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Expanding multi-disciplinary approaches to healthcare information technologies: What does information systems offer medical informatics?

Mike Chiasson [a,*], *Madhu Reddy* [b], *Bonnie Kaplan* [c], *Elizabeth Davidson* [d]

[a] *Management School, Lancaster University, Lancaster, UK*
[b] *School of Information Sciences and Technology, The Pennsylvania State University, USA*
[c] *Yale Center for Medical Informatics, Yale School of Medicine, New Haven, CT, USA*
[d] *Department of Information Technology Management, University of Hawai'i at Manoa, Honolulu, HI, USA*

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ABSTRACT

The effective use of information technology (IT) is a crucial component for the delivery of effective services in health care. Current approaches to medical informatics (MI) research have significantly contributed to the success of IT use in health care but important challenges remain to be addressed. We believe that expanding the multi-disciplinary basis for MI research is important to meeting these research challenges. In this paper, we outline theories and methods used in information systems (IS) research that we believe can inform our understanding of health care IT applications and outcomes. To do so, we discuss some general differences in the focus and methods of MI and IS research to identify broad opportunities. We then review conceptual and methodological approaches in IS that have been applied in health care IT research. These include: technology-use mediation, collaborative work, genre theory, interpretive research, action research, and modeling. Examples of these theories and methods in healthcare IS research are illustrated.

1. Introduction

Health care spending accounts for a substantial and growing portion of the gross domestic product (GDP) in many countries. Policy makers and health care leaders are faced with the dual challenges of increasing access to quality health care services and managing the rate of growth of health care spending. Increasingly, they are looking to information technologies (IT) to play an important role in improving quality and access and managing costs. However, the effective development, application, and utilization of health care IT present formidable challenges. Medical informatics (MI) developed as a research field focused on realizing the potential to use computer and information technologies in health care [1], which has produced a valuable body of knowledge on health care IT. As health care organizations increasingly adopt IT across a broad range of functions and processes, the challenges with developing, implementing and using health care IT will continue to grow. Drawing theories and methods developed in other disciplines could be beneficial to further research [2,3].

The information systems (IS) field is one area that has developed and elaborated theories and methods for studying IT in social and organizational settings. These research approaches are often complementary to current MI research, because the IS field developed from different academic and disciplinary bases and with a different focus from medical informatics. Thus, we suggest that the IS field provides a research resource for MI. Table 1 highlights differences

* *Corresponding author at*: Department of Management Science, Lancaster University, Lancaster LA1 4YX, UK. Tel.: +44 1524 594 255.
E-mail address: m.chiasson@lancaster.ac.uk (M. Chiasson).
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Table 1 – Comparison of the IS and medical informatics fields

Dimension/field	Medical informatics	Information systems
Research focus	Clinical health care	Commercial and manufacturing industries
Theorizing about the IT artifact	Of particular interest, but also use proxies, e.g. changes in physician's orders, number of drug errors, etc.	Outcomes and proxies for the IT artifact are often used (e.g., productivity, satisfaction)
Research methods	Primarily quantitative and experimental	Broad range of laboratory, survey, field methods; qualitative and quantitative, but still primarily quantitative
Researchers	Mixture of MDs, PhDs, RNs	Primarily PhDs
Founding disciplines	Computer science, medicine	Operations management, organizational behavior, general systems theory, computing science
Institutional base	Medical school	Business school
Funding sources	Government	Business

between IS and MI as research fields, which we have experienced as IS and medical informatics researchers in Canada and United States. These differences may be less apparent in other national research settings.

MI's core goal is to directly improve clinical care through the use of information technology. To do so, MI research examines the design of IT applications to address the practicalities of health care delivery, with a focus on clinical users (e.g., physicians, nurses, pharmacists). MI theories often focus on knowledge representation (including data bases and ontologies), interface design, and decision support approaches that are closely tied to the design and structure of an IT artifact. By "IT artifact" we mean the configuration of hardware and software, including user interfaces and algorithms, intended to accomplish specific information processing or functions [4]. MI evaluation research often focuses on the effect of IT on clinical decision-making and healthcare outcomes [11]. The relative success of the IT artifact, ideally examined within a random clinical trial or other experimental setting, dictates the contribution of the study.

