Drivers and Barriers in Health IT Adoption
A Proposed Framework

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Summary:

Despite near (and rare) consensus that the adoption and diffusion of health information technology (health IT) will bolster outcomes for organizations, individuals, and the healthcare system as a whole, there has been surprisingly little consideration of the structures and processes within organizations that might drive the adoption and effective use of the technology. Management research provides a useful lens through which to analyze both the determinants of investment and the benefits that can ultimately be derived from these investments. This paper provides a conceptual framework for understanding health IT adoption. In doing so, this paper highlights specific organizational barriers or enablers at different stages of the adoption process - investment, implementation, and use - and at different levels of organizational decision-making - strategic, operational, and frontline. This framework will aid both policymakers and organizational actors as they make sense of the transition from paper-based to electronic systems.

1. Introduction

This paper proposes a conceptual framework highlighting key organizational factors that are likely to affect both the diffusion of health information technology and its associated outcomes in healthcare organizations. In doing so, we contribute to the emerging debate regarding the potential to improve organizational performance through the adoption of health IT, both in terms of quality of care and financial viability. At the heart of our framework is the proposition that the ability of organizations to leverage health IT in pursuit of these key performance objectives is contingent on the extent to which they understand and address organizational, as opposed to technical, barriers at different stages of the adoption process across different stakeholder levels of activity.

The Health Information Technology for Economic and Clinical Health (HITECH) Act, now in effect in the United States, is expected to yield unprecedented levels of investment in health information technology (IT), incentivizing physicians and healthcare organizations to adopt the technology, eventually penalizing them for continued reliance on conventional, paper-based processes. This act, and the broader push for health IT adoption and diffusion characteristic of health systems in most developed countries, is motivated by the assumption that these new technologies are likely to play a central role in the much needed transformation of healthcare in the United States [1-3].

Despite the promise that health IT holds for healthcare providers, their organizations, and their patients, there are two persisting and related puzzles that researchers point to in this realm. First, the empirical evidence regarding the performance effects associated

with digitizing healthcare organizations has been, at best, mixed [4-7]. This proves somewhat alarming given the stresses already facing the healthcare system in the United States and the reality that technological innovation requires the redirection of resources that would otherwise be allocated to other strategic goals and objectives. Second, despite exuberance for health IT that predates the HITECH Act, only a minority of healthcare organizations actually pursue a comprehensive strategy with respect to investment, implementation, and use of this new technology [8]. Even among those with a comprehensive strategy, few have attempted to integrate the multiple IT systems existing in most hospitals. The most widely- cast study of hospital health IT adoption estimates that only 2.7% of US hospitals have a comprehensive electronic records system and that only 9.2% have even a basic system [9].

The discrepancy between the promise and this documented reality has left many scholars, practitioners, and policymakers puzzled: why are providers and their organizations not embracing this beneficial technology of their own volition, and why has this powerful tool not been delivering more convincingly on the anticipated returns on investment? In this paper, we propose a practical framework for understanding and assessing variation in health IT adoption. Decisions made over the course of the health IT adoption process are likely to explain the gap between its promise and the documented organizational reality. We focus on the organizational environment and conditions under which health IT is adopted beginning with the decision to invest in the technology, through implementation and ending with institutionalized use.

The gap between the expected potential benefits of health IT and the documented outcomes and adoption rates, rests on the relative absence of conceptual and methodological attention to the organizational challenges associated with the introduction of new technology in general and of health IT in particular at different stages of adoption and at different levels of organizational activity [for a recent exceptions see 10]. Health IT's capacity to deliver on its quality of care and efficiency potential is contingent, among other things, on the ability of organizations to overcome and address a number of substantial adoption barriers. These barriers are, for the most part, *organizational* and not *technological* in nature. The successful adoption of health IT requires that healthcare organizations - be they hospitals, ambulatory clinics, or even small to medium size group practices - have a clear sense of the organizational barriers and resistance points that may arise throughout central adoption stages [9, 11]. Indeed, recent research has shown that the very decision to invest in IT and the implementation process that follows are shaped by organizational features of the adopting organization [12-14].

