

## ADOPTION OF ELECTRONIC HEALTH RECORDS IN THE PRESENCE OF PRIVACY CONCERNS: THE ELABORATION LIKELIHOOD MODEL AND INDIVIDUAL PERSUASION<sup>1</sup>

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### Abstract

*Within the emerging context of the digitization of health care, electronic health records (EHRs) constitute a significant technological advance in the way medical information is stored, communicated, and processed by the multiple parties involved in health care delivery. However, in spite of the anticipated value potential of this technology, there is widespread concern that consumer privacy issues may impede its diffusion. In this study, we pose the question: Can individuals be persuaded to change their attitudes and opt-in behavioral intentions toward EHRs, and allow their medical information to be*

*digitized even in the presence of significant privacy concerns? To investigate this question, we integrate an individual's concern for information privacy (CFIP) with the elaboration likelihood model (ELM) to examine attitude change and likelihood of opting-in to an EHR system. We theorize that issue involvement and argument framing interact to influence attitude change, and that concern for information privacy further moderates the effects of these variables. We also propose that likelihood of adoption is driven by concern for information privacy and attitude. We test our predictions using an experiment with 366 subjects where we manipulate the framing of the arguments supporting EHRs. We find that an individual's CFIP interacts with argument framing and issue involvement to affect attitudes toward the use of EHRs. In addition, results suggest that attitude toward EHR use and CFIP directly influence opt-in behavioral intentions. An important finding for both theory and practice is that even when people have high concerns for privacy, their attitudes can be positively altered with appropriate message framing. These results as well as other theoretical and practical implications are discussed.*

**Keywords:** Privacy, elaboration likelihood model, ELM, electronic health records, EHR, concern for information privacy, CFIP, attitude

### Introduction

*All that may come to my knowledge in the exercise of my profession or in daily commerce with men, which ought not to be spread abroad, I will keep secret and will never reveal.*

– The Hippocratic Oath, 4<sup>th</sup> Century BC

<sup>1</sup>Detmar Straub was the accepting senior editor for this paper. Rajiv Kohli served as the associate editor.

In today's increasingly digital and networked society, as the volume of personal information captured in electronic databases continues to grow at exponential rates (Edmonds et al. 2004), the concept of privacy has been elevated to the forefront of public discourse. Widely publicized compromises of personal information<sup>2</sup> are fueling a heated debate on how much information about oneself should be made available to others, and the extent to which this information can be used by various entities such as the government and private corporations. Indeed, recent research underscores the significance of privacy concerns when the Internet is used as a medium for transferring information (Dinev and Hart 2006; Hui et al. 2007; Malhotra et al. 2004), when information is gathered and used in an organizational context (Smith et al. 1996; Stewart and Segars 2002), and how individuals respond to threats to electronic privacy (Son and Kim 2008).

The focus of this paper is on an important and arguably controversial technological innovation: electronic health records (EHRs) that capture patient information in digital format and potentially make this information available in an identified way to those who have permission to access it and to others, in a de-identified, aggregated format. From a legal perspective, the Health Insurance Portability and Accountability Act of 1996 (HIPAA) states that the information in an EHR about a patient is actually owned by the practitioner collecting the information and/or the insurance payor covering the patient, yet the patient has the unconditional right to be informed of the data-handling practices of medical practitioners and providers.<sup>3</sup> It is only recently that hospitals, health systems, and insurance payors have begun to offer patients access to their personal EHR (sometimes termed a PHR or personal health record) through secure Internet connections, but oftentimes this access is limited to a single institution.

Although EHRs offer the potential to radically transform the health care system, 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 because of privacy concerns (Kauffman 2006)? National surveys indicate that the public is particularly anxious about privacy in the context of health related issues: a recent report by the California HealthCare Foundation found that 67 percent of the national

respondents felt "somewhat" or "very concerned" about the privacy of their personal medical records (Bishop et al. 2005). U.S. Senators Frist and Clinton (2004) reinforced this point when they observed, "[patients] need...information, including access to their own health records....At the same time, we must ensure the privacy of the systems, or they will undermine the trust they are designed to create."

In the past decade, recognizing that the health care sector is in need of radical transformation, national and international momentum around the application of information technology in health care has grown considerably. In the United States, significant investments in EHR systems are being propelled by support from the highest levels of the federal government (Bush 2004) as the EHR is viewed by many as the foundation for a safer and more efficient healthcare system. In an attempt to connect every doctor and hospital in the country, the National Health Service in the United Kingdom is bearing the cost of providing electronic health records to every citizen (Becker 2004). A general assumption underlying this momentum is that EHRs will have a positive impact on persistent problems with the delivery of health care such as medical errors and high administrative costs (Bates and Gawande 2003; Becker 2004). However, there are many examples of information technologies that are promising but fail to diffuse widely because of resistance to use from key stakeholders. To the extent that the value potential of these technologies will not be realized in the face of such resistance, from a public policy perspective, this is a matter of significant concern.

Under the assumption that the adoption of EHRs is desirable, in this study we pose the question: Can individuals be persuaded to change their attitudes and adoption decisions toward electronic health records in the presence of significant privacy concerns associated with use? That is, if people are provided with positively framed messages about the value of EHRs, will they allow their doctors to "digitize" their medical information such that it could be made available to others in an electronic format? The individual patient or consumer is the central focus of our study; we do not investigate the adoption decision of the hospital or providers. There is an extensive and robust literature examining the behavioral aspects of technology adoption and usage, drawing upon multiple theoretical perspectives such as the technology acceptance model, theory of reasoned action, and diffusion of innovation (e.g., Agarwal and Prasad 1998; Davis 1989; Fishbein and Ajzen 1975; Rogers 1995; Venkatesh et al. 2003). With a few exceptions (e.g., Bhattacharjee and Sanford 2006), much of this research assumes implicitly that the respondent has developed a well-formed attitude toward the target technology, and there is typically limited discussion of the fact that the

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<sup>2</sup>See "Latest Information on Veterans Affairs Data Security," <http://www.usa.gov/veteransinfo.shtml>; "Chronology of Data Breaches," <http://www.privacyrights.org/ar/ChronDataBreaches.htm#CP>; and "Group Health Investigating Missing Laptops, 31,000 Identities at Risk," <http://www.komonews.com/news/6681342.html>.

<sup>3</sup>"Health Insurance Portability and Accountability Act of 1996," <http://www.cms.hhs.gov/HIPAAgenInfo/Downloads/HIPAALaw.pdf>.

individual could be persuaded to change this attitude. While some work has examined pre and post-adoption behavior (Karahanna et al. 1999), this research does not tap directly into how to persuade a person to change his or her opinion or into the influence process itself (Sussman and Siegal 2003).

In the psychology literature, the elaboration likelihood model (ELM) provides a theoretical perspective on how attitudes evolve and change over time. To examine the effects of privacy concerns on the modification of attitudes, we integrate concern for information privacy (CFIP) into the ELM. Drawing upon the attitude persuasion literature, we suggest that individuals can be persuaded to support the use of EHRs, even in the presence of significant privacy concerns, if appropriate messages about the value and safety of EHR systems are imparted to them. We report findings from an experiment in which subjects are assigned to two different manipulations (positively framed and neutrally framed arguments) to assess the impact of CFIP on the relationship between these variables, attitude, and likelihood of adoption. We use structural equations modeling to empirically test our predictions with a sample of 366 subjects.

The research reported here makes several contributions to both research and practice. From a theoretical perspective, it extends the ELM to include an important moderating construct affecting persuasion and intentions in the context of the digitization of information which has not been examined in prior literature, viz., CFIP. The moderating effect of CFIP theorized, and empirically examined here, may be useful in other contexts in which personal information is controlled or processed. Second, we propose that attitudes toward the use of certain technologies are malleable in response to some forms of persuasion, and test this assertion empirically. As noted, with few exceptions, prior research has implicitly suggested that the attitudes of potential adopters of technology are relatively immutable. In contrast, extending the work of Bhattacharjee and Sanford (2006), we posit that people can be persuaded even *before* they use a technology if value-based arguments resonate with them.<sup>4</sup> This finding is likely to be applicable to any information technology that might result in significant informational disparities between adopters and non-adopters. Third, this paper focuses on EHRs, which are a new and important technology with consequential impacts for the way in which health care is managed by consumers and providers. Given the sensitive and personal nature of one's health information, we also argue that the investigation of privacy of healthcare data offers unique insights into behaviors not found when examining other types

of data privacy and security. Finally, the findings from this study offer pragmatic insights that can be used to drive public policy decisions related to public perceptions and attitudes toward the use of EHRs, including the crafting of national messages and education.

## Theoretical Background

Two major streams of literature provide the theoretical foundations for this study. The literature on attitude change, where the ELM is described, offers a conceptual lens for investigating attitude and persuasion. The literature on information privacy discusses issues surrounding the digitization of personal information and describes the concept of concern for information privacy. We briefly review the relevant literatures and summarize key findings from each. We also describe the focal technology—EHRs—in greater detail.

### Elaboration Likelihood Model

The ELM (Petty and Cacioppo 1981, 1986) is one of two, dual-process theories of attitude formation and change arguing that persuasion can act via a central or peripheral route and that personal attributes determine the relative effectiveness of these processes. The second theory, the heuristic-systematic model (Chaiken 1980, 1987) is similar—and some would argue complementary (Eagly and Chaiken 1993, p. 346)—to the ELM, with two notable exceptions. First, the empirical literature supporting the validity of HSM is limited. Second, the HSM assumes that heuristic processing can jointly act with systematic processing, thus, in the terms of ELM, persuasion can act both through a central and peripheral route simultaneously (Eagly and Chaiken 1993). In both theories, attitudes are viewed as being formed and modified as recipients obtain and process information about attitude objects (Eagly and Chaiken 1993, p. 257). Given the substantial empirical support for the predictive and explanatory power of ELM in a variety of behavioral domains, we restrict our focus to the ELM.

The ELM offers a theoretical explanation for observed differences in the amount of *influence* accepted by recipients exposed to new information. In simple terms, when a message is presented to individuals in different contexts, the recipients will vary in how much cognitive energy they devote to the message (Petty and Cacioppo 1986). These variations in cognitive elaboration, *ceteris paribus*, affect the success of the message's influence. Influence results in the formation of new cognitions as well in the modification of prior beliefs and

<sup>4</sup>We thank an anonymous reviewer for this insight.

attitudes (Petty and Wegener 1999). The underlying elaboration process entails generating one's own thoughts in response to the information to which one is exposed (Tam and Ho 2005). In some situations message content will be read, cognitively processed, and given consideration, while in others, message content may be ignored altogether. Such differences may be due in part to a recipient's knowledge of learning content, structure, and processes (Chaiken and Eagly 1976; Sussman and Siegal 2003) or a recipient's ability and/or motivation (Petty and Cacioppo 1986, p. 6).

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 (Petty and Cacioppo 1986). In the latter situation, 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 (Petty and Cacioppo 1986). It has also been suggested that nonexperts rely less on argument framing and instead focus on what have traditionally been known as peripheral cues<sup>5</sup> such as the credibility of the source (Lord et al. 1995; Petty et al. 1981a).

As noted earlier, there is an extensive empirical literature testing variations of the ELM. Although a detailed review of this work is beyond the scope of this paper, in Table 1 we summarize the major studies from this literature and highlight the key covariates and interactions that have been tested. Two broad conclusions can be drawn from this review. First, prior research has examined two major classes of persuasion determinants: those reflecting some aspect of the *message* such as argument quality, message length, and source credibility, and those capturing various aspects of the *message recipient*, such as issue involvement, motivation, personal relevance, and prior expertise. Second, it is also important to note that several variables have been operationalized as acting through a central or peripheral route depending upon the study context, including issue involvement and argument quality. Consistent with this literature, as will be discussed, we focus on the characteristics of the message (conceptualized as argument framing) as well as characteristics of the recipient (conceptualized as issue involvement). However,

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<sup>5</sup>Petty and Wegener (1999) argue that it is the degree of elaboration, not the variable itself (e.g., source credibility, attractiveness of source, etc.), that determines the route of persuasion. For example, source credibility, which is often characterized as a peripheral route variable, may engender significant elaboration (resulting in a central route) in a context such as a presidential debate in which one is assessing the candidates "credibility" not only with respect to the current comment but also on past responses and actions by the candidate.

we do not seek to identify which route of persuasion is salient within individuals in this particular context. Rather, we use empirical evidence from the ELM literature supporting the differential influence of messages to generate variation in persuasion.

## Privacy

Allen (1988) describes privacy as an elastic concept, suggesting that it has little shared meaning amongst individuals. Even privacy scholars acknowledge that the construct has not taken on a common meaning as it applies to research (Margulis 1977). The term *privacy* typically is assumed to connote something positive (Warren and Laslett 1977), and the topic is most often researched in the context of how to protect or preserve it (Margulis 2003). With respect to personal medical information, the privacy debate has escalated considerably. With the advent of the Health Insurance Portability and Accountability Act (HIPAA) and increased awareness about personal information breaches, privacy and security of health information has been elevated to the forefront of medical informatics research (Bodenheimer and Grumbach 2003; Cantor 2001; Harris Interactive and Westin 2001, 2002; Masys et al. 2002; Shortliffe 1999; Westin 2003).