IS researchers, on the other hand, have addressed the development and use of information systems in a variety of business and organizational settings. Most empirical field studies have been conducted in a subset of for-profit industries, such as manufacturing, retailing, and financial services [5], although a small body of health care IS research has also developed [6]. Like MI, the information systems field is an applied research discipline, but its academic roots are in the social sciences and in business schools, which draw from economic, psychological, operations research, organizational, computer science, and sociological theories. Although IS researchers typically outline implications for practice, research studies are primarily designed to test a specific theory or to develop theory in a given area. As a result, the contribution of IS research is thought to depend on its contribution to the confirmation and elaboration of theory. The implications for practice in IS research are oriented towards managerial, administrative, and business processes, rather than the work of specific groups of users. Often, the detailed nature of the IT artifact is not examined; instead general effects of IT use that are likely to apply to a broad range of contexts are of interest [4]. For example, the implications of IT investments on productivity and organizational performance have been a major research focus, where "IT investment" is the proxy measure of a wide and diverse array of IT artifacts [4,5]. The IS field's focus on generic technologies across a variety of settings is in sharp contrast to the MI field's focus on specific IT applications in specific clinical practice settings [6].

MI and IS research share an interest in IT outcomes, that is, the tangible effects of information technologies on organizations. In MI, this research is termed "evaluation" and is meant to answer the question, "does IT work in this setting"? Providing a general theoretical explanation to account for the outcomes observed is of less interest [2,4]. For example, MI studies tend to report system effects, such as specific changes in physician behavior due to a clinical decision support system (CDSS), without delving into sociological or psychological explanations for those changes, or without using models or theory to predict outcomes [11]. IS studies, on the other hand, are designed to predict outcomes as a way to test theories and models or to provide explanations of outcomes in order to generate theoretically informed insights into organizational behaviors.

Historical, institutional, and organizational differences between the MI and IS academic fields have contributed to these differences in research focus and methods. Medical informatics draws primarily from computer science, information science, and medicine, and has focused largely on the design and testing of medical information technologies [1, p. 21]. Medical informatics faculty or departments are typically housed within a medical school. Information systems has evolved within business schools in the US and Canada, utilizing faculty from other business disciplines who specialized in technology (operations research, management, organizational behavior, and general systems theory) or computer science, and as the IS field developed, within the specialized IS discipline. Differences in research training have also affected the research questions and methods employed: IS researchers are PhDs whereas MI researchers often have professional degrees (MD or RN) or a PhD as well as a professional degree. Thus, MI and IS researchers are separated by the organizational, disciplinary, and physical boundaries that typically separate academic departments and schools (i.e., school of medicine versus school of business). Boundaries are reinforced by academic reward structures for research and publication, such as journal outlets, legitimated research methods, and norms for collaboration and co-authorship of research.

While these differences may appear to be reasons for a natural and functional separation between two fields, we believe that cross-disciplinary research across the fields is beneficial.

We add our voices to recent calls to move toward the use of preexisting theory in MI and evaluation, including calls for studies informed by social science and information systems theories [3,7] and a new "foundational" research track at the American Medical Informatics Association's annual Fall Symposium in 2003. We have argued elsewhere about the advantages of medical informatics and healthcare IT research for IS theory and knowledge [6]. We likewise believe that the use of IS theories and methods can help address research challenges confronting MI. In addition, a number of cross-disciplinary studies, borrowing concepts from IS, have begun to enrich the medical informatics literature. For example, MI research informed by IS approaches has already produced studies examining the compatibility of goals, professional values, needs, and cultures of different groups within an organization, including developers, clinicians, administrators, and patients. MI research focused on interrelationships among key components in health care organizations, such as organizational structure, strategy, management, skills, and technology, has also contributed to MI [2].