2. Organizational Factors in Technological Change: A Life-Cycle Framework

The challenge of demonstrating the link between a technological innovation and organizational performance is not a new one [15]. Management scholars confronted a similar set of weak and inconsistent relationships between the deployment of new technologies and performance outcomes, albeit largely outside of healthcare settings. They scrutinized the link between incumbent employment practices and work structures, including the extent of frontline worker involvement and the degree of decentralization in an organization's decision-making authority [16, 17]. Aside from incorporating organizational features to predict technology adoption, they sought to unravel what came to be labeled the "productivity paradox" - the apparent lack of an establishment-level relationship between IT investment and economic performance [18, 19]. This research led to the conclusion that the business performance "effects" of IT should actually be attributed not to the technology per se, but to the complementary relationship observed between IT and certain IT-enabling employment practices and work arrangements. The incidence of so-called high-performance work systems (HPWS), including teamwork and employee involvement, appear to facilitate not only the deployment process [14, 15], but the manner in which IT is used on an ongoing basis in organizations [20-22]. Indeed, it is now well-understood that certain employment practices and work arrangements moderate IT's performance impact [23-26]. In this sense, one can think of technology adoption as much more of a social intervention than as a purely technical one. What this research highlights is the central role that organizational factors play

in the adoption of new technology. Our proposed framework builds on this argument and attempts to outline concrete organizational factors operating at different organizational levels over the course of the adoption process.

In addition to highlighting the role that work arrangements play in the adoption of new technology, management research has also underscored the centrality of *strategic choice* in the process of making important organizational decisions [27-29]. According to this body of research, stakeholders at different levels of the organization make important strategic decisions about how to respond to the external environment and how to pursue different workplace innovations. Building on this research, we argue that throughout the process of health IT adoption - from the decision to invest resources, through the process of implementation and ending with the institutionalization of use - organizational actors are making strategic choices. Furthermore, these strategic choices have important implications for the extent to which this new technology will be successfully adopted. The framework developed below reflects our application of this general strategic choice literature to the area of health IT adoption.

2.1 A Two Dimensional Framework

The discussion above highlights the importance of organizational factors and strategic choices in understanding organizational performance. In this section we argue that in the area of health IT adoption, strategic choices are made over the course of the health IT adoption evolution across three different levels of organizational stakeholder activity. The organizational adoption of new technology is a complex and multi-staged process [16, 20, 30] requiring more than merely installing appropriate hardware, software, and peripherals. Given that adoption stages differ in terms of what they require from the organization and its employees, it is likely that different organizational barriers emerge over different stages of the adoption process. We focus on three central, evolutionary stages:

1. The decision to invest in health IT,
2. The implementation or deployment process, and
3. The ongoing use or "institutionalization" of the technology.

This dimension is important since different configurations of organizational factors are likely to affect decisions made at each of these different stages.

In addition to movements along the adoption continuum from investment to deployment, to use, our framework also delineates three intra-organizational levels at which barriers are likely to arise:

1. The strategic level,
2. The operational level, and
3. The frontlines or workplace level.

These three levels of analysis build on industrial relations research regarding organizational strategic choice [29]. Kochan and colleagues (1994) argue that a complete understanding of an organizational system requires an analysis of dynamics that occur across different levels of stakeholder activity [27, 29]. Specifically, Kochan and colleagues (1994) proposed three levels of organizational activity: strategic; functional (or operational); and the frontline workplace level [29]. Adapting this stream of organizational research for the study of health IT adoption, we define *strategic-level* barriers as those that stem from a discrepancy between general organizational goals and objectives and either the intended or the actual use of the new technology. For example, how does health IT help the organization meet long-term strategic goals? *Operational-level* barriers are those that relate to the managerial processes and

decisions regarding the use of health IT. For example, does the organization reorganize the layout of the units or make material changes to workflows? Finally, *frontline or workforce-level* barriers are those challenges relating to attributes of the workforce itself or of the structures of work more broadly. That is, do employees have appropriate skill sets and working conditions to facilitate for adequate implementation and use the new technology? Exhibit 1 summarizes our framework, which will be detailed below (►Table 1).

