of EHRs, high issue involvement individuals demonstrated a statistically significant increase in pre-to-post attitude over low issue involvement individuals, especially when strong messages were presented. Simply put, it is easier to persuade individuals who are involved in the HIT discourse in some manner related to the value of EHRs, than it is to persuade low II individuals. This may be due to a lack of understanding, or perhaps a
misunderstanding, of the uses of EHRs by low II respondents. It may be the case that the uninformed are unnecessarily concerned about functions and features of EHRs, which may or may not exist. For example, evidence from this study also revealed that respondents had great concern about their employer finding out about personal medical information if their data were located in an electronic, Internet-accessible database.

Relative to privacy concerns, we found that most respondents, even those with above average concerns for privacy, reacted positively to strong messages. This provides some evidence that privacy, while a salient barrier, is not enough to halt the acceptance of EHRs.

Conclusion

The broad objective of this work was to examine the influence that privacy concerns have on people’s attitudes towards an emerging technology that holds great potential for transforming the way health care is managed and delivered but is not yet well understood or broadly utilized. While information systems researchers have made substantial progress in examining behavioral aspects associated with technology adoption, very little of this work has been integrated into the practice of health care.

As discussed, there is cause for concern that privacy issues may impede the diffusion of an information technology that has been demonstrated to reduce errors and decrease costs. We explored whether people’s attitudes about the use of EHRs were malleable, and if appropriately crafted messages would create more positive attitudes.

There are very strong, visceral feelings about this type of highly personal data and it behooves researchers to examine the barriers to IT adoption in the presence of such concerns. We also believe that concern for privacy of all types of personal information will become increasingly important in the near future as more and more information is digitized. Thus, information privacy should be examined in multiple contexts and domains. The national media exposes breaches in private digital information on a regular basis and it is becoming apparent that diverging views are emerging in the population. It is evident that a “privacy calculus” is emerging such that people will assess the risks of a breach of privacy versus the benefits of having personal information in a digital format which could be useful in specific situations.

The dissemination of strong AQ messages about the value and safety of EHRs will yield increased positive attitude change towards the use of EHRs by both individuals with health industry involvement and those with no prior industry affiliation across CFIP thresholds. Thus, an educational and public information program designed to demonstrate the benefits of EHR use can improve the uptake of the EHR technology.

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For more information about this research study or to request the complete working paper, please send an email to cangst@rhsmith.umd.edu.