IS researchers have used a variety of theoretical and methodological approaches when studying IT in health care. These include action research [6,8,9], feminist theories [10], and social interactionism based on diffusion of innovation theory (e.g., Refs. [11–15]). Other recent examples include constructivist approaches which emphasize organizational, political, social, and cultural concerns: actor-network theory [16], a sociological approach that employs sociocultural analyses and socio-technical design up using actor-network theory and situated action/design [17,18], structuration theory [19,20], technology-use mediation [21], or combinations of these various theories [22,23].

Although it is beyond the scope of this paper to describe all these different theories, we would like to provide examples of how IS theories have contributed to MI research as a way to illustrate the potential synergies of IS and MI in healthcare IT research. In the following sections, we examine our own research and other examples of cross-disciplinary work in health care information technologies, which were informed by IS theories and methods. These include: technology-use mediation, collaborative work, genre theory, interpretive research, action research, and model development. This list is not exhaustive, but serves, we believe, as a point of departure for considering the contributions of IS to a multi-disciplinary foundation of MI.

2. Technology-use mediation

There are well-recognized economic, institutional, and technical hurdles to widespread health information technology [HIT] use [24,25]. Electronic medical record systems (EMRs) are a case in point. Recent national surveys in the US suggest that only 5–10% of physicians use an EMR in their office practice [26]; other studies indicate that many physicians use only one or two electronic clinical functions in their offices [27]. Physicians in small, independent practices (estimated at 60% of US physicians) are particularly challenged by up-front investments, loss of productivity, and ongoing support that HIT applications require. Factors contributing to low HIT *adoption* rates among physician practices include cost, lack of financial incentives, and an immature EMR software market. *Assimilation* of HIT into medical practice is also of concern; little is known about why some physician practices have adopted and assimilated HIT applications successfully, despite barriers to adoption (such as cost), whereas most have not. While the "adoption gap" is widely acknowledged, the "assimilation gap" between adoption and actual use [28] is less well understood. However, unless HIT is assimilated into medical practices in ways that improve healthcare, benefits will be limited to incremental, automation improvements.

To examine the organizational processes through which electronic medical record systems are assimilated into clinical office practices, Davidson and Chiasson [21] applied the IS theory of *technology-use mediation* (TUM) [29] to investigate how technological features and social structures are mutually shaped during system development, implementation, and use. TUM processes go beyond implementation and training activities, to the full range of processes involved integrating information technologies into the substance of organizational practices and structures, often in subtle but highly effective ways. The authors found that a larger organization (an acute care hospital) had the financial and human resources to dedicate clinical staff to configure the EMR package, to work with clinicians to learn how to use the system, and to integrate quality care initiatives into the EMR system interface. Dedicating internal clinical resources to TUM activities heightened the success of the EMR project for influencing health care practices. In contrast, a small clinic lacked the organizational resources for TUM activities. Instead, they relied on academic researchers to develop and customize an EMR system for them. Although a useful EMR system was constructed and implemented successfully in administrative and research activities, clinical practices were not substantially altered to take advantage of technological capabilities.

This study has policy and practical implications for health care. It highlights the need to dedicate substantial clinical staff resources on a long-term basis to support technology use and to integrate information technology use in clinical practices. The need for such roles and resources is often overlooked in IT projects. The study also raises concerns that health care organizations like small, independent physician practices lack sufficient financial and human resources to achieve successful information technology assimilation. As national governments increasingly expect health care providers to adopt and utilize health information technologies effectively, they may need to fund and sponsor resources to these small providers to facilitate their assimilation of the technology.

This example highlights the typical focus of IS-informed research studies: the emphasis is on providing a broad theoretical framework for understanding organizational outcomes beyond only the technical system, individual, group, and organization. Such a study complements MI studies focused on the design characteristics of specific electronic medical record systems or the interaction of different types of clinicians with such a system, by addressing the use of resources inside and outside the organization. Thus, such an IS theory provides one broader explanation why even a well designed and adopted system might not be utilized effectively.