3. The Health IT Investment Decision

Much can be made of the cost of investing in new technology and other economic considerations that might explain slow adoption rates. Indeed, the conception that the problem is, at its core, one of economic incentivizing was the impetus for the public sector's recent financial largess. However, this begs the question of what drives this economic calculus, since clearly some organizations believe the benefits of health IT outstrip its costs. Organizational influences on the health IT-performance relationship are present, according to this view, at the very first stage of adoption - the investment decision. More specifically, they shape top managers' *expectations* and *vision* regarding how effectively the organization would be able to use the technology.

3.1 At the Strategic Level

Health IT is not, in and of itself, a strategy (although some organizations view it as such) [26]. Rather, technology has been shown to complement broader organizational restructuring and strategies [26]. Thus, in the context of healthcare organizations, there needs to be an overarching strategy around care delivery (e.g., patient-centered care or improved quality) or around revenue-generation (e.g., Medicare refreshes, capitation) that is served by its adoption. Avgar and Lipsky (2012) recently outlined three different strategic applications associated with the adoption of health IT [31, 32]. Organizations, according to the authors, are motivated to adopt health IT by fundamentally different underlying strategic objectives. Some organizations seek to advance patient care objectives; others are focused on efficiency objectives; while yet others view this technology as a means of attaining more managerial control [31, 32].

Health IT investment is more likely to occur when the dominant strategic objective of the organization is served by the technology. Therefore, a better understanding of slower than anticipated adoption rates requires a more detailed assessment of targeted organizations' health IT vision and the perceived benefits to specific performance domains. Anticipated patient care quality benefits are likely to entail different tactics and investments than would operational efficiencies or cost savings objectives [32]. Alternatively, organizations rich with "proceduralists" are more likely to benefit more from technologies that increase patient throughput than from systems - be they paper or electronic - that facilitate care coordination. In sum, organizations are likely to differ in terms of their strategic approach to their initial investments in health IT, and these differences should begin to explain variation in adoption rates and subsequent performance outcomes.

3.2 At the Operational Level

Among the factors shaping managerial expectations for health IT are realities at the operational level. That is, does the organization have the capacity for radical change, and do managers, responsible for the implementation of this change, have the authority and the organizational resources to effectuate the transition to the new technology? First, organizational and even managerial capacity to take on large-scale organizational change is central to the investment path taken by the organization. One of the clear barriers at this investment stage, therefore, rests on the ability of managers to make decisions about health IT adoption. Management research has shed considerable light on the limits associated with managerial decision making. In his seminal work, Herbert Simon argued that managerial decision making is constrained by an inherent *bounded rationality,* which stems from limits on available information,

resources and time [33, 34].

Most organizations, particularly those in healthcare, are confronted with a myriad of economic and competitive pressures that require organizational attention and focus and must be met by managers with finite time, energy, and data [35]. Shifting from traditional patient records to an advanced health IT system is a substantial undertaking for organizations in terms of the capacity to manage this change alongside the numerous other innovations and interventions being adopted. Therefore, low adoption rates are also likely to be related to the limited capacity in many healthcare organizations to take on additional large-scale innovations. Second, aside from not having the "bandwidth", many managers are institutionally constrained in the scale and scope of organizational adjustments they can make around new technologies. For example, collective bargaining or scope-of-practice regulations, not to mention organizational policies, may prevent or limit managers from instating changes that would fully unlock the technology or from even conducting change experiments. Knowing this ex ante undoubtedly lowers an organization's expected returns from technology adoption. As such, one likely explanation for low health IT diffusion rates in the United States may stem from limitations at the organizational operational level, which can negatively influence investment decisions. Policy makers interested in expanding health IT investments in healthcare organizations should consider efforts designed to address these managerial limitations at the point of the investment decision.

