Institutional Barriers Against Innovation Diffusion: From The Perspective Of Digital Health Startups

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Abstract

Growth in the applications market for many industries has been rapid, but appears much slower for healthcare-related applications. The purpose of this pilot study was to determine whether: (1) the healthcare field was perceived to be a slower adopter of digital solutions than other industries; (2) if so, what barriers contributed to this; and (3) what might mitigate these barriers? We conducted an exploratory qualitative study by interviewing six startup CEOs and conducting an ethnographic study at a digital health startup to answer these questions. The CEOs contended that compared with their prior ventures in non-healthcare settings, healthcare providers were slower adopters of novel innovations. Another key preliminary finding was the asymmetric impact of regulatory pressures. Even if the startup’s product met regulatory requirements, healthcare providers were reluctant and risk adverse adopters. A last barrier was the need for multidisciplinary buy-in from other stakeholders, including payers and incumbent HIT vendors.

1. Introduction

Healthcare information technologies (HIT) have been promoted widely to address cost and quality issues, which are drivers of institutional change [9]. However, adoption of electronic medical records has been slow. Potential economic and technical gains have often seemed insufficient to drive adoption among healthcare providers. This may become even more important in the future because digital health solutions, such as mobile health applications, may play a crucial role in future healthcare as healthcare providers and patients have increasingly utilized mobile devices, such as smart phones and tablets in many diverse settings [29,35]. In comparison with the diffusion of other mobile application solutions in other industries, however, healthcare applications seem to gain traction much less quickly. For instance, the highly regulated and risk-averse banking industry started offering mobile banking options almost a decade ago, which created new service opportunities to customers and reduced distribution cost [46]. We were thus motivated to investigate: (1) Is the healthcare field perceived to be a slow adopter of digital solutions relative to other industries; (2) if so, what factors contribute to this; and (3) what have startups done to mitigate these perceived barriers? In evaluating the barriers to diffusion of innovation for digital health startups, we reference the existing literature on “traditional HIT” adoption to understand some of the existing barriers to HIT adoption. By diffusion, we refer to “the spread of the capacity to produce and/or use an innovation, and its use in practice” [25]. By “traditional HIT,” we refer to IT solutions, such as electronic medical records, clinician order systems, laboratory or imaging technologies that are already well established.

Davidson and Chismar [15] argued that profound institutional and technical pressures favor change in healthcare organizations. However, healthcare facilities operate in highly technical and institutionalized environmental conditions that make change difficult [7,40]. Many old institutions and practices still persist, which suggests contradictory tensions that exist between change and existing institutions [40]. Some scholars posited that resistance to HIT use stems from threats to norms and practices created by organizational structures, culture, clinical practice, and leadership [27]. As such, healthcare technology adoption has often been slow because decision makers are caught between opposing institutional forces that promote, yet inhibit change [38]. Moreover, with digital health solutions, not only is there concern about the current performance of the innovation, but also the future sustainability of the innovation [25], which may further inhibit diffusion of innovation.

King et al. [25] have also asserted that institutional factors are ubiquitous and essential for understanding or explaining IT innovations that transcend organization boundaries, as in the case of digital health solutions. As such, understanding the constraints and pressures exerted by institutions on how startups navigate this dynamic path-dependent process between its IT product, users and the other stakeholders will allow us to identify ways to facilitate their diffusion. For instance, healthcare facilities’ adoption of new technologies as a response to institutional changes in markets or regulatory pressures in the organizational environments [21,25] suggests that institutional actors,
such as governments, payers, professional and industry associations, can exert considerable influence over the diffusion of IT innovation.

In this paper, we differ from previous HIT adoption work by using the institutional framework to understand the diffusion of digital health innovation from the perspective of the startups driving the innovation. We build on the work done by Nielsen et al. [32] that showed the articulation and legitimation of mobile IT usage in the Danish home care field through recursive theorization of ideas of technologies and translation of these ideas into specific practices for users. We build on their work by attempting to examining the efforts of startups in the presence of institutional barriers. As such, we began a qualitative and inductive study of institutional barriers faced by digital health startups. This paper presents our preliminary findings from a set of pilot interviews with six startup CEOs, a year of ethnographic study at a digital health startup, and numerous observations and informal discussions at conferences and healthcare entrepreneur meet ups.