3. Collaborative work

Medical work is an inherently collaborative activity, and methods of supporting and enhancing coordination among professional groups is essential to effective healthcare delivery. In many clinical settings [30], medical work is organized predominantly through collaborative groups such as patient care teams. The importance of effective teamwork is illustrated in studies that have shown how poor patient outcomes often result from poor collaboration between physicians and nurses [31–33]. As an extreme example, it is claimed that 2500 Canadian and 95,000 American lives are lost per year because of poorly coordinated medical information and inadequate control of work practices [34,35]. Therefore, an important research question is how to coordinate these teams in improving patient care when team members may have different concerns, work, and motivations [36]. The use of information systems has changed in these collaborative environments. Although originally conceived as a means of providing patient-specific information for individual patient care [37], clinical systems such as the electronic patient record have played a more collaborative role than originally anticipated by their designers. Although the patient record does serve as a repository of patient information for individual decision-making, it also helps support collaboration and coordination among team members by providing them with information about what other team members have done for the patient [38].

Drawing on the tradition of research on collaboration and teams in IS, Reddy et al. highlighted this collaborative support in studies of a patient record in a surgical intensive care unit [17,39]. They described how the system supports the collaborative work of groups that have different work practices and responsibilities (e.g., nurses, physicians, and pharmacists). These different practices made it difficult for the groups to sometimes understand each other. However, they found that the different views provided by the patient record allowed each group to see the information in the context that made the most sense to them. The different views combined with the underlying exchange of the same information helped support the collaboration between different team members. This kind of understanding of how the patient record works would not have been possible by studying individual users only.

The IS research focused on the effects of IT on collaboration highlighted above, complements current MI research focused on individual practitioners [40,41]. The development, use, and evaluation of information systems in medical informatics often have focused on the individual user. This is manifested, for example, in studies of physician behavior with respect to clinical decision support systems (CDSS) as a way to improve patient care [42]. Although certain branches of IS research focus exclusively on the user, the IS field's interest in organizational capability tends to push IS researchers to consider levels of analysis beyond the individual user. Consequently, IS researchers focus more attention on collaboration and group work, and the context around work. This offers several benefits to medical informatics research, by expanding our understanding of health care IT use beyond the individual user [3].

4. Communication and interaction

Important to collaborative work is the need to communicate among different members of a team. Practicing clinical medicine requires extensive communication within and between members of occupational groups (nurses, pharmacists, physicians, laboratory technicians) to coordinate patient care. Changing from a paper-based to an electronic patient record affects established communicative practices, altering the content and patterns of interdepartmental communication. Computer mediation of communication can increase the speed of communication, but in some cases may also cause misunderstandings. Recent publications have highlighted, for example, that computerized physician order entry systems can sometimes *increase* medical errors due to the complexity of communicating medical knowledge between clinicians [26,43].

One approach used in IS to study the effects of electronic mediation of communication, borrowing from organizational theory and sociology, is genre theory. Yates and Orlikowski [44] proposed the concept of genres of organizational communication as a theoretic lens to examine communications in organization, for examining the effects of media change on communication, and for guiding the design of information technologies that facilitate organizational communication. Yates and Orlikowski [44, p. 301] defined genre of organizational communication as: "... a typified communicative action invoked in response to a recurrent situation. The recurrent situation or socially defined need includes the history and nature of established practices, social relations, and communication media within organizations". Communication media include face-to-face, written, and electronic exchanges. Changing one aspect of a genre, for example, communication media, is likely to influence other aspects, such as structure and practices. Davidson [20] applied organizational genre theory to analyze how introduction of a computerized clinical order system affected communication among physicians, nurses, laboratory technicians, and pharmacists. Her study illustrated how changing the medium of communication (from paper to computerized order system) structured the contents of order-related communication and influenced related clinical practices. Some changes were beneficial, such as reduced problems with physicians' handwriting, but structuring communication exchanges in electronic formats also created ambiguity and reduced flexibility in some instances. Nurses, laboratory technicians, and pharmacists adjusted their practices in ways that reinforced the clinical hierarchy and preserved physicians' authority and autonomy, even though this reduced system efficiency.