3.3 On the Frontlines

Health IT investment is also likely to be influenced by conditions at the workplace level [13, 14, 30, 32]. Even if health IT serves the organization's overarching strategic objective, and even if managers are not overly constrained in realigning organizational and workflow features around the new technology, frontline employees' skills and abilities and the structures that govern their work are likely to influence the expected return on the investment in new technology. That is, use of health IT requires certain skills and abilities, and one of the considerations that is likely to guide top management decisions about the adoption of health IT is overall preparedness of the incumbent workforce and the extent to which they are conducive to the effective use of health IT. Closely related to the skill composition of the frontline workforce are actual staffing levels - whether there are enough professionals in each of the job roles required to use the technology effectively, including the necessary "backfill" that must be in place in the next stage of adoption, implementation. And, to the extent that all new employees require training on the new technology, high levels of employee turnover can also deter investment.

Clearly, these workplace-level issues tradeoff with barriers and drivers at the operational level, since a structural skills mismatch can be remedied, but only if managers have the resources and discretion to train and hire. Likewise, if employees already have the requisite skills, then constraints on training and staffing at the operational level are likely to be less pronounced. Further, if turnover is a problem, do managers have the authority to address it through increasing wages or materially improving working conditions? Finally, if effective use of health IT requires innovative work structures such as teamwork (e.g., the medical home model) or incentive pay (e.g., pay for performance), their incumbent existence bolsters the frontline foundation for the effective use of the technology, again, contingent on the overall strategy served by the technology and managers' ability to effectuate workplace-level changes where necessary. In other words, organizations are most likely to make a decision to invest in health IT where there is an alignment between the overall strategic posture and capacities at the operational and frontline levels. Policy makers interested in promoting higher levels of health IT adoption should, alongside hardware and software incentives, invest in the organizational infrastructure of this three tiered strategic alignment.

4. Health IT Implementation

Our two-dimensional framework can also shed light on the nature and effects of organizational barriers arising during the implementation process. The implementation stage follows an organization's decision to invest in health IT. During this stage, as opposed to the investment stage, the barriers help to account for the inconsistent empirical relationship between health IT adoption and organizational performance. This makes sense, since the process by which organizations embed new health IT into the organization and its workflows is likely to have a lasting effect on the extent to which this technology is accepted, the way it is used, and, ultimately, the outcomes attained for key stakeholders.

4.1 At the Strategic Level

One of the core health IT implementation challenges at the strategic level is the creation of an alignment with other organizational innovations. As noted above, alongside the introduction of health IT, healthcare organizations are also engaged in ongoing efforts to address quality and efficiency challenges through the adoption of a variety of innovative care delivery practices and organizational arrangements [36]. For example, a growing number of organizations have moved toward a patient- centered model of care—one that shifts from a physician or institutional focus to an emphasis on patient needs and preferences [36, 37]. Patient-centered care, like the numerous other emerging models of patient care, requires a fundamental shift in the organization of work and in the broader strategic focus. In order for health IT implementation to succeed, it should be introduced in a manner that is consistent with and reinforcing of the working organizational model for delivering care [32].

In other words and as discussed above, technology, as a tool, should be leveraged in the service of the existing configuration of patient care and organizational practices. The implementation of health IT in the context of patient-centered care delivery model, for example, should be consistent with the key objective of this model of providing patients with access to information that can assist them in being active participants in their care. Building on research examining the general introduction of IT discussed above [30], health IT implementation must, therefore, be done in a manner that is complementary to the ways in which care is delivered and work is organized. Failure to do so is likely to create a misalignment between an organization's underlying philosophy of care and the apparatus it is using to document it.