Researchers have debated the conceptualization of privacy as a social and/or psychological construct (for a review, see Margulis 2003). Much of today's privacy research relies on the work of Altman (1975) and Westin (1967). Altman examines privacy in the context of how people regulate access to themselves, while Westin focuses on the types and functions of privacy. More recent research (Culnan 1993; Smith et al. 1996; Stewart and Segars 2002) explores concern for *information* privacy as reflecting the extent to which individuals are disturbed about the information collection practices of others and how the acquired information will be used. In this study, we do not use the term privacy to assume any legal or constitutional concept (Allen 1988; Margulis 2003; McWhirter 1994), but rather conceptualize information privacy as a belief that is malleable in response to internal and external stimuli (Altman 1975; Westin 1967).

The implications of using EHRs to manage patient care and the privacy concerns that will surface as a result of such use have been noted in the health informatics literature (Alpert 1998, 2003; Naser and Alpert 1999). As EHRs become more technologically advanced and the challenges of interoperability across facilities are addressed, it is inevitable that issues related to exchanging data across the Internet will become more salient. Indeed, national surveys indicate that people's concerns about information privacy are shifting as

the Internet diffuses. In 1995, when Harris Interactive and Westin began categorizing people into clusters based on their privacy beliefs, the national percentage split was as follows:

- 25% – *Privacy Fundamentalists* are those who reject consumer-benefit or societal-protection claims for data uses and seek legal-regulatory privacy measures.
- 55% – *Privacy Pragmatists* are those who examine the benefits of data collection or use to them or society and evaluate the privacy risks and how organizations propose to control them. Then they decide whether to trust the organization or seek legal oversight.
- 20% – *Privacy Unconcerned* are those who are ready to supply their personal information to business and government and reject what is viewed to be too much concern over privacy.

The same survey given six years later indicated a considerable shift in what had been very consistent results over the past decade. By 2001, the *Privacy Fundamentalist* group had grown to 34 percent, *Privacy Pragmatists* to 58 percent, and *Privacy Unconcerned* dropped to 8 percent of the population (Harris Interactive and Westin 2002). These results underscore the challenges that are likely to emerge when EHR use becomes ubiquitous.

Smith, Milberg and Burke (1996) developed and tested the concern for information privacy (CFIP) construct to measure attitudes and beliefs about individual information privacy related to the use of personal information in a business setting. They conceptualized CFIP as being composed of four distinct, yet correlated latent factors, labeled *collection*, *errors*, *unauthorized access*, and *secondary use*. Stewart and Segars (2002) expanded upon the Smith et al. study and not only validated the multidimensional nature of the CFIP construct, but also found support for the hypothesis that a second-order factor structure is empirically valid, thus confirming the complexity of an individual's concern for information privacy. Other tests of CFIP indicate that differences in cultural values influence one's Internet privacy concerns (Bellman et al. 2004), and that there is a tradeoff between a desire for personalization of products and purchasing experiences, and providing too much information, which could compromise one's privacy (Chellappa and Sin 2005). Finally, CFIP has been used as a control variable in an attempt to isolate and identify the value of privacy assurances on Web pages (Hui et al. 2007).

## Summary

The ELM specifies a set of theoretical mechanisms that yield attitude change that subsequently leads to behavioral intentions to engage in specific acts. Central to this theory is the notion of persuasion. In the context of digital health information, it is widely acknowledged that a critical barrier to widespread diffusion is the individual's concern about privacy. Will these privacy concerns hinder the adoption of EHR systems or can people be persuaded to accept the technology if proper messages are conveyed? We investigate this research question using the ELM as a theoretical framework.

## Electronic Health Record Systems

Prior to presenting the research model and hypotheses, we provide a brief definition for an EHR system. As noted earlier, an electronic health record is simply information in electronic format that contains medical data about a specific individual. EHR *systems* are 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. If, for example, a patient was maintaining her personal medical record electronically at home using a Word<sup>®</sup> document, privacy concerns would not be of central importance. In this case, privacy concerns would not be of central importance. Our focus here is on 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 to others via Internet connections.<sup>6</sup> In a "public" setting such as this, the sensitivity of data stored in a typical EHR—demographic data about patients, their medical conditions, their entire medication list, family history, and possibly mental health data—becomes increasingly more important and worthy of investigation.

## Research Model and Hypotheses

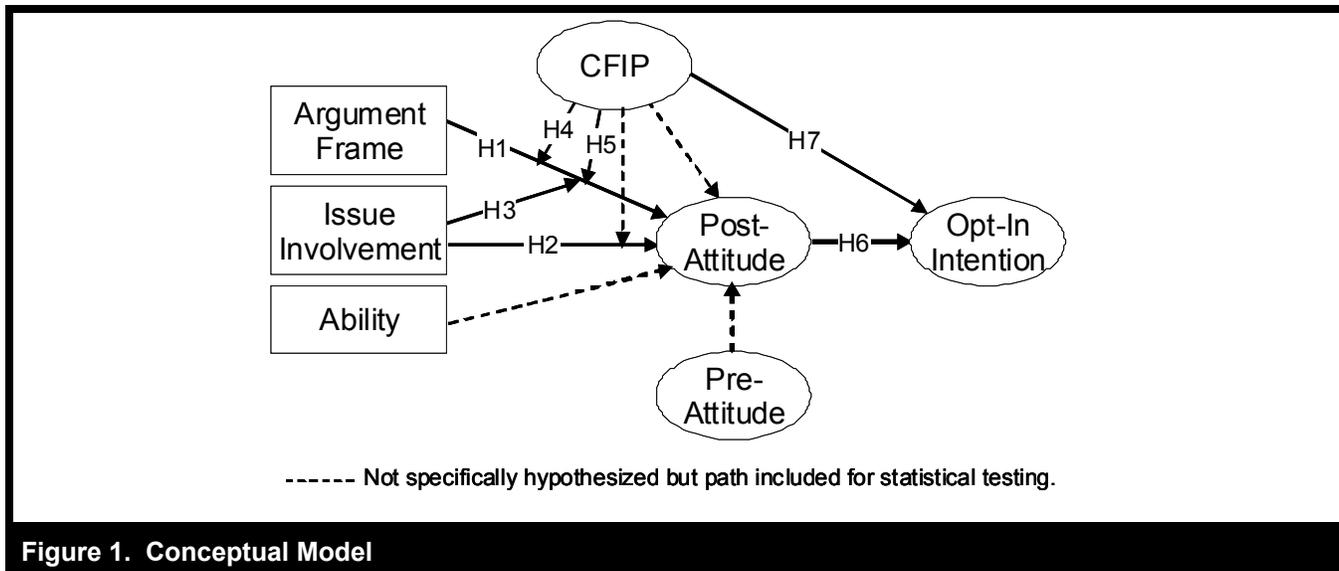
Drawing on the literature reviewed above, the research model for this study, shown in Figure 1, incorporates and positions the CFIP construct within an ELM framework. There are two outcomes of interest that are highlighted in the model. The first outcome that is an intervening variable in the proposed model, post-manipulation attitude, has been used extensively in ELM research. However, the ELM lens has been used less

<sup>6</sup>From this point forward, we use the term EHR to signify an EHR system, unless explicitly stated.

| <b>Table 1. Key Covariates and Interactions Affecting Attitude Change</b>    |   |   |
|--|---|---|
| <b>Variable<sup>†</sup></b>  | <b>Findings</b>   | <b>Reference</b>  |
| Issue Involvement (also known as Self-Referencing or Personal Relevance)     | <p>Elaboration on information is greater when people can relate the information to themselves and to their own experience.</p> <p>When motivation is low, self-referencing has no effect on elaboration or persuasion.</p>  | <p>Burnkrant and Unnava, 1989, 1995; Petty and Cacioppo 1980</p> <p>Meyers-Levy 1991; for meta-analysis, see Johnson and Eagly 1989</p>   |
| Multidimensional Issue Involvement   | <p>The effect of involvement on attitude is dependent on the type of involvement.</p> <p>Manipulations that require extensive issue- or product-relevant thought in order to be effective have a greater impact under high rather than low involvement conditions.</p> <p>Manipulations that allow one to evaluate an issue or product without engaging in extensive issue- or product-relevant thinking will have a greater impact under low rather than high involvement.</p>   | Johnson and Eagly 1989  |
| Argument Quality   | Argument quality positively influences perceived usefulness of information.   | Bhattacharjee and Sanford 2006; Sussman and Siegal 2003   |
| Issue Involvement × Argument Quality   | <p>High Involvement: Quality of arguments has a greater impact on persuasion.</p> <p>Argument quality has an impact only under high involvement conditions.</p> <p>Low Involvement: Quality of arguments has a lesser impact on persuasion.</p> <p>Increased issue involvement enhances persuasion only when messages are strong.</p> <p>Increased issue involvement increases "latitude of rejection," i.e., increases resistance to persuasion.</p> <p>Involvement and expertise moderate the main effects of argument quality and source credibility on perceived information usefulness.</p> <p>Involvement significantly interacts with argument quality to affect perceptions of message utility.</p> | <p>Mak et al. 1997; Petty and Cacioppo 1979; Petty et al. 1981b</p> <p>Petty and Cacioppo 1984b</p> <p>Petty and Cacioppo 1979; Petty et al. 1981b</p> <p>Johnson and Eagly 1989</p> <p>Sherif et al. 1965</p> <p>Bhattacharjee and Sanford 2006</p> <p>Sussman and Siegal 2003</p> |
| Source Credibility (Source Expertise or Source Attractiveness)               | <p>Source expertise typically associated with peripheral route to persuasion but also can act through a central route.</p> <p>Source credibility positively influences perceived usefulness of information.</p>   | <p>Heesacker et al. 1983; Moore et al. 1986; Puckett et al. 1983</p> <p>Bhattacharjee and Sanford 2006; Sussman and Siegal 2003</p>   |
| Elaboration × Source Credibility (Source Expertise or Source Attractiveness) | <p>Low motivation and/or ability: Source expertise acts as simple acceptance or rejection cue. High motivation and/or ability: Source expertise is relatively unimportant since it makes little sense to waste time thinking about a message from someone who does not know very much.</p>  | For a review, see DeBono and Harnish 1988   |

<sup>†</sup>Cue-type is not included in this table due to the considerable debate surrounding the validity of categorizing a variable as acting through a central or peripheral route rather than recognizing the multiple roles for variables (Petty and Wegener 1999).

| Table 1. Key Covariates and Interactions Affecting Attitude Change (Continued)     |   |  |
|--|---|--|
| Variable   | Findings  | Reference  |
| Issue Involvement × Source Credibility (Source Expertise or Source Attractiveness) | Involvement: Source attractiveness has impact only under low involvement conditions.  | Petty and Cacioppo 1984b                                       |
|  | Expertise or attractiveness of a message source has a greater impact on persuasion under conditions of low rather than high involvement.  | Chaiken 1980; Petty et al. 1981a                               |
| Factual Messages   | Factual messages are more believable and more persuasive, particularly for high involvement people.   | Ford et al. 1990; Puto and Wells 1984; Wells 1989              |
| Number of Messages (Arguments)   | Low involvement: People agreed with message more when more arguments were presented. High involvement: More arguments led to more persuasion when the arguments were compelling, but to less persuasion when the arguments were specious. | Haugtvedt and Petty 1992; Petty and Cacioppo 1984a             |
| Prior Knowledge  | Greater prior knowledge allows for greater elaboration of issue-relevant information.   | Alba and Hutchinson 1987                                       |
|  | When prior knowledge is low, the search effort will increase when issue involvement is high.  | Lee et al. 1999  |
| Message Repetition   | Moderate repetition will lead to favorable brand attitude when arguments are strong and tedium low.   | Anand and Sternthal 1990; Batra and Ray 1986; Cox and Cox 1988 |
| Media Type   | Print ads have limited opportunity to influence uninformed.   | Greenwald and Leavitt 1984                                     |
| Distractions   | The presence of distraction impairs most people from processing a communication.  | Petty et al. 1976  |



often to investigate actual *behavior* or behavioral intentions with notable exceptions (e.g., Mak et al. 1997), largely because prior research has consistently found an empirical link between beliefs, attitude, intentions, and behavior (Ajzen 1991). We argue that exposure to messages related to EHRs

shapes individuals' attitudes toward their use, especially when exposed to an emerging technology for which attitudes are not well-formed. The extent to which the messages influence attitude is jointly determined by the way in which the message is crafted (argument framing), the extent to which the informa-

tion presented is relevant for the individual (issue involvement), and their interaction. We further suggest that CFIP moderates the effects of argument framing and issue involvement on attitudes, and has a direct influence on attitudes. Conceptual definitions of the research constructs as well as theoretical arguments for the proposed relationships are developed below.

