Use of Diffusion of Innovations Theory in Medical Informatics Research

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Abstract
The authors examine the use of tenets of diffusion of innovations theory in the medical informatics literature to reveal how the theory has and can continue to provide a basis for scholars seeking to align their research with the theory. A content analysis method was used to examine over 2,000 journal articles from the fields of medical informatics, medicine, and information systems. The authors found that tenets of diffusion of innovations theory were prevalent in the literature. Although several theories are useful in explaining phenomenon in the domain of medical informatics, diffusion of innovation is one such theory that can be applicable to a vast amount of medical informatics research that is focused on new technologies or work processes.

Keywords: Content Analysis, Diffusion of Innovations, Informatics, Management Information Systems, Theory

Introduction
There is no shortage of research opportunities within the interface of information technology and healthcare (Agarwal, Gao, DesRoches, & Jha, 2010; Raghupathi & Nerur, 2010). As the body of knowledge in this area continues to accumulate, some scholars have argued for greater theoretical development in the area of medical informatics (Brennan, 2008). We propose that many scholars have heeded this call for greater theoretical development and that diffusion of innovations (DOI) theory is a lens through which an abundance of research in this area has been and will continue to be conducted. Indeed, the medical informatics literature is rife with exemplary cases where DOI was successfully employed (Ilie, Van Slyke, Courtney, & Styne, 2009; Lorenzi, Novak, Weiss, Gadd, & Unertl, 2008; Spil, Lerouge, Trimmer, & Wiggins, 2009). Nonetheless, we posit that the theory could be more vastly utilized to help explain
phenomenon commonly addressed in the literature. In this study, we conduct an extensive content analysis to examine the use of tenets of DOI and offer recommendations for future research positioned within this theory.

One goal of scientific research is to expand and accumulate knowledge in the field (Cooper, 2010; Hunter & Schmidt, 2004). Scholars attempt to learn more about a particular topic by analyzing previous research and by performing additional studies. This iterative process has led to the accumulation of a vast amount of research literature in the field of medical informatics. However, to provide for the continued growth of a field, it is important to summarize a body of knowledge, lest the number of studies performed in the field becomes too large for an individual scholar to consume. Without such summaries, the sheer volume of studies becomes a morass for a sole scholar to wade through and slows the progress of investigating new knowledge.

One approach to summarizing is to combine studies into single consolidated reviews based on a particular theory, topic, or theme. Our study synthesizes medical informatics literature from two leading journals in the field of medical informatics, three leading journals from the closely related field of management information systems (MIS), and two leading medical journals in order to examine the prevalence of DOI topics in extant medical informatics literature. The purpose of this study is to examine the use of tenets of DOI theory in the medical informatics literature.

**BACKGROUND: DIFFUSION OF INNOVATIONS**

We chose DOI as the basis for this study because it is a frequently-studied and widely-accepted theory, having few changes since its inception over 60 years ago (Brown, 1981; Rogers, 2003). Following is a brief explanation of DOI (for an exhaustive discussion of DOI, refer to Brown, 1981; Rogers, 2003). Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system and involves how, when, and by whom an innovation is adopted (Lipert & Forman, 2005; Rogers, 2003). An innovation is a practice, idea, or object that is new or perceived as new by a unit of adoption (Flint, Larsson, Gammelgaard, & Mentzer, 2005; Hazen, Cegielski, & Hanna, 2011; Rogers, 2003). Many studies in medical informatics investigate innovations and barriers to their diffusion or adoption.

Adoption is “a decision to make full use of an innovation as the best course of action available” (Rogers, 2003, p. 473). There are five stages through which individuals progress when evaluating an innovation for possible adoption (Rogers, 2003; Sahin, 2006). The stages are knowledge, persuasion, decision, implementation, and confirmation. This progression from initial knowledge of an innovation to confirmation of the adoption decision is referred to as the innovation-decision process (Cooper & Zmud, 1990; Rogers, 2003). It is within the innovation-decision process that we find the five perceived characteristics of the innovation and it is on these characteristics that our theoretical analysis of the literature focuses. Specifically, the five characteristics of the innovation affect the persuasion stage of the innovation-decision process. During the persuasion stage of evaluation, potential adopters develop either a positive or negative opinion toward the innovation (Rogers, 2003; Venkatesh & Bala, 2008; Venkatesh, Morris, Davis, & Davis, 2003). In DOI theory, the perceived characteristics of innovations influence the adopters’ attitudes toward the innovation. Rogers (2003) explained the perceived characteristics of innovations as relative advantage, compatibility, complexity, trialability, and observability. Although other authors have investigated such characteristics (e.g., Hazen, Wu, & Sankar, in press; Lee, Kozar, & Larsen, 2003), we adopt Rogers’ definitions for the purpose of our research. As noted later in our method section, these definitions are the basis of our coding schema.

Relative advantage is “the degree to which an innovation is perceived as better than the idea it supersedes” (Rogers, 2003, p. 15). The
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