4.2 At the Operational Level

As noted above, managerial decision making capacity at the operational level is likely to constrain health IT investments. At the implementation stage, a central managerial factor likely to influence health IT implementation is an organization's capacity to learn. Implementing new technology, like health IT, is fundamentally a collective learning process [38, 39]. In addition to the technical learning requirements, employees, managers, and the organization as a whole are required to learn how to approach a central part of healthcare work - documenting, tracking, and accessing key information - in dramatically new ways. As such, organizations that are better equipped at facilitating learning at both the individual and collective levels are likely to see greater technology related gains [39]. Organizational learning capabilities are the product of deliberate managerial decision making manifested in organizational practices and work structures. Organizations equipped with collective learning capabilities are likely to reap benefits during the health IT implementation process [14].

Management research also points the importance of complementarities between new technologies and the organization of work [17]. The organization of work refers to the manner in which work is structured. Do employees work in teams? Is decision making decentralized and are employees provided with the discretion in executing their work? As discussed above, implementation outcomes

are enhanced when organizations have provided employees with structured opportunities to be involved in the process through the use of teams or other participatory work practices. Research examining health IT specifically has also supported this interaction between new technology and organizational design [13-15]. In particular, IT reduces the cost of transmitting data and information down to the frontlines of an organization and of aggregating data to support organizational learning. However, that newly-available information will do little to boost performance if managers do not re-organize work in a way that takes full advantage of it. The opportunity for employee involvement or the devolution of authority down to frontline workers, like organizational learning, requires organizational action and is therefore the product of deliberate managerial decision making at the operational level [14, 15].

4.3 On the Frontlines

In the final analysis, it is the extent to which frontline staff accept and use the technology that dictates its success or failure. Employee readiness for and reaction to the deployment will have lasting implications in terms of the effectiveness with which the technology is employed. Organizational investment in health IT implementation, therefore, requires an upfront investment in the frontline workforce as well as in the new work structures required to use the technology effectively. Aside from the training investments discussed above, this also entails a guarantee of wage and employment security to ensure that the employees who will be applying their human capital to the new technological capital will not be working themselves or their co-workers out of a job or even perceive that they are doing so. Indeed, organizations with high levels of job insecurity and associated turnover are likely to struggle in the implementation process. In an industry plagued by relatively high levels of turnover and burnout [40], organizations capable of maintaining workforce stability are likely to have an advantage in their implementation and subsequent use of health IT.

5. Health IT Use

The third stage in the process of health IT adoption is the ongoing use or institutionalization of the technology. That is, once the technology has been implemented and the metaphorical safety net is removed, how does the technology get used on an ongoing basis to deliver care in new kinds of ways not possible under the previous technology?

5.2 At the Strategic Level

Among its advantages relative to paper-based systems, health IT offers organizations the power of immediate and comprehensive access to essential patient care and organizational effectiveness information. Knowledge that under traditional information systems schemes is buried in volumes of paper records should be easily accessible and searchable, at the stroke of a keyboard or touch of a screen, to clinicians and administrators using health IT. For example, hospitals not only have analy- zable data regarding individual patients and their treatment history, but can also assess outcomes at the employee, unit, and hospital levels. What this means is that organizations have the knowledge base upon which to strategically evaluate strengths and, more importantly, weaknesses. In addition, health IT offers the potential to automate the collection of performance measures that are currently being collected by nurses, offering the potential for significant cost savings. Taken together, health IT offers an organization the ability to learn and to monitor and improve performance.

Despite this potential, it is not clear that healthcare organizations have, in fact, been leveraging health IT in this diagnostic, learning-centered manner, and there are a number of likely reasons why. First, much of the health IT implementation focus has centered on issues regarding technical proficiency. Health IT vendors and public policy makers have largely ignored the need to educate healthcare organizations how to move beyond the technical aspects to a more strategic and analytical model of usage. Second, in some ways, IT provides an overwhelming amount of data and information. Administrators and frontline providers can be inundated by almost

endless possibilities for data analysis. At the strategic level, therefore, organizations must carefully consider how best to make use of the knowledge captured and made easily accessible by this new technology.