### **Predicting Attitude Toward EHR Use**

An attitude has been defined as a “complex mental state involving beliefs and feelings and values and dispositions to act in certain ways”<sup>7</sup> and “positive or negative views of an ‘attitude object’: a person, behavior, or event” (Bernstein et al. 2000). Fishbein and Ajzen (1975) suggest that attitudes influence behavior via their influence on intentions. In addition, they propose that attitude toward a behavior is more predictive than attitude toward the artifact itself. Extending this argument using an information-adoption-based view, it has been suggested that people will not only form intentions toward adopting a technology, but they will also form opinions toward adopting advocated ideas and behaviors (Sussman and Siegal 2003).

Attitudes are typically formed and modified as people gain and process information about attitude objects (Eagly and Chaiken 1993, p. 257). When this information processing results in a change in attitude, *persuasion* is said to have occurred (i.e., persuasion is defined as the modification of a private attitude or belief resulting from the receipt of a message; Kenrick et al. 2005, p. 145). Following from prior ELM studies, we propose that argument framing (an attribute of the message) and issue involvement (a characteristic of the recipient) will jointly influence the amount of persuasion that occurs, that is, the individuals’ attitude after receiving the message. Prior work has also suggested that *ability*, conceptualized as the cognitive capability of a recipient to process a very simple message, is an important component of the information processing act. Because our primary theoretical focus is not on ability, we include it in our model as a control to eliminate variance explained by it in attitude, and do not formulate a specific hypothesis for the effects of ability.

*Argument Framing.* Argument quality refers to a subject’s perception that a message’s arguments are strong and cogent as opposed to weak and specious (Petty and Cacioppo 1986) and has been shown to be a strong determinant of persuasion

and attitude change. While Petty et al. (1981a) argue that persuasion is influenced by several factors including argument quality, Fishbein and Ajzen (1981), while not distinguishing between strong and weak arguments, note that message content is the most significant predictor of attitude, rather than source credibility, attractiveness, or other cues. When argument quality is strong, the message contains facts that are justified and compelling (Petty et al. 1981a) and, in general, is more persuasive. Persuasive messages focus the attention of the subject, leading to a reallocation of cognitive resources and eliciting responses (such as an attitude change) or a behavior (Tam and Ho 2005). If messages lead to predominantly positive thoughts, the message is said to be relatively successful in eliciting changes in attitude and behavior (O’Keefe 1990, p. 103). If messages lead to predominantly negative thoughts, the messages will not elicit strong changes in attitude or behavior. It also has been shown that the influence of unfavorable thoughts can be weakened with positive, strong argument quality (Kim and Benbasat 2003). In short, there is compelling evidence suggesting that aspects of argument quality will affect attitude. Yet, the conceptualization and subsequent operationalization of argument quality has been inconsistent in prior literature (Stiff and Mongeau 2003, pp. 227-229). For example, in some studies, argument quality is argued to be a measure of valence (Mongeau and Stiff 1993), in others it is strength (Petty and Wegener 1999), and in still others it is both (Iyengar 1987; Schneider et al. 1979, Chapter 2).

We draw from the insights of the argument quality/attitude relationship and extend it by incorporating the concept of argument *framing*. Argument framing (AF) refers to the extent to which the message highlights the consequences of a behavior and infers causality (Iyengar 1987). As Iyengar notes, “[simply stating] the current rate of unemployment... does not so readily imply political attitudes and preferences” (1987, p. 816). For instance, one could argue that 6 percent unemployment is terrible, or a vast improvement from a previous reference point. Thus, messages can be framed in various ways such as positively, negatively, or neutrally in an attempt to persuade the recipient (Schneider et al. 1979, Chapter 2). A positively framed series of messages not only contain credible content, they emphasize the beneficial outcomes that the individual might realize. In contrast, negatively framed messages contain strong messages emphasizing unfavorable results that may be attained.

We restrict our analysis to messages that are positively and neutrally framed. Given our interest in examining the effect of CFIP on persuasion and attitude change, we chose not to use frames that could potentially biased the respondents. While there are some negative aspects of EHR adoption noted in the

<sup>7</sup>From <http://www.webcitation.org/query?id=1143578234714500>, retrieved on March 28, 2006.

literature (workflow, efficiency, etc.), the majority of the backlash has resulted from concerns about privacy. Further, from a public policy perspective, negatively framed arguments are unlikely to be used as a mechanism to favorably change public attitudes. Given our goal of demonstrating that variance in attitudes can result from the framing of the messages while ensuring that we do not negatively bias the respondent, we use neutrally framed messages that contain weak arguments and do not specifically address how the behavior might result in positive outcomes for the recipient. To the extent that credible and positive message frames are more likely to be internalized by recipients and therefore more influential in changing attitudes (e.g., Chaiken 1980; Ford et al. 1990), we predict

H1: Controlling for pre-manipulation attitude, post-manipulation attitude will be more favorable toward EHR use in individuals presented with positively framed messages versus neutrally framed messages.

*Issue Involvement.* Issue involvement (II) has been defined as the extent to which recipients perceive a message topic to be personally important or relevant (Petty and Cacioppo 1979, 1986, 1990), and a *motivational* state induced by an association between an activated attitude and one's self-concept (Johnson and Eagly 1989; Sherif et al. 1965). There is some debate about the dimensionality of this construct (Johnson and Eagly 1989), primarily because of the lack of a succinct operational definition and mixed results relative to its relationship with persuasion. In their meta-analysis, Johnson and Eagly (1989) identify three distinct types of involvement: (1) value-relevant involvement, (2) outcome-relevant involvement, and (3) impression-relevant involvement. Value-relevant involvement, also known as ego-involvement (Ostrom and Brock 1968), reflects the manner in which individuals define themselves. Outcome-relevant involvement exists when involvement has the ability to attain desirable outcomes, and impression-relevant involvement is the impression that involvement makes on others (Johnson and Eagly 1989). Johnson and Eagly argue that each type exhibits unique characteristics, such as varying degrees of self-concept, which influence persuasion in different ways. For example, in *value-relevant* involvement studies, high-involvement subjects were less persuaded than low-involvement subjects; yet in *outcome-relevant* involvement studies, high-involvement subjects were more persuaded by strong arguments and less persuaded by weak arguments than were low-involvement subjects. Presenting an alternative explanation, social judgment theory argues that highly involved persons exhibit more negative evaluations of a communication because high involvement is associated with an

extended "latitude of rejection" (Sherif et al. 1965), that is, increasing involvement enhances resistance to persuasion. Overall, it is clear that findings relating different types of involvement to persuasion are equivocal.

Our conceptualization of involvement is most closely aligned with outcome-relevant involvement. We sought to identify conditions under which people would be motivated to elaborate upon information about EHRs, that is, to be involved with the core issue. Prior research suggests that chronic illness is strongly predictive of EHR acceptance (Agarwal and Angst 2006; Lansky et al. 2004), therefore, an individual's health condition will determine their issue involvement. We treat II as a motivational state reflected by the health of the individual existing at a particular point in time, rather than an attitude or belief that can be manipulated (Cacioppo et al. 1982; Sherif and Hovland 1961). Intuitively, those who are well and/or are infrequent users of the healthcare system will be less inclined to elaborate strongly on messages about a topic that is not highly salient to them, while unhealthier individuals will have a stronger motivation to attend to technologies that can potentially alter the management of their health.

Scholars on all sides of the involvement debate concur that highly involved people appear to exert the cognitive effort required to evaluate the issue relevant arguments presented, and their attitudes are a function of this information-processing activity (Johnson and Eagly 1989; Petty and Cacioppo 1979, 1986, 1990; Sherif et al. 1965). For instance, in a study of college students that investigated attitudes about abortion and capital punishment, Pomerantz et al. (1995) found that embeddedness<sup>8</sup> led to increased open-mindedness, objectivity, and information-seeking behavior. Interestingly, they also found a decreased propensity to *selectively* elaborate. They explain this finding by suggesting that embedded subjects seek relevant data that provides *accurate* information. In other words, the amount of influence accepted by individuals varies according to their level of personal involvement with the subject matter. Thus, we expect that people who are highly involved as a result of their frequency of use of the healthcare system will be more receptive to persuasion, and test

H2: Controlling for pre-manipulation attitude, post-manipulation attitude will be more favorable toward EHR use in more highly involved individuals.

*Argument Framing × Issue Involvement:* Empirical studies in the ELM tradition suggest that the predictors of attitude

<sup>8</sup>Embeddedness refers broadly to involvement in multiplex social relations (Granovetter 1985).

change are likely to exhibit interactive effects, with argument quality and issue involvement as the most commonly tested interactions (see Table 2 for a brief review). Consistent with this, we expect argument framing to moderate the effect of issue involvement on attitude. The ELM theorizes that people are more motivated to devote the cognitive effort required to evaluate the true merits of an issue or product when the topic is of central importance to them (Petty and Cacioppo 1986; Petty et al. 1981a). However, it has also been shown that increased issue involvement enhances persuasion with strongly framed arguments but inhibits persuasion with weakly framed arguments (Petty and Cacioppo 1984a; Petty et al. 1981a; Petty et al. 1983). Yet some studies find support for this hypothesis only in relation to argument frames that contain strong persuasive messages and not weak messages (Axson et al. 1987; Burnkrant and Howard 1984; Johnson and Eagly 1989). Receivers that are highly involved with the argument issue will engage in extensive elaboration, while those that are not involved will elaborate less and are more susceptible to influence from peripheral cues (Petty et al. 1981a; Stamm and Dube 1994). Other research has shown that strong attitudes, which are more stable and able to fend off persuasive arguments, are more resistant to change than weak attitudes (Bassili 1996; Petty and Krosnick 1995). To the extent that EHRs fundamentally offer positive benefits for patients and involvement increases elaboration, we expect that H2 will enhance the relationship between argument framing and attitude change. This leads us to posit:

H3: Controlling for pre-manipulation attitude, issue involvement will positively moderate the effect of argument framing on post-manipulation attitude.

*Concern for Information Privacy:* As noted earlier, there is substantial and growing evidence that privacy and security of health information is a matter of paramount importance to individuals. Studies related to privacy concerns have predominantly focused on domains such as corporate uses of personal information (Graeff and Harmon 2002; Milne and Boza 1999; Smith et al. 1996), electronic commerce and Internet buying behavior (Dommeyer and Gross 2003; Long et al. 1999; Milberg et al. 2000; Porter 2000; Smith et al. 1996), and the economics of privacy (Petty 2000; Rust et al. 2002). Aside from descriptive opinion-poll surveys, no work has empirically investigated the privacy concerns associated with using electronic health records.

The characteristics of digital information in general and EHRs in particular are such that there is an expected increase in the likelihood of privacy violations and misuse of information. For instance, digital information can be easily repli-

cated at very low marginal cost (Daripa and Kapur 2001). Compared to data stored on other traditional media, digital information is susceptible to compromise from a wider set of infiltrators (Denning 1999; Hundley and Anderson 1995), it is relatively easy and inexpensive to undertake inappropriate activities with digital information, and there are no geographical barriers (Denning 1999; Irons 2006). Disturbingly, there are high economic rewards linked to digital crime relative to the risks associated with "traditional" face-to-face crime (Irons 2006; Turvey 2002). To the extent that people have stronger concerns about information privacy, their attitudes about the use of EHRs should be more negative (Chellappa and Sin 2005).

A recent national survey suggests that the EHR offers a different context than other information technologies with respect to privacy concerns and information accessibility. The National Consumer Health Privacy Survey (Bishop et al. 2005) revealed surprising findings that reinforce the lengths to which consumers will go to hide health information. For example, while over 66 percent of respondents felt that EHRs could reduce medical errors, disturbingly nearly 13 percent of respondents withhold personal information—such as existing health problems—which could *reduce* errors. In addition, almost 15 percent ask doctors to report a less serious diagnosis, avoid diagnostic tests due to anxiety over privacy, or pay out of pocket to keep the insurer from being informed of a specific condition. Yet, 75 percent of respondents would share their personal health information if it would help a doctor during an emergency. Thus, it is evident that concerns associated with EHR use span the gamut from financial anxiety (e.g., I don't want to be put into a high risk, high premium insurance plan), to embarrassment (e.g., I'm ashamed to tell my doctor about my past risky behaviors), to job security (e.g., my employer might fire me if they know I have had a history of mental illness), to control (e.g., I don't want pharmaceutical companies marketing new drugs to me). Given this complexity in individual responses to the health information privacy issue, research that begins to unravel the intricacies of privacy concerns is needed. As Malhotra et al. (2004, p. 349) note,

research in the IS domain has paid little attention to consumers' perceptions specific to a particular context...our findings clearly reveal that to have a complete understanding of consumer reactions to information privacy-related issues, researchers should examine not only consumers' privacy concerns at a general level, but also consider salient beliefs and contextual differences at a specific level.