The findings suggest both similarities and differences in the barriers facing digital health startups versus traditional HIT vendors. Regulatory pressures affected both startups and traditional vendors. However, even when startups have fulfilled regulatory requirements, healthcare facilities were often still risk averse and conducted lengthy due diligence owing to a lack of knowledge and experience with this category of solutions. This proved detrimental to the resource-scarce digital health startups, which had cash flow issues that traditional HIT vendors typically do not. Additionally, the need for multidisciplinary stakeholder buy-in was lower for traditional healthcare IT vendors because they often liaised solely with administrators and, to some extent, clinicians. In contrast, startups needed to engage with patients, insurers and administrators as well. Similar to the findings from Nielsen et al. [35], we identify recursive theorization and translation of ideas from startup CEOs who described the morphing of strategies and product development to target different user groups and customers in the healthcare field.

2. Theoretical Framework: Institutional Change

An institution can be defined as a social structure that gives organizations or individuals lines of action or orientations, yet at the same time controls and constrains them [40]. IS scholars have adopted the institutional perspective and examined the interaction between institutions and IT [12,41] and contended that implementation of a technology will be greatly facilitated when it is congruent with existing institutions and vice versa. The institutional framework has also been used in examining the stages in the IT institutionalization process [13,31,34]. In this sense, innovations that emerge from digital health startups could be thought of as new actors that seek to gain legitimacy in the healthcare field to survive over the long term. These digital health innovations offer complementary ways in which physicians and patients can gather and exchange knowledge and interact. Here, we seek to understand the diffusion and institutionalization of digital health innovations. Unlike traditional HIT, these digital health solutions not only affect intra-organizational operations, but also shape future interactions with other users outside of the organization, such as payers and patients. As such, they must cope with the multiple institutional pressures that exist across all the members of the healthcare ecosystem, rather than just those inside the individual healthcare organization. This is a much more complex problem.

As mentioned previously, healthcare has been described as institutionally plural organizations in which multiple institutional logics, such as financial, clinical professionalism and regulatory institutional logics co-exist [10,13,40]. For instance, a regulatory logic would be a coercive logic that originates from governmental agencies that requires compliance from individuals. One of the most salient and normative logics in this study, given our study context, is medical professionalism. It accounts for how clinicians prioritize the quality of care and service to the patient, which results in normative pressures. Mimetic isomorphism can result from financial logic that leads to imitation of industry best practices or other successful organizations to gain cost savings and efficiency. The financial logic is driven not only by the hospitals’ desires to be profitable, but further reinforced—and to some extent complicated—by the involvement of insurance payers. Under these institutional pressures and constraints, startups will implement strategies to gain, maintain or repair their legitimacy [43].

Scholars have posited that institutional entrepreneurs could use theorization to illustrate and propose the interactions between sets and the IT in the field, formulate ideas about the cause and effect related to the use of their innovations, and gain legitimacy through improved understanding [19,35,42]. Translation is then lends a practical lens to the new ideas. Through a recursive process of theorization and translation, abstract ideas are implemented in specific contexts to eventually become taken for granted [14], and for the innovation becomes institutionalized. Similarly, Leblebici et al. [28] demonstrated that change begins with “practical solutions developed at the micro level and institutionalized through conventions at the macro level”. This reinforces the need for digital health solutions to be practical to seek legitimacy. This was also supported by Kennedy and Fiss [26], who demonstrated that adoption of total
quality management practices in healthcare facilities was done in a two-stage manner in which early adopters seek technical or economic gains and later adopters of innovations seek legitimacy.

Similarly, Abrahamson & Rosenkopf [1] believed that the early adopters of new institutional practices adopted them because they believed that these new practices efficiently solve a problem or yield positive returns. As the new practices are adopted, they become legitimated and the motivation for adoption shifts such that late adopters are compelled to adopt the innovation through institutional isomorphism and the need to maintain legitimacy. The decisions of potential early adopters can thus affect subsequent diffusion [1].