A study of individual-level system use, particularly one focused only on physicians, would be unlikely to detect such implications for communication among clinical team members. Focusing primarily on the interaction between the individual user and the system, medical informatics researchers have addressed issues of medical information representation and utility to a clinical professional (e.g., physicians), but in doing so have largely ignored computer mediation of interactions and communication that are also important in IT design and use. Interpersonal and interdepartmental communication affects the collaborative environment around the system, and ultimately affects individuals' use of the system. Broadening the contextual boundaries of an IT system to include these interactions provides a more complete understanding of what the system does and should do [17,45]. Similar to the organizational genre study cited above, other IS-informed studies have demonstrated how computerized clinical order entry and results reporting systems and patient records affect communication among various professional groups [20,46–52] and how different groups of professionals adjust their practices, often in ways that reinforce the clinical hierarchy and preserve physicians' authority and autonomy. They also point to reasons why patient records may not succeed or system efficiency may be reduced. Without examining the broader context of communication and coordination, researchers would have a difficult time understanding the reasons for a system's success or failure.

5. Interpretive research

Information systems are equivocal artifacts that different users, in different settings, must make sense of in different ways in order to adopt the technology into their practices. If researchers assume that users all react similarly, and that their reactions are normative and rational, important aspects of the social, psychological, and organizational processes through which IT are developed and used, will be overlooked.

As the IS field developed, a greater appreciation of the interpretive nature of IS phenomena, and the need for research approaches that would be sensitive to these processes, also developed. In the process, IS researchers have drawn research methods and approaches from a broad range of disciplinary bases. For example, experimental and quantitative methods have been drawn from psychology (as they are in MI), whereas qualitative and intensive field study methods are drawn from anthropology, sociology, and the humanities. The result is a diverse set of methods that IS researchers may draw on to examine research phenomena from different ontological, epistemological, and methodological perspectives. In particular, in-depth field study and interpretive research methods have gained legitimacy and use in the IS field.

As an example, Chiasson and Lovato [15] use interpretive research to understand how a user forms perceptions of a decision support system (DSS) tool during the planning of a health promotion program for mammography screening. The DSS tool guided the planner through stages of the Precede-Proceed model of health promotion [53], which identifies predisposing, reinforcing and enabling factors that affect mammography screening behavior.

Using Rogers' diffusion of innovations concepts [54], they followed the user over a 12-month period, asking her to explain and justify her conclusions about *perceived characteristics* of the innovation, which included: the ease in learning the software (*trialability*), the usefulness of the results in using the software (*observability*; *result demonstrability*), the ability to understand the detailed planning content (*complexity* of the software), and the ability to reconcile the structured approach in the software to her organic planning style (*compatibility*). In answering these questions, they found the user drew upon five contextual factors in her explanations: *stage of adoption*, *implementation processes*, *organizational factors*, *subjective norms*, and *user competence*.

They concluded that understanding diffusion through the eyes of an individual adopter is important in understanding how a user "makes sense" of a new technology. In her particular case, her formation of perceived characteristics the innovation was seen to be an active and ongoing process to make sense of her experiences using a technology within a particular setting. Her deep-seated impressions of health planning as predominantly a *social* activity influenced her perceptions of the DSS tool, which did not emphasize the building of relationships. Given this, her impressions of other opinions about using this tool (subjective norm) heavily influenced her assessment of the software's task-technology fit with the social needs of planning.

Consistent with Chiasson and Lovato [15], Kaplan and Maxwell [55] discuss five main reasons for using qualitative methods in information systems and medical informatics research:

(1) Understanding how a system's users perceive and evaluate that system and what meanings the system has for them;
(2) Understanding the influence of social and organizational context on systems use;
(3) Investigating causal processes;
(4) Providing formative evaluation—evaluation aimed at improving a program under development, rather than assessing an existing one;
(5) Increasing the utilization of evaluation results.