Our focus, however, is not on this direct effect, which is intuitively appealing and has been indirectly tested in studies

**Table 2. Variables Crossed with Argument Quality and Issue Involvement**

| Variable                                 | Findings   | Reference  |
|--|--|--|
| Variables crossed with Argument Quality  | Issue Involvement (or Participation)<br>Expertise<br>Mood<br>Recipient posture<br>Deprivation of control<br>Expectation of discussion with another<br>Number of message sources<br>Message repetition<br>Ambivalence about the message topic<br>Speed of speech<br>Physiological arousal<br>Time pressure<br>Knowledge about the issue | Chaiken 1980; Petty and Cacioppo, 1984b; Petty et al. 1981a<br>Sussman and Siegal 2003<br>Bless et al. 1990<br>Petty and Cacioppo 1983<br>Pittman 1993<br>Chaiken 1980<br>Harkins and Petty 1987; Moore and Reardon 1987<br>Cox and Cox 1988<br>Maio et al. 1996<br>Smith and Shaffer 1991<br>Sanbonmatsu and Kardes 1988<br>Ratneshwar and Chaiken 1991<br>Wood et al. 1995 |
| Variables crossed with Issue Involvement | Prior Knowledge<br>Number of messages<br>Source attractiveness<br>Source expertise<br>Media type   | Lee et al. 1999<br>Petty and Cacioppo 1984a<br>Petty and Cacioppo 1984b<br>Chaiken 1980<br>Greenwald and Leavitt 1984  |

relating the CFIP construct to attitudes (Smith et al. 1996). Rather, we are interested in the extent to which concern for information privacy interacts with the determinants of attitude change, viz., argument framing and issue involvement. Prior literature acknowledges the existence of such moderated relationships (Van Slyke et al. 2006). In a variety of contexts, it has been found that individuals who harbor strong concerns about a particular issue require particularly compelling arguments to modify their belief structure (Bassili 1996; Boritz et al. 2005; Lau et al. 1991). The stronger the concern, the more persuasive a message needs to be in order to overcome the associated apprehension. Not only must the message contain strong evidence, it should also highlight the positive consequences that might accrue from ignoring the individuals' concern (Iyengar 1987). In other words, the message argument must be framed *positively*. As described earlier, Louis Harris & Associates and Westin (1995) found three distinct categories related to people's levels of concern about privacy of information. Consider, for example, the group that is most concerned about privacy, the so-called privacy fundamentalists. If this group is persuaded to support "social welfare-based" appeals to digitize data—especially when the use of EHRs is grounded in facts—then the other, less concerned groups should be even more supportive. Based on this logic, we test

H4: Controlling for pre-manipulation attitude, individuals with a stronger concern for information privacy will have a more favorable attitude toward EHR use under conditions of positive

argument framing than under conditions of neutral argument framing.

*Argument Framing* × *Issue Involvement* × *CFIP*: Thus far we have presented arguments supporting the existence of multiple two-way interactions between the key independent variables and attitude. A three-way interaction is indicated whenever there is reason to plausibly believe that at least one combination of the levels of the three variables will yield a result that is different from another combination. Thus, we expect CFIP to moderate the relationship between the two-way interaction term  $AF \times II$  and attitude.

As suggested by the literature on embeddedness (Boninger et al. 1995; Pomerantz et al. 1995), active involvement within a specific domain generates openness to new ideas. In this particular case, we argue that unwell and/or active health users will seek ways to simplify their interactions with the healthcare system. Recent research suggests that those who feel empowered and are "activated" with respect to their care will be more willing to try health alternatives (Hibbard et al. 2004). In other words, those who are activated because of their health conditions will be more likely to evaluate the merits of an argument about EHRs *even* if they have strong concerns for privacy. By contrast, those activated individuals who have little concern about privacy will evaluate the argument based on other decision cues. Thus, when privacy concerns are high, only those individuals who feel they will be directly affected by EHRs will be open to persuasion as a function of argument frame. For others, because the issue is

not personally relevant or consequential, less cognitive processing and elaboration will occur and, therefore, attitudes toward EHR use are likely to change less. Note that we are not suggesting that CFIP is not a key factor in the three-way interaction. For example, when involvement is low (i.e., engagement in health care activities is low), CFIP is expected to be a key factor in determining how much attitude can be changed as a result of the arguments presented. In this situation, if a patient has little reason to see a doctor, a high concern for privacy may offer just enough negative incentive to avoid care, unless very strong arguments are made in favor of the benefits of digitization.

Based on the logic presented above, we theorize a three-way interaction between CFIP, AF, and II. However, as others have noted (Dawson and Richter 2006; Halford et al. 2005; Jaccard and Turrisi 2003), proposing specific hypotheses related to three-way interactions is complex, and they are best interpreted from empirical findings. Therefore, we test

- H5: Controlling for pre-manipulation attitude, CFIP will be a significant moderator of the relationship between the AF  $\times$  II interaction term and post-manipulation attitude.

### **Predicting Likelihood of Adoption**

The timing of this study is such that, at this point, EHR use by patients or clinicians is not at a stage of diffusion where it is feasible to assess actual adoption behaviors. For the most part, there are few cases in which EHRs are stored in interoperable systems or made available via the Internet to patients. Thus, as yet, patients typically cannot actually adopt the technology; they can only form attitudes and beliefs about the concept of participating, and therefore use must be assessed through perceptual measures rather than actual opt-in behavior. In fact, the artifact itself (a digital health record) and not the system (electronic health record system) must be acceptable for adoption as a concept before the EHR system is contemplated. In other words, a consumer has to be comfortable with the *idea* of having health information in electronic form before considering whether to allow others to access and use the system.<sup>9</sup> However, it is important to ascertain whether people will choose to opt-in to an EHR system if they are given the choice in the near future. Therefore, we incorporate the variable—*likelihood of adoption*—into the model as a means of estimating actual future behavior.

<sup>9</sup>We thank the associate editor for this insight.

There is currently a spirited debate amongst those in the medical profession, civil liberty groups, informaticians, and the general public surrounding the topic of opt-in versus opt-out electronic health record systems (Cundy and Hassey 2006; Watson and Halamka 2006; Wilkinson 2006). This debate ponders whether the general public should have the right to decide if their health information can be digitized and made available for various purposes in a de-identified way, or if it should be available to *only* the health provider who *created* the record, thus making it unavailable to others who could potentially treat the patient (Wilkinson 2006). We conceptualize and operationalize the likelihood of adoption (LOA) construct as an opt-in behavioral intention (Ajzen 1991; Davis and Bagozzi 1992) or the extent to which the individual would agree to have his/her medical information digitized and shared with relevant parties. Behavioral intentions are formed as a result of the motivational factors that influence the behavior of an individual (Ajzen 1991, p. 181). Prior work in the ELM domain has incorporated behavioral intentions (see, for example, Petty et al. 1983) but only from the perspective of the strength of the intention relative to the route of persuasion.

*Attitude:* A positive relationship between attitudes and intentions is well-documented (Ajzen 1985, 1991; Ajzen and Madden 1986; Fishbein and Ajzen 1974, 1975), including an extensive literature examining this link in the context of IT adoption (Agarwal and Prasad 1998; Davis 1989; Davis and Bagozzi 1992; Taylor and Todd 1995; Venkatesh et al. 2003). Most of the research related to IT adoption intentions in organizational contexts, however, reflects situations in which adoption is not considered fully volitional, such as a new system implementation in a firm. In the context of this study, likelihood of adoption, operationalized as opt-in behavior, by definition, is volitional. Here the motivation for the individual to adopt the technology is largely intrinsic rather than extrinsic and arguably, all other aspects of the system being equal, stronger than when adoption is mandated. Regardless of whether the motivation is intrinsic or extrinsic, however, the relationship between attitudes and intentions derives from the basic human need to achieve cognitive consistency (Festinger 1957) such that attitudes and behaviors are aligned with each other. Therefore, we test

- H6: Post-manipulation attitude toward the use of EHRs will be positively related to the likelihood of adoption (opt-in intention).

*Concern for Information Privacy:* Malhotra et al. (2004), Van Slyke et al. (2006), and Smith et al. (1996) test various relationships between privacy concerns, beliefs, and intentions, with mixed results. Smith et al. report a direct effect of CFIP on intentions. In contrast, Van Slyke and his colleagues

explore the relationship between CFIP and willingness-to-transact (intention) and find that the relationship is fully mediated by risk-perception (belief) and nonsignificant as a direct effect. Finally, Malhotra et al. find that privacy concerns are fully mediated by beliefs but that the construct IUIPC (Internet Users' Information Privacy Concerns) better models their context than CFIP.<sup>10</sup>

Other research suggests that privacy beliefs have a direct effect on intentions and specific *behaviors*. For instance, Sheehan and Hoy (1999) found that as privacy concerns increased, people were more likely to provide incomplete information to online queries and opt-out of mailing lists or websites that required registration. By contrast, as concern for privacy decreases, individuals increasingly provide information with little elaboration on the consequences such as being profiled or identified (Berendt et al. 2005). Given the substantial empirical evidence in support of a direct relationship between privacy concerns and behavioral intentions as well as behaviors, we expect that when privacy concerns are high, the tendency to opt-in to an EHR will be low. Therefore, we test

H7: CFIP will be negatively related to the likelihood of adoption (opt-in intention).

## Methodology

### Study Design

We use an experimental approach to test the research hypotheses. Subjects are randomly assigned to a single treatment with two conditions: positive and neutral argument frames. Study subjects, as well as the procedure followed, are described below.

*Subjects:* Theoretically, EHRs are, or will be, accessible in principle by everyone. To obtain a representative group of subjects, we purposively sampled from two subject pools. One pool consisted of individuals attending a conference called *TEPR (Toward an Electronic Patient Record)*, for which the theme was "The Year of the Electronic Health Record." We collected the e-mail addresses of 129 individuals in attendance. A second group of subjects was a sample of people who opted-in to an online survey sample list provided by Zoomerang<sup>TM</sup>. The Zoomerang service sends

<sup>10</sup>Malhotra et al. note that IUIPC is a more appropriate construct when modeling an individual user's concern about Internet-based information privacy, while CFIP reflects an individual's concern about organizational uses and handling of private information, thus resulting in our choice of CFIP for our study context.

e-mail solicitations to a database of e-mail addresses and, in exchange for membership points that can be redeemed for merchandise, an individual can opt-in to complete a survey. We requested a random sample based on national census statistics. Subjects from both groups were randomly assigned to either a positive or neutral argument frame manipulation and asked to complete an online survey. For the first subject pool, after two email reminders, we received 67 completed surveys (52 percent response rate). Zoomerang estimates a 25 to 45 percent response rate based on the general group that was surveyed. After two e-mail reminders, we received 299 completed surveys from the second pool. The final sample consists of 366 subjects.

*Procedure:* At the beginning of the Web-based survey, subjects were asked to consent to participation in the study via a checkbox query. If the subject consented, s/he was then asked several questions about his or her familiarity with electronic health records. To ensure that respondents understood the use of the term EHR, we provided a detailed description of medical record technology and also included pictures and screen captures of several types ranging from nonelectronic, paper-based forms to fully interoperable, Internet-based EHR systems. The survey specifically noted that the questions were related to EHR systems that stored medical records on an Internet-based platform that could be accessed by multiple clinicians, other health entities, and possibly by the patient or caregiver.

Subjects first responded to questions related to concern for information privacy and pre-manipulation attitude. In the next step, the subject was provided with either a positive argument frame or a neutral argument frame, depending upon random assignment. The positive AF group received a manipulation in the form of six strong messages endorsing the use of EHRs and highlighting some of the facts surrounding medical errors and the connection between HIT and reduced errors (see "Argument Framing" in Appendix A). The messages were pretested to confirm which generated the strongest and weakest responses. The neutral AF group received a manipulation where the four messages were weak, consisting of user endorsements, anecdotal evidence, and opinions. After reading the messages, the subjects were asked to confirm that they read the messages by checking "yes." If "yes" was not selected, the subjects were asked to go back and read the messages. Everyone in this study selected "yes." As a manipulation check, we then asked the subjects two questions about the messages—one about the trustworthiness of the subject and the other about the reliability of the information presented in the messages (see "Manipulation Check" in Appendix A). Subjects were then asked to respond to a set of questions about EHRs, and finally, demographic data were collected at the end of the survey.

## Operationalization of Variables

*Likelihood of Adoption (Opt-In/Out):* The choice to opt-in to an EHR is simply an affirmative or negative response. To introduce variance into this outcome variable, we queried the subject as to when s/he expected to opt-in. The subject was also given the option of choosing that s/he would never opt-in to the system (see “Likelihood of Adoption in Appendix A). The scale ranged from 1 (“I will never use them”) to 6 (“I am already a user”).