By exploring how startups view and navigate existing institutions as barriers to IT diffusion, we can understand the institutions’ ability to guide the firm’s strategy and some of the “taken for granted” assumptions that have driven the slow diffusion of digital health solutions [17].

3. Method

This is an exploratory pilot study to examine the institutional barriers digital health startups face and the actions taken to address these institutional barriers to increase diffusion and legitimization of digital health technologies. We used the qualitative method to understand the associated behaviors and complex inter-dependencies and interactions between people and technologies. However, startups each have their own distinct characteristics that lead to low generalizability across settings and low external validity. To help understand the variations across contexts, CEOs from different digital health startups were interviewed in addition to the ethnographic component.

3.1 Participants

Forty-five CEOs were identified and contacted through their business listings on accelerator or incubator websites and other published lists of successful healthcare startups. Six CEOs agreed to participate in an in-depth interview about their digital health startup, as listed in Table 1. Additional interviews are underway to build upon these pilot interviews and improve our findings’ generalizability.

Each interview took about 60 minutes, on the phone or over video conferencing. The semi-structured interview method was chosen over structured interviews to allow for natural conversation and new insights to develop, as structured interviews are a reflection of the researchers’ views about the world and thus may not be an accurate reflection of the participants’ sensemaking processes, particularly in a pilot study. However, the semi-structured interview format was still able to yield rough equivalence for systematic comparison across informants.

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<th>Table 1: Overview of CEO respondents</th>
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The protocol asked informants to describe their startups, reasons for starting the firm, challenges and barriers faced, and how they overcame these barriers. We also triangulated our findings with bimonthly discussions with entrepreneurs, physicians and analysts at conferences and technology meet-ups over six months.

One of the authors also conducted a year-long ethnographic study at a digital health startup (marked *) to triangulate the findings. This startup helps physicians disseminate care coordination plans through the iOS or Android platform or web portal. For instance, a patient coming in for an infusion treatment may be asked to report post treatment side effects or blood pressure readings that they measure through the application for the providers to review in the clinic. The startup sells its service directly to healthcare providers, who then have to register the patients on the application.

The startup has about 650 active patients and five major clients. The organization is about two years old and has eight full-time staff. All staff had prior startup experience and had electrical engineering or computer science backgrounds. Data sources obtained include weekly interactions with the staff, informal observations of sales pitches and start-up client interactions and group and management interviews.

3.2 Data Analysis

The analysis focused on reviewing and summarizing evidence of institutional barriers faced by digital health startups. We followed the guidelines suggested by Miles and Huberman [33] to develop an empirical grounded set of insights. We used an iterative process in which we developed hunches about potential

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barriers, compared these to new data from the site, and then used the new data to decide whether to retain, revise, or discard these inferences. Any emerging themes such as the emergence of periphery actors and roles of multidisciplinary stakeholders, were added into the subsequent interviews that followed. The following presents our preliminary findings from our study.

4 Findings

4.1 Finding 1: Digital Health Startups as peripheral institutional entrepreneurs

All interviewees in our sample were institutional entrepreneurs that emerged from the periphery with non-healthcare backgrounds. Half of them were serial entrepreneurs with prior ventures, whereas others started their companies in response to the experiences with deficiencies in the healthcare delivery system. The interviewees echoed the social benefits of working in healthcare, that the "Gravity of what you are building sinks in really quickly" [CEO A]. This CEO said he was just a "geek dad [whose daughter was diagnosed with the condition]" who started asking questions, such as: "Why is this like this? Why does this device look like a pager - so out dated and hard to install. And I came to the conclusion that [medical device firms] don't know how to build good software. They don't talk to customers, have bad user interfaces and no agile development" [CEO A]. Another CEO said, "What if I had a game rather than traditional boring and painful therapy? I thought there was potential. We ended up developing a prototype and came in finalist [in a competition]...And decided to keep moving this forward" [CEO D]. This CEO was also motivated by his personal experience with rehabilitation when he broke his arm as a teenager and his services has gained traction with both adults and children seeking physical therapy. Another CEO [B] commented that "Health systems [are] not thinking productively about mobile phone in a productive way that truly extends and supplements the care delivery process."