An important and classic study in IS illustrates these attributes of qualitative research and the value of combining qualitative and quantitative methods [55]. This is not frequently done in MI, but is more common in IS. The study was of a clinical laboratory computer information system used by different laboratories within one department of an academic medical center [55–59]. Kaplan and Duchon [56] developed a survey questionnaire to assess the impact of the computer system on work in the laboratories. Statistical analysis of the survey data initially revealed no differences among laboratory technologists' responses. However, they also gathered qualitative data from interviews, observations, and open-ended questionnaire questions. Qualitative data analysis indicated that laboratory technologists within each laboratory differed in their reactions to the system, as did laboratories as a whole. Some focused on work increases, whereas others emphasized improved laboratory results reporting and service. Investigation of this finding revealed that different technologists had different views of their jobs, and these different views affected their attitudes toward the computer system. For some technologists, the system enhanced their jobs, while for others it interfered with their jobs, even though they ostensibly had "the same jobs" and were using "the same system". Neither the researchers nor the laboratory personnel expected this finding. Further analysis of the quantitative data supported this explanation for the differences among laboratories and among technologists.

Qualitative data enabled the researchers to understand the contexts in which the system was developed, installed, and used, and thus to understand differences among laboratories. The variety of human, contextual, and cultural factors that affect system acceptance in actual use would not have been identifiable through quantitative methods alone.

At this point in time most MI studies strive for objectivist and experimental designs, like the randomized controlled trials (RCTs), without explicitly considering human and contextual factors important to understanding reasons for the changes they report [11]. Greater use of qualitative methods and of an interpretive framework for research design and analysis could help address key challenges in medical informatics that are less easily studied with only objectivist and rationalist approaches [7]. For example, in the all studies we so far described, qualitative methods were important to conducting the research and understanding the results. We have written more generally elsewhere on the value of qualitative and interpretive methods in medical informatics and the need for broadening research approaches [2,11,57–65].

6. Action research

The implementation of IT in healthcare settings entails numerous technical, social and political challenges. Action research (AR) is an approach to interpretive research. It is used in IS to both understand and assist IT implementation in complex social settings. As an active approach, AR shares much with experimental approaches and has been used in some MI research [8,9,21]. The AR method provides an insightful technique for studying information systems development (ISD) process across time and across technologies and contexts. Defined as "an inquiry into how human beings design and implement action in relation to one another", the purpose of AR is to observe and create effective organizational change [66]. Compared to other research traditions, this relationship between scientific observation and deliberate action is unique [67]. To achieve its purpose, AR encompasses both a method and a set of principles about action and knowledge generation. These principles include: (1) a focus on the knowledge of action and outcomes from action; (2) studying a phenomenon in its natural setting to uncover its complexity and richness; (3) interpreting and/or sometimes critiquing individual and organizational patterns of practice; (4) valuing researcher, developer, and user experience in creating knowledge; (5) employing the "process view" of research, which requires sustained and detailed data collection over a long period of time.

A specific example of action research in MI is Chiasson and Dexter [8], where they examined the use of information systems prototyping (ISP) during the development of an electronic patient record system. Despite claims that the ISP could address design conflicts, the development of an electronic patient record in a heart clinic resulted in a period of intense structural conflict, and the dismissal of an organizational member. Four possible reasons for this outcome using AR were examined. These included: the specification of measures and perceptions of success within the AR method (goals); general problems with the AR methodology and/or its clear delineation (processes); problems in using a particular AR methodology in a specific time and place (contingency); problems with the researcher's implementation of the AR processes (implementation).

The analysis suggests that all four factors help in understanding this particular outcome and delineate further theoretical development of ISP as an action research method: structural conflict is not adequately addressed in ISP; the removal of the organizational member helped produce a successful implementation of the system according to organizational members' reports—a goal of ISP; the "success" of an information system depends on the observer's and developer's interests and anticipated outcomes; ISP methods need to more adequately consider structural conflict with diverse interest groups; a setting with many semi-autonomous professional and autonomous groups brimming with structural power may require conflict-resolution methods to augment ISP; the developer's role in producing structural conflict is inconsistent with assumptions about the process and outcome of ISP.

