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# Social Influence on Health IT Adoption Patterns of the Elderly: An Institutional Theory Based Use Behavior Approach

Karoly Bozan[a]*, Bill Davey[b], Kevin Parker[a]

[a]*Idaho State University, 921 South 8th Avenue, Pocatello, ID, 83209, U.S.A.*
[b]*RMIT University, GPO Box 2476, Melbourne, VIC 3001 Australia*

**Abstract**

This study aims to investigate and improve understanding of the social forces that influence patient portal use behavior among the elderly. Underpinned by institutional theory and using the Unified Theory of Acceptance and Use of Technology, our proposed model examines the three social environmental factors of normative, mimetic, and coercive forces within the health Information Technology (HIT) context. The proposed model was tested using an empirical study of 117 subjects in the United States. Using the partial least squares method, the study found that coercive and mimetic pressures significantly influence patient portal use behavior. These findings signal that older people follow their providers' advice and follow the behavior of a respected, higher-status peer from their network. Normative pressure was found to be an insignificant force, which indicated that older people do not follow the bandwagon effect.


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*Keywords:* Health IT Adoption; Institutional Theory; Unified Theory of Acceptance and Use of Technology (UTAUT); Health IT Usage; Elderly Citizens

## 1. Introduction

Improving patient outcomes through better provider-patient communication[1,2] is gaining attention in the healthcare industry. Healthcare providers are increasingly relying on patient portals, secure online websites that give

* Corresponding author. Tel.: +1-330-687-2752
*E-mail address:* bozakaro@isu.edu


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patients access to their personal health information from anywhere with an Internet connection.[3] Patient portals are designed to communicate summaries of recent visits, medications, immunizations, allergies, and lab results (HealthiT.gov). Some patient portals are also capable of handling prescription refills, scheduling non-urgent appointments, accepting payments, downloading and completing forms, and viewing educational material.[4] These uses of technology are critical in addressing the problem of rapidly aging populations in most countries.[5]

Electronic health records (EHR) use is on the rise. About 80% of office-based physicians make use of EHRs,[6] and most of them (70%) are committed to participate in the "meaningful use" based monetary incentives offered in the United States.[7] One of the Stage 2 Core Set objectives for meaningful use is to "provide patients the ability to view online, download, and transmit their health information". Therefore, providers with EHR systems are mandated to provide their patients with access to their own health information over the Internet through a secure online portal. Similar initiatives are being introduced in several other countries as they try to both improve health outcomes and strive for efficiencies in their health systems.[8]

Patient portal acceptance and use has been the basis of numerous studies.[4,9-14] The existence of chronic conditions was found to be one of the factors that potentially affected the rate of acceptance and use of patient portals.[4,9,15] Contrary to this, patient age is found to be negatively correlated with patient portal adoption and use, especially among older patients.[12-14] Approximately 20% of the US population will be over the age of 65 years in the next decade due to an increase in average lifespan. It is also known that doctor visits and medical spending increase during the final years of life[16]; some studies find a quarter of an individual's medical spending happens in the last-year-of-life.[17] Therefore the older patient population is the group who would get the most use out of patient portals, yet they are less likely to use them.

Although a number of empirical studies examined the factors to better understand consumer health information technology (CHIT) acceptance and use, they rely primarily on technology acceptance theories.[18] The variety of antecedents in the competing models concluded that older patients are less likely to accept CHIT and make use of online health information due to less comfort, efficacy, and control.[10,19] However, one of these antecedents is social influence, also called subjective norm,[20-22] and has not been explored in regards to older patients. Elderly patients are likely to conform to the attitudes, norms, and beliefs those around them.[23] Therefore social influence, which may motivate the elderly to adopt and use a patient portal, should be studied in more detail beyond the technology acceptance theories.

In this empirical study, we argue that elderly patients form a belief about patient portal acceptance and use based on the influence of those peers they respect. We propose a conceptual model based on institutional theory's driving forces as a precursor of the driving forces of behavioral intention and use behavior within the Unified Theory of Acceptance and Use of Technology (UTAUT) Model. Data collected from the elderly in different social settings provides the basis of our empirical evidence that normative, coercive, and mimetic forces significantly impact older patients' use behavior toward a patient portal.

In the next section we provide an overview of the theoretical background and the conceptual model development, followed by the methodology and data analysis. Finally, the results are discussed and managerial and theoretical implications are presented, followed by limitations, further directions, and conclusions.

## 2. Theoretical background and conceptual model

### *2.1. Theoretical background*

An individual's beliefs about technology acceptance and use are driven by two major determinants: individual beliefs and social factors. The social pressure to engage in an activity is referred to as subjective norm.[24] Driven by the motivation to comply, an individual develops beliefs about the extent to which other people who are important to them think they should or should not perform.[25] In the technology domain, influence of peers and superiors is found to be a strong determinant of this belief.[26,27] This study is not exploring or hypothesizing any relationship among the individual beliefs or social factors; rather it is approaching the social factors from the basis of institutional theory.