Furthermore, there must be an institutionalization of systematized and formalized methods for extracting relevant information about the quality of patient care across the organization. Third, organizations may not have invested in the technical and human resources needed to pull data from the HIT system and learn from it. For example, the data structures of the IT systems are often complicated and the analysis likely requires advanced statistical skills such as longitudinal data analysis. Given the significant capital investments required to implement an IT system, organizations may lack capital to invest in this analytical capability.

The use of this newly-available data is just one example of the ways that health IT can be used to *transform* care delivery systems rather than to simply *automate* them. However, an organization's potential to use health IT in this way requires employees perceive a modicum of "psychological safety" [41] - a culture that encourages the sort of experimentation that allows organizations to find new ways to use new technologies to improve patient care delivery. Organizational scholars have provided an abundance of evidence on the effects that an organization's culture can have on diverse performance measures [42, 43]. In particular, recent studies have documented the centrality of an organization's learning and knowledge management culture [44]. Organizations that create an environment in which employees are encouraged to seek out new knowledge and to share it with others have been shown to yield greater benefits from new organizational innovations, like new technology [45]. Research specific to the healthcare setting has also documented the centrality of an organization's learning capabilities in adopting new technologies and advancing patient care [38, 39, 46]. Without such a culture in place, the potential returns to health IT can only emerge from the limited set of uses originally conceived by those far removed from the frontlines.

5.3 At the Operational Level

As noted above, the adoption and implementation of health IT does not, by itself, guarantee that it will be used in a manner that leverages its full potential. From an operational perspective, organizations should seek to encourage health IT use in ways that enhance coordination across providers, promote information sharing and learning [47]. As proposed, promoting broad use of health IT is, in large part, a function of management's strategic deployment of the technology. The scope of health IT use is, however, also a function of managerial and operational factors. First, healthcare organizations must provide strong incentives for using the technology in ways that go beyond a mere digital replication of paper and pencil documentation. This requires the creation and maintenance of an employment contract - almost always implicit - that underscore the mutual commitment required for and the mutual gains that should arise from the effective use of the technology [31, 32]. Aside from providing the aforementioned employment and wage security, it should also ensure positive rewards and incentive structures for employees. For example, individual and collective performance incentives should also include attention to the extent to which health IT is used in ways that increase coordination throughout the delivery of care, enhance documentation accuracy, and promote individual, unit, and organizational learning.

5.4 On the Frontlines

Institutionalizing health IT in organizations in a manner that goes beyond a narrow technical use requires both adequate employee skill levels and a relative degree of workforce stability [31, 32]. During the institutionalization phase, this entails a focus on both the retention and the recruitment of a health IT-capable workforce, something that should become increasingly easy as these technologies spread and are more ubiquitous and woven into training curricula. However, it also requires workers continued belief in employee involvement structures and processes, as these are the primary way to ensure two-way feedback between the frontlines and those charged with designing and effectuating a health IT-dependent strategy for the organization [13-15]. In addition, it requires that

employees perceive the IT systems supports their work rather than imposes additional barriers. For example, in most hospitals with IT systems, employees commonly scribble notes on paper, a work around likely driven by the IT systems failure to meet the workers' needs. It is essential that managers routinely seek out these work-arounds and iteratively work to enhance the usefulness of the IT system for frontline employees.

