

Perceived and actualized IT affordances in healthcare: A systematic review and research agenda

Abstract:

Affordances of information technology (IT) are important variables for studying healthcare IT use. Yet, research on healthcare IT affordances is in an early stage with diverse definitions, no established operationalizations, fragmented understanding about the relationships between healthcare IT affordances and their antecedents and outcomes. We present a research-in-progress literature review study of healthcare IT affordances to analyze (1) how perceived and actualized healthcare IT affordances have been defined; (2) how they have been operationalized; and (3) how they relate to other variables, including antecedents and outcomes. Based on the literature review, we propose a taxonomy of healthcare IT affordances and a research framework as bases for suggesting future research directions. Our systematic review of the literature and proposed future research directions would potentially serve as a steppingstone and foundation for establishing more systematic research on healthcare IT affordances.

Introduction & Background

Research on information technology (IT) use has evolved through several stages and perspectives on: from an early materialistic view concentrating on the technical aspects of IT artifacts, to a social view concentrating on user behaviors, to a socio-materialistic view concentrating on the duality or the interaction between the IT artifacts and the user's structuration of the system meanings (Orlikowski, 2007; Orlikowski and Scott 2008). An emerging concept, IT affordance, has been introduced as a lens to study IT use and its consequences by acknowledging the material nature of technology as well as the interpretation of IT artifacts by users (Hutchby, 2001; Markus and Silver, 2008). IT affordance can be distinguished between perceived affordance and actualized affordance. Perceived affordance constitutes the user's perceived potential to carry out an action afforded by the IT artifact to complete a particular goal (Leonardi, 2011; Markus and Silver, 2008). Actualized affordance constitutes the user's realized actions in using the IT artifact to achieve 'immediate and concrete outcomes' (Strong et al., 2014). Affordance has been widely used as a perspective to explain issues related to IT deployment and use, at both organizational and individual levels, in such contexts as e-commerce (Leong et al. 2016), automotive design (Leonardi, 2011), tourism (Yan and Gong, 2022), and healthcare (Strong et al. 2014).

Healthcare, involving multiple stakeholders (e.g., providers, patients, payers) in providing complex, consequential yet sensitive patient services, is unique, with peculiar social, economic, organizational, technological, and regulatory dynamics and constraints. State and federal regulations such as HIPPA and Health Information Technology for Economic and Clinical Health (HITECH) Act impose constraints on healthcare organizations. Healthcare has evolved from a pay-for-service to a pay-for-performance model, to, ultimately, as we are witnessing now, pay-for-value, focusing on patient-centered evidence-based care (Engle et al. 2021; Lockner, 2018). This transformation has been largely enabled and facilitated by healthcare IT and connectivity, such as through integrated electronic medical records (EMRs), electronic health records (EHRs) or personal health records (PHRs), real-time access to patient data, or on-demand synchronization of data (HealthIT, n.d.; Levy, n.d.; Saripalle et al. 2019).

As the landscapes of healthcare, including technologies, regulations, patient expectations, fast change, healthcare IT system implementation and evaluation have become uniquely complex. While patient-centered evidence-based care requires seamless health information sharing across the entities that a patient has been with, healthcare organizations operate independent IT systems that prevent cross-organizational health information exchange. Healthcare IT systems have often failed to deliver expected use and outcomes. For instance, EHRs have been shown to be error-prone and their limitations have been a cause of concern regarding safety and quality in the healthcare environment (Bell et al. 2020). Providers often consider the use of EHRs to be cumbersome and driving burnout (Melnick et al. 2020) and to be ineffective in supporting provider work (Glaser, 2020).

While the affordance concept has been widely studied in the IS field in general, research examining IT affordances in healthcare is in an early stage. There are diverse conceptualizations of healthcare IT affordances, with no established operationalizations for the constructs (perceived and actualized IT affordance), and with fragmented understanding about the relationships between healthcare IT affordances and their antecedents and consequences. Given that there are sufficient publications on healthcare IT affordances, it is now an appropriate time to conduct systemic reviews of the literature to derive synthesized conceptualizations and operationalizations and examine relationships between healthcare IT affordances and their antecedents and consequences. There have been several literature reviews on the general IT affordance literature, (e.g., Fromm et al. 2020; Ostern and Rosemann, 2021; Wang et al. 2018), yet none of them focused on research within the healthcare context. Additionally, although some IT affordance literature reviews have delineated methodological best practices for such research, questions concerning measurement of affordance remain (Fromm et al. 2020).