*Attitude:* A common approach to assessing attitude is the use of semantic differential scales anchored by polar adjectives (e.g., Eagly and Chaiken 1993; Gallagher 1974). We measured attitude toward the use of EHRs using a seven-point semantic differential scale (Karwoski and Odbert 1938; Osgood et al. 1957) with polar adjectives bad–good, foolish–wise, and unimportant–important (Bhattacharjee and Sanford 2006; Taylor and Todd 1995). Attitudes were assessed immediately following the presentation of the description of the EHR (pre-attitude) and then at the end of the survey (post-attitude) after the treatment had been administered and other unrelated questions were asked.

*Argument Framing:* As noted, argument framing refers to the extent to which the message contains strong and credible arguments that highlight consequences and imply causality. Thirteen arguments were pretested to assess the relative strength of the EHR message (see “Argument Framing” in Appendix A). Positive argument framing consists of six messages that typically involve a statistical link between electronic health record use, error reduction, and decreases in deaths attributed to medical errors. All messages are true and the literature from which the message is taken is cited. The messages are all delivered by a recognizable source that is assumed to be credible and is subsequently checked in the survey for trustworthiness and reliability. Neutral argument frame is operationalized using messages that are entirely fabricated, typically anecdotal, lacking any statistical validation, and a source, if given, is anonymous. In an attempt to induce additional variance in attitude change specifically from the argument frames, we used six positively framed arguments and only four neutrally framed arguments since the number of messages has also been demonstrated to impact attitude change (Haugtvedt and Petty 1992; Petty and Cacioppo 1984a).

*Issue Involvement:* In most studies of attitude change and dual process, modes of persuasion, motivation, or involvement are artificially manipulated via a description given to the respondents. For example, it is common to suggest to some

participants that a decision they are about to make will have a direct impact on them in the near future while telling other participants that the decision they will make will not affect them or will affect them at a much later date (see Apsler and Sears 1968; Petty et al. 1983; Sherif and Hovland 1961). This approach has been criticized for the difficulty it poses in confirming that the manipulation actually took effect and the respondent takes on the prescribed involvement (for a discussion, see Petty et al. 1983). As described earlier, we use a different and arguably more objective method of assessing involvement that is most closely aligned with outcome-relevant involvement and embeddedness. We treat involvement as a function of the frequency with which the subject uses health services. More specifically, we created a composite factor score based on the following three survey questions: (1) In the past 6 months, how many times have you been to a healthcare provider for your own healthcare? Include any care such as a doctor’s visit, hospital visit, physical therapy, allergy shots, lab tests, etc. (2) How many different prescription medications are you taking for chronic or long-term health problems? (3) How many chronic illness do you have? (Question 3 included a list of illnesses.)

*Concern for Information Privacy:* To measure CFIP, we adapted the scale developed by Smith et al. (1996). Minor changes were made 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. (see “Concern for Information Privacy” in Appendix A).

*Ability:* As briefly noted earlier, ability, as used in the ELM literature, is conceptualized as the cognitive ability of a subject to process the information presented in the message. Because our argument frames are not complex and do not reference any technical aspects of EHRs, education represents a good proxy for ability. Further, because EHRs are a digital artifact, it is expected that individuals with greater technological experience and skill will be better able to understand what the innovation is and what it does and, thus, form opinions about the use of the technology. Prior research also suggests that computer skills and experience contribute to enhanced *cognitive* ability through the generation of specific information processing capabilities (Gillan et al. 2007; Kearney 2005). Thus, both computer experience and computer skill inform an individual’s ability to process technology-related messages. Results from a factor analysis indicate that education, computer skill, and experience load on the same factor. We include ability as a reflective construct in the structural model.

## Analysis and Results

### Analysis Strategy

We test the hypothesized relationships among the constructs using structural equation modeling (SEM)<sup>11</sup> with the software program EQS6.1/Windows (Bentler 1985; Bentler and Wu 1993). Only recently have researchers discovered ways to use SEM in models with categorical data and interaction effects (Kupek 2005, 2006). In our model, both situations are present, which restricts us to using composite measures for interactions (McDonald 1996), rather than latent constructs. However, when calculated correctly, composite measures have been shown to be reliable and, in fact, are preferred when sample size is small (Bagozzi and Heatherton 1994; McDonald 1996).

Two recent reviews of the SEM literature suggest four strategies for handling categorical data in SEM (Kupek 2005, 2006): (1) a method employing asymptotic distribution-free (ADF) estimators (Browne 1984; Yuan and Bentler 1998), (2) robust maximum likelihood estimation (Browne and Shapiro 1988), (3) using multi-serial, multi-choric correlations between pairs of variables with non-normal joint distribution as inputs for SEM (Jöreskog and Sörbom 1994; Muthén 1993), and (4) estimating probit or logit model scores for observed categorical variables as the first level, then proceeding with SEM based on these scores as the second level (Muthén 1993). The conclusion that Kupek (2005) draws based on tests of all four models is that, despite the unique advantages and disadvantages of each approach, all methods perform at the same level. We use a *robust* maximum likelihood estimation method (Bentler 1985; Browne and Shapiro 1988) because it has also been shown to be effective in modeling interactions (Bollen 1989).

### Results

Demographic and descriptive statistics are presented in Table 3 (see also Appendix B). Estimates derived from the SEM analysis are used to test the research hypotheses. The overall fit statistics of the structural model were nearly identical to the initial measurement model, however, the structural model is preferred due to parsimony (i.e., the measurement model includes all paths between variables whereas the struc-

tural includes only the hypothesized paths): CFI = .91, AGFI = 0.82, RMSR = 0.06, RMSEA = 0.07.

In the first hypothesis, we proposed a relationship between argument framing and post-manipulation attitude. The path coefficient is positive and significant ( $\beta_{AF} = .076$ ,  $p < .10$ , see Table 4, Model 2) suggesting that positively framed arguments yield higher post-manipulation attitudes, supporting hypothesis 1. In hypothesis 2, we argued that greater II will yield greater attitude changes. Our results support this assertion ( $\beta_{II} = .123$ ,  $p < .01$ , see Table 4, Model 2). Hypothesis 3 states that II will positively moderate the relationship between AF and post-manipulation attitude. We create the AF  $\times$  II interaction term by multiplying the variables (Kenny 2004) and the resultant standardized coefficient measures how the effect of AF varies as II varies. In Model 3, the AF  $\times$  II coefficient is 0.007 and nonsignificant, indicating that the effect of II on attitude change does not change significantly as AF goes from 0 (neutral) to 1 (strong). Thus, H3 is not supported.

A key objective of this study is to evaluate how privacy concerns influence attitude and likelihood of adoption. In hypothesis 4, CFIP is hypothesized to moderate the relationship between AF and attitude. Following the procedure outlined by Kenny (2004), we create a product term for AF (positive/neutral) and the continuous, aggregated variable CFIP. The relationship between AF  $\times$  CFIP and attitude is positive and significant ( $\beta_{AF \times CFIP} = .335$ ,  $p < .05$ , Model 4), thus confirming hypothesis 4. In hypothesis 5, CFIP was hypothesized to moderate the relationship between AF  $\times$  II and attitude. In this three-way interaction analysis, we again followed the procedure outlined by Kenny and created variables for the AF  $\times$  II interaction and multiplied these by CFIP and calculated the resulting path coefficient. The three-way interaction was positive and highly significant ( $\beta_{AF \times II \times CFIP} = .629$ ,  $p < .001$ ), indicating that CFIP does in fact moderate the relationship between AF  $\times$  II and attitude, thus confirming hypothesis 5. The variance in post-manipulation attitude explained by AF, AF  $\times$  II, AF  $\times$  II  $\times$  CFIP, and the control variables is 87.6 percent, representing a 19.0 percent increase in variance explained when the three-way interaction is included.

In hypothesis 6, we proposed a relationship between post-manipulation attitude and likelihood of adoption of EHRs (opt-in); this relationship is positive and significant ( $\beta_{Att} = .50$ ,  $p < .001$ ; see Table 4, Models 1–5), confirming hypothesis 6. Finally, in hypothesis 7, we posited a negative relationship between CFIP and likelihood of adoption. The negative relationship between CFIP and LOA is present and highly significant ( $\beta_{CFIP} = -.12$ ,  $p < .05$ ; see Models 1–5); therefore,

<sup>11</sup>The left portion of the model is essentially a 2  $\times$  2 factorial design, which has traditionally been tested using an ANOVA. Our intent in using SEM was to assess the entire model simultaneously, including the right-hand portion of the model. Later, in the *post hoc* analysis, we use ANOVA to further interpret the findings.

| <b>Table 3. Sample Characteristics</b>                   |   |  |                |
|--|---|--|----------------|
| <b>Variable</b>  | <b>Mean</b>   | <b>Standard Deviation</b>                          | <b>Missing</b> |
| Attitude (Pre/Post)                                      | 5.054/5.413   | 1.092/1.168  | 2              |
| Age  | 46.1  | 12.8   | 2              |
| PC experience (Years)                                    | 13.0  | 7.5  | 4              |
| Self-rated PC skills<br>(1 = None to 5 = Very Extensive) | 3.7   | 0.85   | 2              |
| Gender   | Male<br>Female  | 128<br>237   | 1              |
| Chronic Illness  | No<br>Yes   | 225<br>141   | 0              |
| Race   | American Indian or Alaskan Native<br>Hispanic<br>Black, not of Hispanic origin<br>White, not of Hispanic origin<br>Asian or Pacific Islander<br>Mixed racial background<br>Other                            | 3<br>6<br>26<br>295<br>17<br>10<br>8               | 1              |
| Education  | Some high school or less<br>Completed high school or GED<br>Some college<br>Associates degree<br>Undergrad/bachelors degree<br>Master's degree<br>Beyond Master's   | 6<br>34<br>103<br>34<br>97<br>55<br>36             | 1              |
| Industry Employed  | Healthcare and/or social services<br>Not employed/retired<br>Homemaker<br>Student<br>Education<br>Retail trade<br>Professional, scientific, management services<br>Finance, insurance, real estate<br>Other | 80<br>43<br>35<br>30<br>29<br>22<br>19<br>19<br>85 | 4              |
| Annual Income  | Less than \$20,000<br>\$20,000 – \$29,999<br>\$30,000 – \$49,999<br>\$50,000 – \$74,999<br>\$75,000 – \$99,999<br>\$100,000 – \$124,999<br>\$125,000 – \$174,999<br>\$175,000 or more<br>Decline to answer  | 21<br>24<br>59<br>68<br>42<br>33<br>22<br>20<br>72 | 5              |

| Description                        | Variable                             | Model 1 <sup>a</sup>         | Model 2                     | Model 3                     | Model 4                           | Model 5                     |
|------------------------------------|--------------------------------------|------------------------------|-----------------------------|-----------------------------|-----------------------------------|-----------------------------|
|                                    |                                      | Just Pre-Att, No Interaction | Model 1 plus AF, II         | Model 2 plus AF × II        | Model 3 plus AF × CFIP, II × CFIP | Model 4 plus AF × II × CFIP |
| Main Effects                       | AF                                   | –                            | .076 <sup>†</sup><br>(.099) | .077 <sup>†</sup><br>(.100) | –.247 ns<br>(.407)                | .022 ns<br>(.613)           |
|                                    | II                                   | –                            | .123**<br>(.100)            | .117 ns<br>(.237)           | .116 ns<br>(.237)                 | .059 ns<br>(.245)           |
|                                    | CFIP                                 | –                            | –                           | –                           | .145*<br>(.102)                   | .078*<br>(.108)             |
| Interaction Terms                  | AF × II                              | –                            | –                           | .007 ns<br>(.144)           | –0.15ns<br>(.144)                 | –.259***<br>(.150)          |
|                                    | AF × CFIP                            | –                            | –                           | –                           | .335*<br>(.070)                   | –.530***<br>(.110)          |
|                                    | II × CFIP                            | –                            | –                           | –                           | .043 ns<br>(.191)                 | –.122*<br>(.189)            |
|                                    | AF × CFIP × II                       | –                            | –                           | –                           | –                                 | .628***<br>(.009)           |
| Control Variables                  | Pre-Attitude                         | .803***<br>(.057)            | .767***<br>(.056)           | .786***<br>(.056)           | .788***<br>(.055)                 | .453***<br>(.108)           |
|                                    | Gender                               | –0.44 ns<br>(.104)           | –.060 ns<br>(.102)          | –.060 ns<br>(.102)          | –.057 ns<br>(.101)                | –.011 ns<br>(.106)          |
|                                    | Ability                              | .114*<br>(.077)              | .114*<br>(.077)             | .113*<br>(.077)             | .113*<br>(.077)                   | .070*<br>(.081)             |
| Dep. Variable, Adj. R <sup>2</sup> | <b>Post Attitude</b>                 | 60.7%                        | 65.3%                       | 67.0%                       | 68.6%                             | 87.6%                       |
| Change in Post Attitude            | ΔR <sup>2</sup>                      | –                            | 4.6%                        | 1.7%                        | 1.6%                              | 19.0%                       |
| Main Effects                       | CFIP                                 | –.120*<br>(.085)             | –.121*<br>(.085)            | –.121*<br>(.085)            | –.125*<br>(.086)                  | –.107*<br>(.086)            |
|                                    | Post Attitude                        | .497***<br>(.056)            | .496***<br>(.057)           | .496***<br>(.057)           | .498***<br>(.057)                 | .500***<br>(.031)           |
| Control Variable                   | Gender                               | .060 ns<br>(.130)            | .060 ns<br>(.130)           | .060 ns<br>(.130)           | .058 ns<br>(.130)                 | .045 ns<br>(.130)           |
| Dep. Variable, Adj. R <sup>2</sup> | <b>Likelihood of Adoption</b>        | 26.0%                        | 25.9%                       | 25.9%                       | 25.5%                             | 25.5%                       |
| Overall Goodness of Fit            | (χ <sup>2</sup> , (df)) <sup>b</sup> | 704 (222)                    | 537 (219)                   | 560 (218)                   | 630 (217)                         | 1734 (216)                  |
|                                    | CAIC                                 | –545.3                       | –620.0                      | –756.9                      | –729.5                            | 299.1                       |

AF = Argument Frame; II = Issue Involvement, CFIP = Concern for Information Privacy

<sup>a</sup> Path Coefficient<sup>(statistical significance)</sup> (Standard. Error)

<sup>b</sup> The χ<sup>2</sup>-statistic is significant at the p<.001 level in all models, when a well-fit model should yield a non-significant result. However, many researchers have noted that the χ<sup>2</sup>-statistic is sensitive to large sample sizes (Froehle and Roth 2004; Hu and Bentler 1999), and the χ<sup>2</sup>/df test yields values of less than 3 in most models.