6. Moving Forward

The use of sophisticated hardware, software, and peripherals is now an established component of a vision for a 21st century healthcare system. In order to deliver on this vision and to leverage technology to improve both the quality and efficiency of healthcare, organizational barriers to investment, implementation, and use must be identified and addressed. Our framework provides a systematic means of hypothesizing and testing factors that are likely to explain the gap between the promise inherent to health IT and the documented evidence associated with its diffusion and realized outcomes. Specifically, we that organizational factors across three levels of analysis are likely to explain variation in health IT outcomes across three central evolutionary stages; adoption, implementation and institutionalized use.

In doing so, we highlight nine specific junctures that are likely to play an important role in predicting both sustained diffusion of this new technology and the effects it will have on patient care and organizational financial viability. Scholars need to provide additional empirical evidence on the role that organizational factors play in general and across each of the individual adoption stages, in particular. In this paper, we have outlined the complex array of barriers that can arise at different adoption stages across different organizational junctures. In doing so, we shine a light of management theory on the health IT paradox in service of two claims: First, attention to the key barriers outlined in this paper can help in setting a scholarly agenda for studying health IT adoption. Second and more importantly, attention to key barriers will assist hospitals and other healthcare organizations in avoiding organizational pitfalls that have likely played a role in circumscribing some of the performance returns to health IT adoption.

From a practitioner standpoint, our proposed framework has a number of practical implications for organizations. We believe that this framework can be used by organizations as a template for evaluating the strengths and weaknesses of a given organization's IT infrastructure. First and foremost, our framework highlights the centrality of organizational strategic choices in the process of health IT adoption. Outcomes associated with the decision to adopt health IT are, to a large extent, contingent on clear strategic choices made by organization and the extent to which these are aligned with broader organizational goals and objectives. In other words, the ability to leverage health IT in order to attain patient care and efficiency goals is highly contingent on the extent to which organizations make clear and strategic decisions about the how to invest, implement and use the new technology.

Second, our framework also points to the importance of addressing health IT preparedness across three central evolutionary stages of the adoption process; the investment decision, IT implementation, institutionalized use. Outcomes associated with health IT are likely to be contingent on the ability of healthcare organizations to address key factors inherent to each of these phases. As such, healthcare organization should, according to this framework, adapt their strategic health IT efforts to the evolutionary stage they are in. It is important to note that central to our framework is the claim that decisions made by organizations at the investment and implementation phases will have clear implications for outcomes at the institutional use phase.

Finally, our framework highlights the importance of addressing health IT barriers and drivers at different organizational levels. As discussed above, strategic choices made by top management in healthcare organizations are essential to ensuring the ability to capitalize of the potential vested in health IT. Nevertheless, preparedness at the operational and frontline levels of the organization is also essential in this respect. Organizations that ignore central factors at these levels of activity are not likely, according to our

argument, to attain optimal gains associated with the adoption of new technology. As noted, our framework provides a road map for organizations to evaluate the extent to which they are addressing central issues across the three levels of health IT activity.

Conflict of Interest Statement

None of the authors have any conflict of interest, financial or otherwise, relevant to the conduct or reporting of this study.

Protection of Human and Animal Subjects

This study did not require the use of animal and/or human subjects.

Table 1 Framework for conceptualizing drivers of and barriers to health IT adoption

	Investment	Implementation	Use
Strategic Level	§ Alignment with organization's strategic vision	§ Alignment with organizational model for care delivery	§ Learning strategy for the use of knowledge and information made available § Cultural reform to provide "psychological safety"
Operational Level	§ Expectations regarding the organization's capacity for change § Expectations regarding managerial instrumentality over organizational/workflow changes	§ Employee involvement §Devolution of authority §Organizational learning capacity	§ Creation and maintenance of an innovative, "mutual gains" employment contract § Managerial practices that incentivize and promote broad health IT use and ongoing learning
Frontline Level	§ Skills and abilities to use the technology § Staffing adequacy § Existence of appropriate work structures	§ Perceived preparedness for technological change § Perceived employment and wage security	§ Maintenance of skill levels § Continued trust in employee involvement mechanisms § Promoting point-of-contact learning and feedback

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