Thus, the objectives of this study are to review and synthesize healthcare IT affordance literature, provide a systemic analysis of the current knowledge base, and propose future research directions. More specifically, we analyze how IT affordances, both perceived and actualized, (1) have been defined; (2) have been operationalized; and (3) relate to other key variables, including antecedents and outcomes. Based on the literature review, we assess the perspectives and prime foci of affordances and propose a taxonomy –

an organizing logic – of IT affordances in healthcare, and a research framework. We hope that our systematic review of the literature and proposed research directions will serve as a foundation for future research on healthcare IT affordance.

Methodology

We conduct our literature review by following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) framework (PRISMA, 2021). Widely used, the PRISMA framework promotes the rigor of a review by strengthening methodological quality and reliability through well-planned and systematically conducted literature search (Moher et al. 2015). To ensure completeness of the literature on healthcare IT affordances in our review, we conduct a comprehensive search of peer-reviewed journals and most prominent IS conferences (ICIS, AMCIS, ECIS, HICSS, and PACIS). We carry out a two-stage literature search: (1) systematic search using online databases (Web of Science, JSTOR, and AIS eLibrary) and identification of papers subject to eligibility criteria; and 2) backward and forward citation analysis of the articles included in the first stage and literature reviews touching upon the construct of IT affordances (Fromm et al. 2020; Ostern and Rosemann, 2021; Wang et al. 2018). The results of each stage are validated by two investigators. Zotero is used to manage the compiled references. Currently, we are in the process of completing the first stage and, thus far, ran a systematic search, taking into consideration records with keywords appearing in paper title or abstract. We are following strict search criteria which include: (1) studies examining IS adoption or use by patients, health consumers, or healthcare professionals through the lens of affordance theory; (2) keywords (“affordance” OR “affordances”) AND (“healthcare” OR “health”) AND (“information systems” OR “information technology” OR “technology”); and (3) papers published in peer-reviewed journals and full-text conference articles.

We analyze the literature from five perspectives. First, we provide a descriptive summary of the articles, including publication source, research type (exploratory vs. confirmatory), purpose of the study, affordance type, type of healthcare IS studied, context, and nomological framework used. Second, we synthesize how healthcare IT affordances have been defined and operationalized thus far. Third, we summarize the relationships between healthcare IT affordances and their antecedent/consequential

variables. Lastly, we suggest future research directions by proposing a taxonomy of healthcare IT affordances and a research framework integrating the various variables reviewed.

Preliminary Results

Thus far, we have compiled 42 papers for our literature, with 33 articles journal papers and 9 conference proceeding papers. There are 38 empirical studies (27 qualitative, 7 quantitative, 3 mixed methods, 1 design science), 3 conceptual papers, and 1 review paper for the context of COVID-19. The papers were published since 2011 with the highest number of articles published in 2021. Twenty-two papers studied perceived IT affordance (22), 19 papers studied both perceived and actualized affordances, and one paper examined actualized affordance. Affordances were studied for various technologies such as EHRs (9 papers), EMRs (3 papers), electronic patient records (EPRs) (1 paper), mHealth (7 papers), social media (5 papers), smart objects and wearables (3 papers), and artificial intelligence and robotics (3 papers).

The preliminary results of our literature review suggest that there are diverse definitions of healthcare IT affordances. At the same time, there is limited research on the operationalization of healthcare IT affordances, with only three papers providing survey measures. Liu et al. (2021) delineate their measures of perceived connective, utilitarian, and hedonic affordances in the context of usage of chronic disease management apps. Qahri-Saremi et al. (2018) provide measures of perceived and actualized affordances of EHR use. Li et al. (2020) define perceived technology affordance as perceived media richness based on Dennis and Kinney (1998) for patients attending a teleconsultation session with their provider. Other approaches have also been taken, for instance, Gimpel et al. (2021) manipulated enhancement of autonomy affordance by manipulating features and autonomy signifiers in a mobile wellness app and actualization was assessed as changes in the frequency of activities planned by the user.

We have thus far examined 15 papers with respect to the relationships between healthcare IT affordances and other variables. Most studies investigated the mechanisms of affordance actualization and its outcomes. For example, Alshawmar et al. (2021) develop a model, based on qualitative insight, showing how affordances of wellness apps related to promoting goal, comparison to others, coaching, and nurturing

influence health consumers' habit formation, self-awareness, and goal-attainment. They also discuss that factors such as aesthetic, information overload, and user characteristics affect actualization.