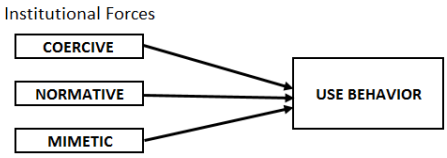
Technology use among individuals has been explored through the characteristics of individuals and organizations. These studies found that institutional characteristics show strong influence on technology use.[28-30] Institutional theory has been developed and applied in the organizational context.[31-33] However, organizations

operate at the local, interpersonal relationships level with a network of individuals.[34] Therefore, our study will empirically investigate the effect of social factors of institutional theory on patient portal use by the elderly. This study will expand the theory's applicability through theoretical and managerial implications

### *2.2. Conceptual model and hypotheses*

This study proposes a conceptual model (Figure 1.) drawn upon the institutional theory[33] and the UTAUT Model.[45] The model seeks to better understand how the institutional forces influence patient portal use behavior among the elderly. Social forces are a major precursor in almost every major technology acceptance models, yet none of them investigated them on a more granular level. This study argues that use behavior among older users is affected by social factors that consist of the three institutional forces.

Figure 1: Conceptual Model




The first studies of institutional theory identified three mechanisms that promote structure and process similarities, namely, coercive, normative, and mimetic.[33,34]

#### *2.2.1. Use behavior*

Actual use, intention to use, and behavior are the most common dependent variables in the technology acceptance literature. Behavior is specific or general action, whose prediction is of interest in the particular model.[35,36] This dependent variable is often preceded by the subjective norm, which is an individual's perception of influencers' approval or disapproval of the specific or general target behavior. The antecedents of use behavior are often linked to the subjective norm or social influence, hence our choice for the dependent variable. For the purposes of this study, we define use behavior as the degree to which a user regularly uses the system for the purposes it is designed.

#### *2.2.2. Coercive pressure*

Both the formal and informal pressures on an individual (social actor) by a more powerful individual (actor) to adopt the same practices, behaviors, or attitudes is defined as coercive pressure.[33] A number of sources may generate formal or informal coercive pressure on the organizational level, such as regulatory agencies, customers, suppliers, and other powerful actors.[37]

On the individual level in the context of healthcare, regulatory pressure is often present for many facets of care. However, for the purposes of this study of patient portal acceptance, we investigate the pressure the provider may put on the patient to use the patient portal. Physicians, for example, as more powerful actors may informally pressure patients to check on their portal for health-related communication and ultimately to increase the effectiveness of care. Hence, we hypothesize:

H1: Patients who perceive higher coercive pressure are more likely to use a patient portal.

#### *2.2.3. Normative pressure*

Institutional theory posits that if an action, behavior, or belief is taken by a large enough group of actors, a social actor is more likely to copy that action. This action of copying is not mandated, nor conscious, but rather becomes the norm, the "right" way.[38,39] As a social factor for adopting a behavior or belief, normative pressure results in discord if peers whose opinion is valued are using an innovation.[33,40]

Older patients with a large enough network may often discuss their physical health with each other. If others, whose opinion is valued, reference the use of patient portals, an individual is more likely to consider trying one out. This effect has been described generally by Abrahamson as theories of fads.[57] Hence, we posit:

H2: Patients who perceive higher normative pressure are more likely to use a patient portal.

*2.2.4. Mimetic pressure*

DiMaggio and Powell (1983) proposed mimetic pressure as a phenomenon, describing the conscious and voluntary act of copying behaviors of those with higher status and success. This copying behavior is driven by the belief that actions of more successful and respected actors result in positive outcomes. It is also believed that copying behavior of respected members of a network is safer than experimenting new, "untested" behavior.[37]

Older people are aware of their health status and more actively seek information about their health.[41] If a trusted friend refers to their patient portal as a reliable source of information, those who have not adopted a portal are more likely will try and possibly use it. Therefore, we hypothesize:

H3: Patients who perceive higher mimetic pressure are more likely to use a patient portal.

*2.3. Control Variables*

Demographic variables, such as age and gender**,** have been found to have significant effect on social factors studies.[42,43] Morris et al.[58] found that older individuals are more susceptible to social influences, yet they are more cautious before they decide on an action.[44] Women are found to be more perceptive regarding others opinion than men.[45] This study also controls for residence since an assisted living environment may have an effect on social factors as opposed to those who are somewhat more isolated in their residence.[46,47] Furthermore, technical efficacy[48,49] and attitude toward self-health[50] were also examined for their effect on use behavior.

## 3. Research methodologies

3.1 Measurement

Questionnaire items were adopted from the literature for social forces[31,37, 60] and use behavior.[45, 59] The social factors constructs were measured by six indicators, while the dependent variable was measured by three indicators.