\*\*\* = p < .001; \*\* = p < .01; \* = p < .05; † = p < .10

**Table 5. Summary of Hypothesis Testing Results**

| Hypothesis | Description   | Result        | Tested in  |
|------------|---|---------------|------------|
| H1         | Positively framed arguments will generate more favorable attitudes toward EHR use           | Supported     | Model 2    |
| H2         | Issue Involvement will generate more favorable attitudes toward EHR use                     | Supported     | Model 2    |
| H3         | Issue Involvement positively moderates the relationship between argument frame and attitude | Not Supported | Model 3    |
| H4         | CFIP positively moderates the relationship between argument frame and attitude              | Supported     | Model 4    |
| H5         | CFIP moderates the relationship between argument frame × involvement and attitude           | Supported     | Model 5    |
| H6         | Post-attitude is positively associated with likelihood of adoption (opt-in intention)       | Supported     | Models 1–5 |
| H7         | CFIP is negatively associated with likelihood of adoption (opt-in intention)                | Supported     | Models 1–5 |

hypothesis 7 is also supported (see Table 5 for a summary of results). The model explains a substantial amount of variance in the dependent measures, particularly post-manipulation attitude (i.e., post-manipulation attitude, adjusted  $R^2 = 87.6$  percent; likelihood of adoption, adjusted  $R^2 = 25.5$  percent).

**Post Hoc Analysis**

To obtain further insight into the interactions, particularly those that are contrary to predictions, we conduct a series of *post hoc* analyses. As Page et al. (2003, pp. 62-64) note, a significant three-way interaction suggests that one of the two-way interactions is different or has a different pattern when the third factor is incorporated. Further, they suggest that discovery of significant three-way interactions calls for *post hoc* investigations within the significant interaction. Because we also hypothesized significant two-way interactions and found  $AF \times II$  to be nonsignificant when the three-way interaction was not present, we are directed to interpret main effects (Page et al. 2003, p. 62) through a closer scrutiny provided by a *post hoc* analysis. These analyses are discussed below.

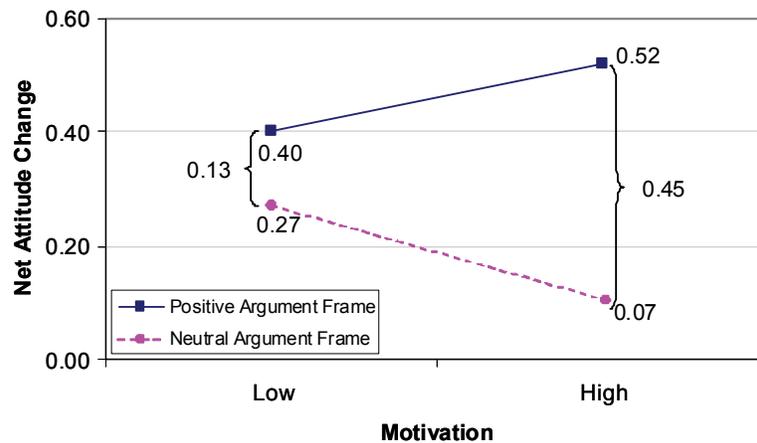
*Argument Frame × Issue Involvement:* We hypothesized that the framing of arguments would influence the relationship between issue involvement and attitude but found no statistical support for this assertion; however, in Model 5 where the three-way interaction was also included, the  $AF \times II$  two-way interaction became significant, although opposite to the direction predicted. This suggests that the relationship is more complex than simply a two-way interaction. Because both AF and II are significant as main effects, Page et al. (2003, p. 62) suggest that the two-way relationship be explored in further detail. To do this, we categorized the sample into subgroups based on their position in the  $AF \times II$  matrix, adopting a median-split for II and using ANOVA with planned *post hoc* multiple comparisons. We use attitude

change (AC) as the variable of interest in this *post hoc* analysis.<sup>12</sup>

Overall, the ANOVA is statistically significant ( $F(3,317) = 4.15, p < .01$ ). Positive AF elicits much greater attitude change than neutral AF (see Figure 2). In particular, notice the significant difference between attitude change when AF is neutral versus when AF is positive (.13 and .45), suggesting that persuasion can occur in people when positively framed arguments about the value of EHRs are presented under conditions of both low and high II.

*Argument Frame × CFIP:* As noted above, the interaction of AF and CFIP is significant and positive in isolation but negative when included in the full model. To further explore these effects, we create a group variable based on AF (positive/neutral) and CFIP (privacy fundamentalists [high]/privacy unconcerned [low]) and classify each subject accordingly. Using independent sample t-tests, Figure 3 shows a small difference in attitude change under *low* CFIP ( $AC_{neutral} = .23$  versus  $AC_{positive} = .31$ , not significant) and a large disparity under *high* CFIP ( $AC_{neutral} = .20$  versus  $AC_{positive} = .57, p < .05$ ). These results suggest that when concerns about privacy are high, only positive argument frames will elicit persuasion. When CFIP is low, the strength of the argument frame is less important for persuasion to take place. On the other hand, when motivation interacts with  $AF \times CFIP$ , the effect changes and high II seems to counter some of the effect of CFIP.

<sup>12</sup>Because we control for pre-manipulation attitude in the structural model, we essentially measure attitude change even in the prior analysis. Yet, conceptually and theoretically it does not make sense that attitude change influences intentions; rather, post-manipulation attitude is the determinant. Since we do not include LOA in this *post hoc* analysis, attitude change (the difference between pre- and post-manipulation attitude) is the appropriate dependent variable here.



**Note:** Attitude change represents the difference between pre- and post-manipulation attitudes about the use of EHRs. The attitudes were measured on three 7-point semantic differential scales anchored at 1 and 7 (bad-good, foolish-wise, unimportant-important).

**Figure 2. Interaction Effect of Issue Involvement and Argument Frame on Attitude Change**

*Argument Frame  $\times$  Issue Involvement  $\times$  CFIP:* The interaction of CFIP with AF  $\times$  II was significant and positive ( $\beta_{AF \times II \times CFIP} = .629, p < .001$ ). A more detailed investigation of endpoints provides useful insights into this complex relationship (details are provided in Appendix C).

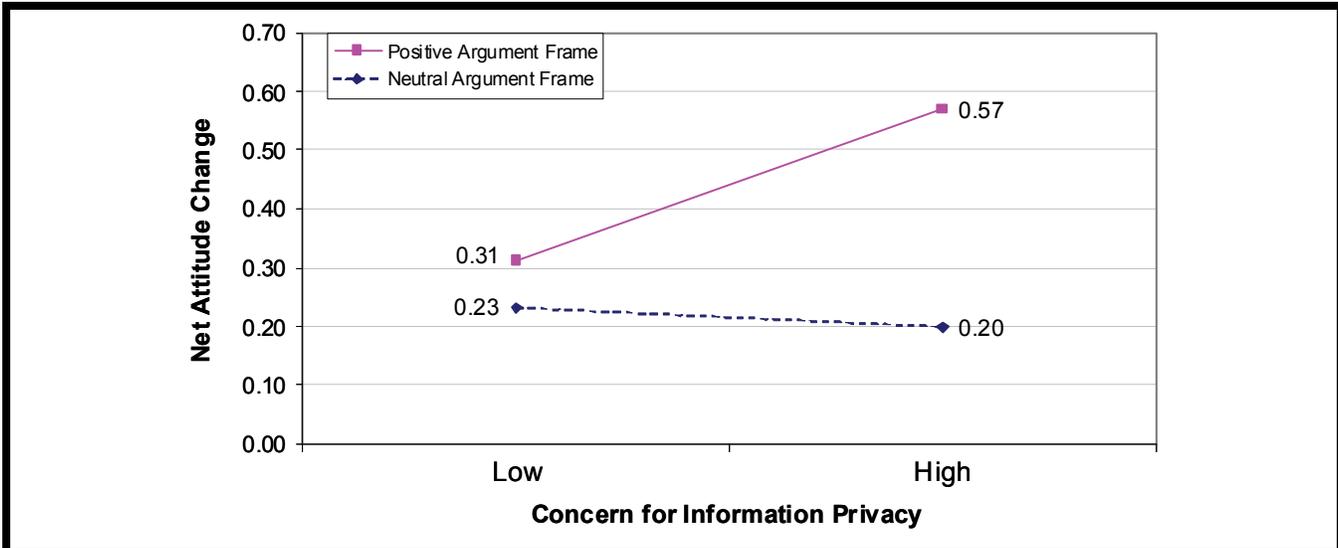
## Discussion

Overall, results provide empirical support for the core hypotheses proposed in this research. Argument framing, issue involvement, and concern for information privacy are all important influences on individuals' attitudes toward the use of EHRs both as main effects and as interactions with each other. We further find that attitudes and concern for information privacy influence the likelihood that the individual will opt-in to making his/her health-related data available in a digital artifact. While we were unable to collect actual behavioral data related to the opt-in decision, we suggest that this is an important area for future research. Much work remains with respect to the interrelations between privacy, attitudes and beliefs, and actual behavior. This, coupled with the increasing prevalence of volitional (versus mandated) information systems, offers numerous research opportunities.

As noted earlier, the interaction term AF  $\times$  II exhibited counter-intuitive behavior. In Model 2, the interaction term was nonsignificant but in model 5, it became significantly

negative. One explanation for the nonsignificant result is that the motivated subjects have reason to believe in the value of the use of EHRs and therefore respond favorably to *all* messages, irrespective of whether they are positively framed. It is also possible that the highly motivated individuals would have been previously exposed to the positively framed arguments and in many cases may be more familiar with the source, thus the endorsement may not have been as striking. However, the *post hoc* examination yielded other interesting insights. Following the median split analysis, we learned that there was a significant difference in attitude change but only under conditions of positive AF. One explanation for this is that it is easier to persuade highly involved individuals of the value of EHRs than it is to persuade weakly involved individuals. It can be argued that high II individuals *want* to believe in the value of EHR use, while low II individuals need to be persuaded by more compelling arguments. This may be due to a lack of understanding, or a misunderstanding, of the uses of EHRs by low II respondents. It may also be the case that the uninformed are unnecessarily concerned about functions and features of EHRs, which may or may not be grounded in fact.

A second explanation can be offered by insights that the ELM brings. As noted, elaboration is a function of both ability and motivation and if one or both factors are low, a peripheral route of persuasion may be acting. In this particular case, we found that attitude change was only significant when AF was



**Figure 3. Effects of CFIP on the Relationship Between Argument Frame and Attitude Change**

positive. Because low II subjects are less motivated to elaborate, a peripheral route of persuasion is the more likely route to be taken, thus only those messages that have source credibility should yield changes in attitudes, which is what our results reveal. With high II subjects, elaboration is more likely to be extensive, thus the content within the messages is more relevant. Therefore, the neutral AF should have less impact—consistent with what our results suggest.

This analysis also revealed that highly involved individuals had more favorable pre-manipulation attitudes toward the use of EHRs, thus their relative increase in attitude change may not have been as great as those whose pre-attitude was lower.

The negative interaction term that resulted in model 5 may simply be an artifact of complexity of the model when a three-way interaction term is included, but it may also suggest that when CFIP is included in the model, as II increases, the effect of argument framing diminishes. For example, for heavy users of healthcare services, the magnitude of attitude change is less dependent on the framing of the arguments.