Like interpretive methods, as this example suggests, greater use of action research could help address key implementation challenges in MI research by actively involving the researcher and participants in IS and organizational design. By addressing both the implementation problem and the research question, AR produces a unique view of knowledge as both observation and reflection, and successful action.

7. Models

Developing an understanding of the individual, group, and organizational influences on IT development, adoption, and use has been an important focus in MI research. This has also been an important focus in IS research, and by drawing upon psychological, sociological, and organizational theories, some IS researchers have employed modeling techniques in order to guide theoretical development, use, and generalization of study results. Models use pictorial description, often a systems diagram, showing dependent, independent, and mediating variables derived from theory. From this, equations are developed, and statistical analyses are performed to test how well the theoretical model fits the data in the study.

These theoretical models provide a bridging mechanism for IS researchers between existing IS theory and the specific topic and context of interest. Researchers select variables of interest according to the model they are using, and then use measures and statistical techniques to test how these variables predict outcomes or influence situations. Models also allow researchers to organize specific data and findings into conceptual categories in order to ensure that study results contribute to theory.

IS researchers have introduced various models into the medical informatics literature. These models have had an important effect on conceptualizing and organizing medical informatics results, at various levels of analysis. Several examples follow:

- Chismar and Wiley-Patton [68] apply a technology acceptance model (TAM) to study the Internet in pediatrics.
- Lauer et al. [69] illustrate how an equity implementation model can apply to evaluating user satisfaction with a patient scheduling system.

- Protti [70] draws on Kaplan and Norton's balanced scorecard [71] and recommends using this approach to measure and evaluate information management and technology's efficiency, effectiveness, transformative potential, and impacts from multiple perspectives and in assorted ways. Both Gordon and Niss [72,73] advocate the use of Kaplan and Norton's balanced scorecard [71].
- Others [74] draw on the DeLone–McLean model of information system success [75] and combine it with Donabedian's well-known structure-process-outcome evaluation model [76,77]; others [78,79], with Fineberg's model for efficacy of clinical diagnostic technology [80]. Others advocate using the DeLone–McLean model to study both system successes and failures [81].

IS researchers may also test the suitability of different models to explain a situation. Wilson and Lankton [82], for example, tested three theoretical models of IT acceptance. These models included TAM, a motivational model, and a model that integrates both. They concluded that all provided a good means for predicting patients' intentions to use e-health. Such models help identify variables that could affect how users will respond to different IT applications.

IS modeling, drawing upon various psychological, sociological, and organizational theories, can complement existing MI research in elaborating and publicly displaying theoretical influences in particular studies, and across numerous studies. Modeling techniques can also be used to support the exchange of theoretical and empirical knowledge across MI studies.

8. Conclusions

Health care is one of the most significant social and economic components of modern society, and the effective use of IT in this industry is important to its success. However, despite the successes of MI research, numerous challenges to developing, implementing, and evaluating health care IT remain. Different disciplines offer different insights and perspectives concerning these challenges. In this paper, we argue that IS research could contribute to the further development of MI knowledge by bringing a heightened awareness and research attention to social and organizational facets of health information technology. To illustrate this, we reviewed studies that the authors have engaged in, in which theories and methods used in IS were applied to healthcare IT topics. These include technology-use mediation, studies of collaborative work, genre theory, interpretive methods, action research, and modeling. Kaplan and Shaw [2] argue that medical informatics has already benefited from continued efforts to bring together understanding developed in other disciplines. We join them and other medical informaticians in calling for a wider range of theories and methods to enhance medical informatics research.

In making this argument, we hope to illustrate how different fields can complement and learn from each other. In doing so, we have concentrated on the use of IS knowledge in health care IT research. However, we would point out that knowledge and theory developed within MI may also have a broader, cross-disciplinary role [83,84]. Although addressing this interesting proposition is beyond the scope of the current paper, we hope that others will in the future explore the possibilities for inter-disciplinary exchange of MI research experiences to other disciplines, including information systems.

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