3.2 Data Collection

Convenient and snowball sampling was used for data collection. Several assisted living establishments were contacted and asked to promote our survey among their residents. The survey was also disseminated among a network of elderly individuals and they were asked to do the same. 117 fully completed questionnaires were returned prior to data analysis.

## 4. Data analysis and results

*4.1. Instrument validation*

The Partial Least Squares (PLS) statistical method was used for scales validity assessment and hypotheses testing because it provides more flexibility with sample size and residual distribution.[51-53] We used the most recent version

of SmartPLS (version 3.2.1 for Windows 64 bit). We examined the relationships between constructs (path coefficients) and the predictive power of the dependent variable – R-squared.[53]

Table 1**.** indicates the measurement model t-statistics and factor loadings. Factor loadings of less than 0.7 have been removed to strengthen the item reliability. Since reflective indicators are interchangeable (meaning they ask the same thing), some can be omitted and PLS is flexible with a low number of factors per latent variables.[54] Construct reliability was tested by Cronbach's Alpha and they were above the recommended 0.7 value.[55] Convergent validity values, in terms of average variance extracted (AVE) were above the recommended 0.5 value.[56]

Table 1. Factor loadings, t-statistic and Cronbach's Alpha for the measurement model

| Construct | Loading | t-statistic | Cronbach's Alpha |
|---|---|---|---|
| Coercive | 0.24** | 2.93 | 0.71 |
| Normative | 0.11 | 1.31 | 0.78 |
| Mimetic | 0.35** | 4.83 | 0.80 |

**t-statistics are significant on the 0.01 level

*4.2. Hypotheses testing*

Our measurement model was tested against the hypotheses through path coefficients (relationship strength between IV and DV) and R-squared values to measure the predictive power of the model.[61] T-statistics were calculated using bootstrapping technique in SmartPLS.

Path coefficient from coercive pressure to use behavior ($b=0.24$, $p<0.05$) and from mimetic pressure to patient portal use behavior ($b = 0.351$, $p<0.001$) supported hypothesis 1 and 2 respectively. However, normative pressure showed no significant impact on patient portal use behavior ($b=0.11$, NS).

The research model explains 28% of the variance of social forces on patient portal use behavior as indicated by the r-squared value. This magnitude is somewhat expected as technology adoption and use behavior is a cumbersome subject with numerous antecedents. The focus of this study was on social factors and intentionally omitted other, well established constructs. Therefore, the predictive power of the model was expected to be on the lower side.

Control variables showed an insignificant effect on patient portal use behavior with path coefficients of $b= 0.04$, $-0.07$, $-0.05$, $0.03$ respectively for attitude toward self-health, gender, resident type, and technical affinity respectively.

## 5. Limitations and future directions

While we feel that this study contributes to the relevant literature and provides valuable directions, it has limitations that may affect the generalizability of the findings.

Data collection followed convenience samples and snowballing approach. Geographical distribution was not tracked and the results may only represent that of a particular area. Also, the subjects were mostly asked through email and social media and the survey took place through the Internet. Therefore, every respondent must have possessed a basic level of familiarity with the Internet and computers.

It is important to keep in mind that a large portion (72%) of variables in use behavior remains unexplained by the variance in the measurement model. Therefore there are a number of other factors that influence adoption and usage of patient portals by the elderly. This may also serve as future research direction to enhance the model to find other important social factors that strengthen the predictive power of the model.

It would be worthwhile to investigate the same model with behavioral intention as mediator between social factors and use behavior, similarly to UTAUT. Since the social factors are investigated in this study on a more granular level, one may wonder whether or not all three institutional forces are significant with the moderator or only with the dependent variable.

## 6. Discussion and conclusion

This study examined the effect of social factors on patient portal adoption and use behavior among the elderly. The conceptual model was built on institutional theory and UTAUT. The study empirically tested the strength of the effects of three independent variables, namely coercive, normative, and mimetic pressures on the elderly to adopt and use patient portals as the dependent variable. The study found theoretical and practical implications.

Our study found that coercive and mimetic forces have a significant effect on the adoption and use of patient portals among the elderly. One of the main coercive forces on elderly patients is their providers; older patients follow the advice of their medical provider.

In regards to mimetic forces, it became apparent that higher profile, respected peers have influence on the elderly with regard to patient portal adoption. Mimetic pressure has a stronger influence than normative pressure; satisfied portal users will have a stronger effect on other elderly patients to adopt and use patient portals.

The insignificant effect of normative pressure on use behavior is a significant finding of the study. It indicates that elderly people do not follow the bandwagon effect. They have established practices, which may only change if a respected, higher status actor from their network suggests it.

The low effects of the control variables are also important findings as a more general approach is sufficient to reach the elderly to the same extent.

The literature has also been expanded on patient portal use, as the use behavior of elderly has not been investigated through social forces. Applying institutional theory as the pillar of our model with significant findings adds to the growing literature on the adoption and usage of information and communication technologies in healthcare by the elderly. Additional factors have been identified for health communication technology adoption by the elderly population.

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