Relative to privacy concerns, we find that most respondents, even those with higher than average concerns for privacy, react favorably to positively framed arguments. This provides some evidence that privacy concerns, while a salient barrier, may not be enough to halt the acceptance of electronic health records; a finding that has significant practical implications. Our results demonstrate that across the board, positive argument frames elicit greater attitude changes. Even when CFIP is very high, positive AF messages generate more positive

attitudes. This is encouraging since it demonstrates that with proper messaging, attitudes toward EHR use can improve (for a more detailed explanation and interpretation of the *post hoc* analysis, see Appendix C).

Finally, prior literature suggests that elaboration requires that an information processing activity takes place in which both motivation and ability are necessary and our results confirm this: we find that ability is positively related to attitude change. Although we did not propose or test any interaction effects for ability, additional research may be warranted with respect to how intelligence/ability interact with CFIP and the effect that this has on intentions. In Table 6, we acknowledge additional limitations of the study and the directions for future research they suggest (see Table 6).

## Implications and Conclusion

[The next iteration of the Nationwide Health Information Network (NHIN) should give] people the capability to decide how they view, store and control access to their own information. A person could say how that information flows to specific entities or completely block the flow of information [*statement from Dr. Robert Kolodner, national coordinator for health information technology*] (in Ferris 2007, p. 1).

Spurred by government intervention and a looming realization that the efficiency and effectiveness of the entire health system needs to be overhauled, digital technologies will soon

**Table 6. Limitations and Suggestions for Future Research**

| Limitation   | Suggestion for Future Research   |
|--|--|
| Although we attempted to educate the subject about EHRs, it is possible that some respondents did not understand the technology. Because EHRs are not part of the lexicon of most people, there is a small chance that some people formed their own mental construal of the artifact which was not accurate.   | Use subjects who are familiar with EHRs.   |
| People's responses to privacy-based survey questions may not align with actual exhibited behaviors—particularly if there is a reward (e.g., possibility of improved health) associated with the behavior (Berendt et al. 2005).  | Because we do not examine actual behavior in this study, future researchers should allow for the possibility that stated intentions may be more conservative than actual actions.  |
| We did not incorporate many technology acceptance-based constructs.  | Future research should incorporate other technology acceptance-based constructs such as perceived usefulness and measure actual behavior.  |
| Although our operationalization of II mitigated some of the concerns with the construct such as the assurance that the manipulation has taken effect, we may have also introduced new issues. For example, the classification based on wellness and frequency of health services use may not truly represent the involvement that an individual <i>feels</i> relative to the impact that EHR use may have. | Issue involvement is a complex construct and as discussed earlier, findings have been mixed when it is used in ELM studies (Maheswaran and Meyers-Levy, 1990). Future studies should evaluate various forms of II and determine the most suitable metric for the context of the study. |
| We used a single item measure for likelihood of adoption for which we are unable to assess reliability.  | As noted by Wanous et al. (1997), single item measures are acceptable when there is little room for misinterpretation by the respondent, but future research should employ a multi-item scale.   |
| We included only those subjects who had access to the Internet.  | Use a sample that is generalizable to a wider demographic.   |
| Exclusion of negatively framed arguments.  | Test negatively framed arguments.  |

become important aspects of the business of healthcare (Agarwal and Angst 2006). Inevitably, the development and application of technology is accompanied by public concerns about its implications for information privacy. When the technology is focused on highly sensitive domains such as health, escalating levels of controversy are not surprising; there are very strong, visceral feelings about this type of highly personal data. Although the literature is replete with anecdotal and opinion poll data related to privacy and medical information, limited scholarly research focuses on discussing information privacy in the context of electronic health records. This research was motivated by a need to illuminate the public debate surrounding the potential obstacles imposed by privacy concerns in EHR uptake and diffusion. Our findings yield several important implications for research and practice.

### **Implications for Research**

While the ELM framework has been used for investigating attitude change extensively, very little work has incorporated intentions into the ELM framework (for a recent exception, see Bhattacharjee and Sanford 2006). We extended the ELM framework in two ways: by incorporating concern for infor-

mation privacy and by including intentions in the overall nomological network. Consistent with prior research, we find a significant relationship between attitudes toward the use of EHRs and intentions to opt-in at some point in the future. However, the variance explained in this relationship was much lower than the variance explained by the predictors of attitude (.26 versus .88, respectively). One plausible explanation is that the ELM almost exclusively focuses on attitudes (Petty and Cacioppo 1986); therefore, its explanatory power as a theoretical lens when intentions are included is less pronounced. Another interesting explanation recently argued by Bhattacharjee and Sanford (2006) is that, depending upon the route of persuasion, attitudes may not be the only mediating factor to influence an individual's intentions. They posit that other behavioral factors, such as perceived usefulness, will mediate the relationship between some commonly used ELM antecedents and intentions.

It is very likely that concern for privacy of all types of personal information will escalate in the near future as more and more information is digitized. The construct CFIP has been used in a limited fashion in IS research and, as yet, has not been widely tested in other disciplines. We focused on the influence of the overall CFIP construct, but more work needs to be done to tease out the individual contributions of

its four underlying factors. The research reported here could be extended by examining the impact of collection, secondary use, errors, and unauthorized access as individual discrete latent components that, by themselves, have unique impacts on attitude change. Prior work suggests that errors in medical data can hold grave consequences and interesting insights are likely to emerge from exploration at a more nuanced level.

The compelling call for research investigating the antecedents of attitude and persuasion has never been fully addressed. After more than two decades, researchers are still using most of the original antecedents proposed by Petty and Cacioppo (1981). This study investigates the impact of privacy concerns on one's beliefs about the use of technology. With the increased ubiquity and availability of the Internet, and the fact that people are relying on the web to transfer and store much more personal data, researchers need to begin including privacy into models of technology adoption and attitude toward technology. The ramifications of loss of privacy are significant. Researchers have identified consequences ranging from stress (Stone-Romero et al. 2003) and negative feedback about competence (Margulis 2003) to very severe long-term consequences such as dehumanization and failure to integrate into ordinary life (Goffman 1961) to life or death (e.g., a Jewish male posing as a Christian in Nazi Germany; Stevens 2001). As Margulis (2003) says, "When privacy is invaded or violated, it is lost."

### **Implications for Practice**

From a practical standpoint, this research focuses on a crucial topic in need of attention if the goal of electronic health records for most consumers in the United States is to be met by 2014. First, we introduce the idea that EHR adoption by health care providers such as hospitals and physician practices may not achieve the desired outcome of national adoption by consumers. To the extent that patients may demand that their records remain nondigitized due to privacy concerns, they have a central role to play in the diffusion process. Our results show that messages can be crafted to elicit changes in attitudes about the use of electronic health records, even under high concerns about privacy. Second, we have attempted to unravel which factors drive attitudes and intentions with respect to EHRs. The finding that under most conditions, it is possible to persuade people and improve their attitudes toward use is striking and likely to be of significant value to policy makers. For example, we provided a very limited amount of education about EHRs and, even so, were able to persuade people by presenting them with strong, text-based messages. This suggests that a national educational program designed to demonstrate the benefits of EHR use has the

potential to improve the uptake of EHR technology significantly. It also is apparent that a one-size-fits-all approach to messaging is unlikely to have universal appeal or success. Not only is there great variance in privacy concerns, but these concerns impact attitude in different ways. Some of this variance can be explained through the framework that ELM provides but much work remains to be done to identify what variables resonate the most with a specific demographic.

From an employer's perspective, this research provides insight related to the management of employee health programs such as wellness initiatives supported via health portals. Recently many employers have started to offer personal EHR access to employees, however, some have questioned whether the employer is the appropriate trusted entity (Angst 2005). Our results demonstrate that ensuring privacy remains a critical aspect of uptake for all employees, but that some employees may require more powerful persuasion techniques. Future research might examine the impact of financial incentives or mandates on the opt-in decision.

Finally, there is also an issue here that propels the EHR beyond other information systems in terms of importance to the public. While the digitization and aggregation of financial data, for example, has limited value from a public welfare standpoint, the aggregation of near real-time health data could have tremendous public health implications, such as the identification and early detection of diseases. Thus, a deeper understanding of the balance between individual privacy and security and the common good associated with opting in to a national system is crucial.

### **Conclusion**

Our choice of a privacy-focused lens to investigate attitudes toward and adoption of electronic health records was motivated by three primary considerations. First, opinion-poll data would lead one to believe that privacy concerns will negatively affect attitudes toward EHRs to such a degree as to render any national efforts unachievable. We sought to demonstrate that through proper messaging and education, attitudes can be changed, even in the presence of great privacy concern. Second, there has been tremendous media attention focused on the privacy of information in a variety of different domains other than health such as financial data. Typically the discourse has highlighted negative consequences such as breaches of security, fraud, or theft of information. This study is a first attempt at investigating whether these concerns are unfounded or if people weigh the costs and benefits of potentially compromising some degree of privacy for the possibility of getting better results (Dinev and Hart

2006). This so called “privacy calculus” (Culnan 1993; Laufer and Wolfe 1977) is a cognitive process that people undergo as a means of assessing future ramifications from choices made today (e.g., if one chooses to opt-out of an EHR, could this result in negative consequences in the future?). The final reason we explored privacy is the belief that privacy concerns are the single greatest threat to successful rollouts of EHRs. Considerable work remains with respect to the investigation of the variability in beliefs related to privacy concerns and, in particular, whether public opinion will impact the use of information technology that has been developed to store and maintain personal information.

On the basis of published research, it is also abundantly clear that there is limited knowledge related to the role that *patients* play in the health information technology arena, especially as it relates to patient involvement in the delivery, monitoring, and dissemination of information related to their health care. This study sought to fill some of these gaps in current knowledge. Thus, it can serve as a foundation not only for making decisions related to EHR design, adoption, and implementation, but also as a basis for future research.

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# Appendix A

## Measures

### Argument Framing

#### Positively Framed Manipulation

1. Rates of serious errors fell by 55% in one study by using computerized medical system (Partners HealthCare System, Brigham and Women's Hospital – Bates 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 (Birkmeyer and Dimick 2004).
3. Between 44,000 and 98,000 Americans die in hospitals each year as a result of medical errors (Institute of Medicine – Kohn et al. 2000).
4. "By computerizing health records, we can avoid dangerous medical mistakes, reduce costs, and improve care," (President George W. Bush, State of the Union Address, January 20, 2004).
5. Existing technology can transform health care...if all Americans' electronic health records were connected in secure computer networks...providers would have complete records for their patients, so they would no longer have to re-order tests (Newt Gingrich and Patrick Kennedy, *New York Times*, May 3, 2004).
6. By 2002, only 17% of US primary care physicians used an EHR system compared with 58% in the United Kingdom and 90% in Sweden (American Medical News – Chin 2002).

#### Neutrally Framed Manipulation

1. "I have been using a software program for 2 years for managing my health records and it has really helped me" (electronic health record user).
2. "Electronic health records are the wave of the future" (anonymous user).
3. Most students say they would like to use electronic health records to maintain their health information (yahoo weblog 2003).
4. The US Government is serious about promoting the use of electronic health records.

#### Manipulation Check

1. Taken as a whole, how trustworthy are the sources of the information posed above, relative to the message's content?
2. Taken as a whole, how reliable are the sources of the information posed above, relative to the message's content?

#### Likelihood of Adoption (Opt-In)

I would like to begin using electronic health records...

1. I will never use them
2. Not sure I will ever use them
3. Sometime in the future
4. In the very near future
5. As soon as possible
6. I am already a user

#### Semantic Differential Scale – Assessment of Attitude (Pre and Post-Manipulation)

With what you now<sup>†</sup> know about electronic health records, please answer the following question. What are your feelings about electronic health record usage by DOCTORS and HOSPITALS? (1 to 7 scale)

- Bad to Good
- Foolish to Wise
- Unimportant to Important

<sup>†</sup>The word *now* was only used in the post-manipulation attitude assessment

#### Concern for Information Privacy

Here are some statements about *personal information*. From the standpoint of personal privacy, please indicate the extent to which you, as an individual, **agree or disagree** with each statement by circling the appropriate number (1 = strongly disagree; 7 = strongly agree).

### Collection

- C1. It usually bothers me when health care entities ask me for personal information.
- C2. When health care entities ask me for personal information, I sometimes think twice before providing it.
- C3. It bothers me to give personal information to so many health care entities.
- C4. I'm concerned that health care entities are collecting too much personal information about me.

### Errors

- E1. All the personal information in computer database should be double-checked for accuracy—no matter how much this costs.
- E2. Health care entities should take more steps to make sure that the personal information in their files is accurate.
- E3. Health care entities should have better procedures to correct errors in personal information.
- E4. Health care entities should devote more time and effort to verifying the accuracy of the personal information in their databases.