Based on the analyses of the conceptualizations, operationalizations, and the contexts of the studies, we are developing a taxonomy of healthcare IT affordances. Table 1 presents seven exemplary work-in-progress categories along with applicable subcategories, definitions, and references. For instance, the category 'Patient's health management' pertains to affordances related the support of patient's health behavior - such as managing chronic condition (Liu et al. 2021), facilitating care coordination – such as scheduling appointments (Bao et al. 2020), or help track wellness activities and pursue goals (Gimpel et al. 2021). Category of 'Public health' is associated with affordances related to use of IT to protect or promote public health, such as usage of social media to communicate HIV/AIDS issues and to mobilize resources and support from higher-level institutions (Fu and Zhang 2019).

Table 1. Exemplary and preliminary categories of perceived and actualized IT affordances in healthcare.			
Affordance category	Subcategory(ies)	Definition	References
Clinical	a. Provision of health services support	Use of IT artifact supports providers' responsibilities by e.g. facilitating care for patients, clinical decision-making, or joint consultations	Bardram and Houben (2018); Burton-Jones and Volkoff (2017); Califf and Martin (2016); Chatterjee et al. (2021); Goh et al. (2011); Mallampalli et al. (2018); Mikesell et al. (2018); Petrakaki et al. (2014); Preko et al. (2019); Strong et al. (2014); Vos et al. (2020)
Administrative/ Management	b. Organizational operations and decision-making support	Use of IT artifact supports organizational operations and decision-making, e.g. monitoring, reactive services	Burton-Jones and Volkoff (2017); Naik et al. (2020); Strong et al. (2014); Preko et al. (2019)
	c. Resource management		
Patient's health management	d. Health behavior support e. Logistical support f. Lifestyle/ wellness support	Use of IT artifact supports management of a medical condition, activities related to coordinating care, and wellness (e.g. countering unhealthy habits, setting up healthy lifestyle habits)	Alshawmar et al. (2021); Bao et al. (2020); Gimpel et al. (2021); Liu et al. (2021); Mettler and Wulf (2019);
Communication & Interaction	g. Relationship-building/ social support	Use of IT artifact enables the user to develop a support network and exchanging information and knowledge	Bernardi (2016); Fu and Zhang (2019); Yeshua-Katz (2021); Lin and Kishore (2021); Liu et al. (2021); Moreno and D'Angelo (2019)
	h. Information exchange		
Identity building & self-determination		Use of IT enables development and expression of user's identity	Moreno and D'Angelo (2019)
Medical research		Use of IT artifact to advance knowledge and resources with regard to a health concern	Mora et al. (2021)
Public health		Use of IT artifact to support operations designed to protect or promote public health	Fu and Zhang (2019); Mora et al. (2021)

Expected Contributions

Currently we have completed the initial analyses of the papers and are in the process of developing a taxonomy for clarifying healthcare IT affordances and proposing a research framework that suggests future research directions. We expect to complete the analyses before the workshop. Our literature review is expected to make several contributions. We add to the extant body of knowledge by providing a systematic review and synthesis of the existing literature on healthcare IT affordances. More specifically, we provide insights about the differentiation and detailed definitions of perceived and actualized IT affordances in healthcare, the categories of healthcare IT affordances, as well as their determinants and outcomes.

As Fromm et al. (2020) point out, there is a need for a systematic approach to theorizing on IT affordances. Our literature review extends Fromm et al. (2020) and further responds to Seidel et al. (2013) who called for more methodological guidelines with respect to affordance research. This study enables us to establish how IT affordance is conceptualized in healthcare. Particularly, as we examine the literature by focusing on the idiosyncratic characteristics and mechanisms of perceived vs. actualized affordances, our literature analysis results should (1) shed light on the potential disparity between perceived affordance and its actualization; (2) explain the dynamics and settings within which IT affordance is indeed actualized; (3) provide a taxonomy of healthcare IT affordances that future research can use to guide their conceptualization and operationalization of IT affordances; and (4) propose a research framework regarding how perceived and actualized healthcare IT affordances relate to their antecedents and outcomes.

In this manuscript we present our efforts thus far, as we examine the status of research concerning IT affordances in healthcare. Our next steps include a full-scale and robust analysis of the literature using Dedoose©; extending the literature search and increasing the number of databases queried and updating the search to include most recent 2022 publications; documenting our findings while paying special attention to developing a taxonomy of perceived vs. actualized IT affordances, and to developing an integrated model of determinants and outcomes of healthcare IT affordances. We will propose a future research agenda based on our findings, particularly based on our proposed taxonomy and research framework.

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