### Unauthorized Access (Improper Access)

- UA1. Health care entities should devote more time and effort to preventing unauthorized access to personal information.
- UA2. Computer databases that contain personal information should be protected from unauthorized access no matter how much it costs.
- UA3. Health care entities should take more steps to make sure that unauthorized people cannot access personal information in their computers.

### Secondary Use

- SU1. Health care entities should not use personal information for any purpose unless it has been authorized by the individuals who provided the information.
- SU2. When people give personal information to a company for some reason, the company should never use the information for any other reason.
- SU3. Health care entities should never sell the personal information in their computer databases to other health care entities.
- SU4. Health care entities should never share personal information with other health care entities unless it has been authorized by the patient who provided the information.

## Appendix B

### Sampling Descriptives and Measurement Validation

Of the total sample of 366, there is nearly double the number of females as males. We tested for significant differences in descriptive variables between males and females and found that age, education, income, computer experience, and computer skill were all reported higher in males than in females ( $p < 0.05$  in all cases). Self-assessed health and presence of a chronic illness were not significantly different between males and females. Based on these initial analyses, we control for gender in the structural model.<sup>13</sup>

Recall that attitude is measured pre- and post-manipulation using semantic differential scales. We first test for an overall difference between pre- and post-attitude while holding all other variables constant and find that post-attitude is significantly greater than pre-attitude ( $M_{pre-att} = 5.054$ ,  $M_{post-att} = 5.413$ ,  $p < 0.001$ ). Next, we tested for convergent and discriminant validity using factor analysis. Using a cutoff value of .70 for internal consistency and loadings (Fornell and Larcker 1981), a few items were borderline (CFIP collection 0.692; overall health 0.683; education level 0.661). Results from structural analysis including and without these items were identical, therefore we retained them for the final analysis. Cronbach alpha values, representing the internal consistency within constructs, was acceptable for our focal constructs with scores ranging from 0.72 to 0.93 (see Table B1).

Finally, we fit a measurement model to the data. This yielded acceptable goodness of fit indices. Specifically, we obtained a comparative fit index (CFI) = .91, CFI > 0.90 is recommended (Jiang and Klein 1999); adjusted goodness of fit (AGFI) = 0.5, AGFI > 0.80 is recommended (Gefen et al. 2000); root mean square residual (RMSR) = 0.07, RMSR < 0.10 is recommended (Chang et al. 2005), and root mean square error approximation (RMSEA) = 0.07, RMSEA < 0.08 for a good fit (Browne and Cudeck 1992). Because the measurement model displayed an

<sup>13</sup>To ensure that random assignment had been successful, we compared the two treatment groups on a variety of variables. Results indicate that there are no significant differences between them. Mean values and associated p-values are as follows:  $Age_{positive} = 47.8$ ,  $Age_{neutral} = 45.8$ ,  $p = .205$ ;  $Gender_{pos/neu} = 0.31/0.39$ ,  $p = .156$ ;  $Education_{pos/neu} = 4.40/4.54$ ,  $p = .463$ ;  $ComputerExperience_{pos/neu} = 13.4/13.1$ ,  $p = .706$ ;  $ComputerSkill_{pos/neu} = 3.57/3.64$ ,  $p = .518$ ;  $Health_{pos/neu} = 2.37/2.30$ ,  $p = .501$ ;  $EHR\_Knowledge_{pos/neu} = 2.02/2.17$ ,  $p = .317$ .

acceptable fit, no modifications were made to the model parameters. All variables were checked for multicollinearity and in all instances the test statistics were within acceptable ranges (tolerance greater than 0.2 (Menard 1995) and VIF less than 10 (Myers 1990)).

Two questions are used to perform a manipulation check: respondents' assessment of the trustworthiness and reliability of the sources of information. Analysis of variance with trustworthiness and reliability as dependent variables and argument frame as a fixed factor indicate that respondents perceived significantly more trust and reliability when AF was positive, confirming that messages had been read and understood as desired (Trust:  $M_{positive} = 5.33, M_{neutral} = 4.51, p < 0.001$ ; Reliable:  $M_{positive} = 5.42, M_{neutral} = 4.40, p < 0.001$ ).

**Table B1. Factor Analysis: Convergent and Discriminant Validity**

| Items                                 | Latent Factor                                      | Component |       |       |       |       |       |
|---------------------------------------|--|-----------|-------|-------|-------|-------|-------|
|                                       |  | 1         | 2     | 3     | 4     | 5     | 6     |
| CFIP (unauthorized access)            | Concern for Information Privacy<br>$\alpha = 0.81$ | 0.90      | -0.07 | 0.13  | 0.03  | -0.09 | 0.07  |
| CFIP (errors)                         |  | 0.84      | -0.14 | 0.19  | 0.05  | 0.01  | 0.12  |
| CFIP (secondary use)                  |  | 0.82      | 0.07  | 0.04  | 0.09  | -0.06 | -0.04 |
| CFIP (collection)                     |  | 0.64      | 0.02  | -0.26 | 0.06  | 0.03  | -0.28 |
| Pre-Attitude (good/bad)               | Pre-Attitude<br>$\alpha = 0.84$                    | 0.03      | 0.82  | 0.25  | 0.00  | 0.10  | -0.09 |
| Pre-Attitude (important/unimportant)  |  | -0.04     | 0.81  | 0.24  | -0.05 | -0.01 | 0.07  |
| Pre-Attitude (foolish/wise)           |  | -0.10     | 0.73  | 0.37  | -0.04 | 0.02  | 0.23  |
| Post-Attitude (good/bad)              | Post-Attitude<br>$\alpha = 0.93$                   | 0.11      | 0.26  | 0.82  | 0.05  | -0.04 | 0.03  |
| Post-Attitude (important/unimportant) |  | 0.05      | 0.32  | 0.79  | 0.05  | -0.04 | 0.05  |
| Post-Attitude (foolish/wise)          |  | 0.06      | 0.38  | 0.67  | 0.05  | 0.10  | 0.15  |
| Number of prescriptions               | Issue Involvement<br>$\alpha = 0.76$               | 0.03      | 0.03  | 0.00  | 0.86  | -0.04 | 0.12  |
| Number of chronic illnesses           |  | 0.06      | 0.02  | 0.10  | 0.82  | -0.01 | -0.02 |
| Number of doctor visits               |  | 0.03      | -0.19 | 0.09  | 0.67  | -0.12 | -0.35 |
| Overall health                        |  | 0.17      | -0.01 | -0.10 | 0.62  | -0.16 | 0.36  |
| Computer experience (years)           | Ability<br>$\alpha = 0.72$                         | 0.04      | 0.06  | -0.02 | 0.00  | 0.86  | -0.14 |
| Computer skill                        |  | -0.09     | -0.03 | 0.07  | -0.17 | 0.78  | 0.24  |
| Education level                       |  | -0.16     | 0.43  | -0.27 | -0.12 | 0.66  | 0.21  |
| Likelihood of adoption                | na   | -0.10     | 0.29  | 0.34  | 0.05  | 0.28  | 0.60  |

## Appendix C

### Post Hoc Investigation of Three-Way Interaction

To test the endpoints in the three-way interaction, we created a group variable based on AF (positive/neutral), II (high/low), and CFIP (privacy fundamentalists [high]/privacy unconcerned [low]),<sup>14</sup> coded each subject accordingly, and conducted independent-samples t-tests between groups (Kwong and Leung 2002). As before, to simplify the presentation of results and their interpretation, we use attitude change as the dependent variable.

Table C1 summarizes the results of the *post hoc* three-way analysis. The right side of the table identifies when a statistically significant difference in attitude change results between two groups. For example, in case 1 ( $AF_{pos}, II_{hi}, CFIP_{hi}$ ), the mean attitude change between pre- and post- is .698 and in case 8 ( $AF_{neut}, II_{hi}, CFIP_{low}$ ), the change is .142, which is a significant difference at the  $p < .01$  level. We discuss these

<sup>14</sup>Due to the fluctuations in percentages of the U.S. population belonging to each of the three privacy categories as noted by Harris Interactive and Westin (2002), we chose not to create our subgroups based on this variable rate but instead split the sample into two equal-sized groups—using only high and low, which is a more conservative approach.

findings and others below. The variance in post-manipulation attitude explained by AF, AF × II, and the controls (pre-manipulation attitude, ability, and gender) is 67.0 percent, with pre-attitude explaining almost 60 percent by itself.<sup>15</sup>

An intriguing finding in the *post hoc* analysis is that attitude change is greater in people with high CFIP but primarily under conditions of positive AF (see Table C1). There are two possible explanations for this. First, people who have strong privacy concerns may be basing their beliefs on unfounded assumptions. For example, they may not understand the true merits of the EHR system, but when they read the positively framed messages, they are easily persuaded. The same may be true of low CFIP individuals but the result may not manifest itself in attitude change because it is already factored into their pre-manipulation response since we found that individuals with low CFIP had a more favorable attitude toward EHR use than high CFIP individuals ( $M_{lowCFIP} = 5.20, M_{highCFIP} = 5.00, p < 0.10$ ).

A second explanation is that the results of the three-way interaction are an artifact of issue involvement interacting with AF and CFIP. We provide some interpretation of this three-way interaction but it is highly complex and warrants further investigation. As suggested, it may be true that under conditions of high CFIP only high II people are persuadable (because they want to believe in the technology), but at the same time these individuals perceive more control over events, in which case the role played by CFIP diminishes.

One important pattern in Table C1 is that positive AF almost uniformly results in greater attitude change than neutral AF, even when CFIP and II vary, further affirming that the strength of the argument influences persuasion. In addition, the top three rankings of the cases provide additional insight into central versus peripheral routes of persuasion. As noted, in all three cases, AF is positive, which may suggest that elaboration takes place only when the message is worthy of considered thought. More importantly, in two of the cases, CFIP is high, and intuitively one would assume that indifferent feelings about CFIP would yield greater changes in attitude. Furthermore, II is high in two of the three cases, suggesting that in situations when people have strong feelings about something—as manifest here in high CFIP and/or high II—they will carefully evaluate the issues and undergo a highly considered decision process, which is indicative of a central processing route. An alternative explanation is that embedded (Pomerantz et al. 1995) people already have well-formed beliefs and therefore the framing is of less consequence for persuasion. Finally, Maheswaran and Meyer-Levy (1990) highlight a third plausible explanation in their study. They found that when involvement was low, people relied upon peripheral cues and in fact inferred that they agreed more with positively framed arguments simply because they were associated with positive outcomes. The implication of this is that messaging is likely to have the most impact when people are “involved” with the issue, that is, they are either very concerned about privacy or are highly motivated to elaborate.

**Table C1. Summary of Three-Way Interaction Results**

| Rank<br>Δ Att. | Argument<br>Frame | Issue<br>Involvement | CFIP | N  | Mean<br>Attitude<br>Change <sup>a</sup> | Significant Difference in Attitude Change |    |    |    |    |    |    |    |
|----------------|-------------------|----------------------|------|----|---|---|----|----|----|----|----|----|----|
|                |                   |                      |      |    |   | 1   | 2  | 3  | 4  | 5  | 6  | 7  | 8  |
| 1              | Positive          | High                 | High | 47 | 0.698                                   |   | ns | ns | †  | *  | ** | *  | ** |
| 2              | Positive          | Low                  | High | 43 | 0.634                                   | ns  |    | ns | ns | ns | ns | †  | *  |
| 3              | Positive          | High                 | Low  | 27 | 0.489                                   | ns  | ns |    | ns | ns | ns | ns | †  |
| 4              | Neutral           | Low                  | Low  | 44 | 0.423                                   | †   | ns | ns |    | ns | ns | ns | ns |
| 5              | Positive          | Low                  | Low  | 58 | 0.396                                   | *   | ns | ns | ns |    | ns | ns | ns |
| 6              | Neutral           | Low                  | High | 35 | 0.271                                   | **  | ns | ns | ns | ns |    | ns | ns |
| 7              | Neutral           | High                 | High | 9  | 0.211                                   | *   | †  | ns | ns | ns | ns |    | ns |
| 8              | Neutral           | High                 | Low  | 20 | 0.142                                   | **  | *  | †  | ns | ns | ns | ns |    |

<sup>a</sup>Change in Attitude was calculated by partialing out the impact of pre-attitude. This was accomplished by regressing post-attitude on pre-attitude and saving the unstandardized residuals. The residuals were then used as the dependent variable, thus isolating the impact of Argument Frame, Issue Involvement, and CFIP.

\*\*\* =  $p < .001$ ; \*\* =  $p < .01$ ; \* =  $p < .05$ ; † =  $p < .1$

<sup>15</sup>We ran the model excluding Pre-Attitude, but including AF, MOT, ability, and gender and the adjusted R<sup>2</sup> was 11%. When pre-attitude was added back to the model, the variance explained jumped to 65.3%, thus we conclude that there is some shared variance explained by pre-attitude and the other variables, that is, (Controls = 60.7%; Controls + AF + MOT = 65.3%; Ability + Gender + AF + MOT = 11%).

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