In terms of technical barriers, the CEOs reported not having any difficulty with technical requirements of the product. The CEOs we spoke to all had computer science training and could cope with the technical requirements with ease. The CEOs also talked about their innovations being relatively less technically intensive than what one would find for a silicon valley startup [CEO A - E] and were hosted on the cloud.

As a result of being a periphery actor, startups often leveraged and learned healthcare or business knowledge from accelerators [CEO B, C, D, E]. These systems were helpful not only as source of knowledge but also for establishing initial connections between the startups and high profile mentor companies, such as health system or payers, critical for initial pilot tests or getting their first customers [CEO B, C, D]. To become legitimate, CEOs relied heavily on the reputation of their collaborations and pilot sites [CEO D, E, B] that were often obtained through accelerator programs. These accelerator programs put the startups in front of healthcare industry representatives and obtained seed money for them [CEO B, C, D, E] and were described as a "good and powerful experience" [CEO B]. Conversely, to get access to data from medical device companies, CEO A had to "make the crazy decision to be non-profit. If we had to be for profit, the [incumbent vendors] would have kept data for themselves. As non-profit, we explain that we are not here to take your customers away. We are trying to help customers achieve better value from your device. And this is not your data."

However, several CEOs mentioned that the duration of the programs were often too short to gain any real traction with the providers [CEO C, B]; three months was insufficient to get a product launched with the provider. Startups expressed the need for more follow up post guidance, such as six or eighteen month programs or stay-as-long-as-you-need programs. The CEOs had hoped that given the equity contribution, accelerators should have aligned interests and be motivated to help startups establish connections, but some CEOs feel that the accelerators often moved on quickly onto the next "sexy" idea [CEO B]. There is some evidence for this in the product design literature, particularly with respect to startups whose products are only one part of an ecosystem [3].

Given that CEOs appear to be periphery actors, we believe that existing mechanisms theorized in affecting institutional changes resulting from innovations can guide our analysis and thinking about how digital startups can lead the change. We would describe the startups in our study as institutional entrepreneurs, a title that has been used to actors who have an interest in particular institutional arrangements and who can leverage resources to embark on activities and practices to create new institutions or transform existing ones [32]. This was observed in our findings; our CEOs have founded digital health startups in response to perceived problems in the healthcare delivery system.

As such, the CEOs described having to satisfy all the different stakeholders, highlighted in Figure 1 not only in terms of value creation, but also user interface design and alignment with workflow and other operational issues in the eco-system. This is further exacerbated by the multiple institutional logics at play in the healthcare setting. For instance, tension may exist within the healthcare provider settings: clinicians may be convinced of the benefits, but administrators cannot afford the application. Startups and hospitals thus have to convince insurers to pay for the application and the burden of proof has often remained with the startup. There is currently limited support for that [CEO B, C, D].
Figure 1: Stakeholders and sources of institutional pressure in the digital health ecosystem

In our ethnographic study, we saw that the startup sold its services to population health management businesses but faced issues of patient engagement, because patients (end users) did not have a therapeutic relationship with these population health companies or insurers and were not committed to using the application. The regulatory agencies and rules can further exert institutional pressures on all these interactions and govern the way digital health solutions can interact with the users.

4.2 Finding II: Complex web of stakeholders that digital health startups need to navigate

One of the key challenges CEOs reported was the need to show proof of technical or economic gains with the use of the digital solution. Proofs of returns on investment or clinical improvements were often asked during sales pitches [startup C]. This became a chicken and egg problem, as most providers were reluctant to be early adopters, given their fears of liability and thus, it was often difficult finding a pilot site [CEO C, F, D, B]. In fact, some leading academic hospitals have propositioned to startups the offer to pilot in their organizations in exchange for payment, without any guarantee of organizational support for the product even if deemed successful [CEO C]. One CEO recommended that new startups should just work with any clinical site that was willing to pilot, even if it were not the optimal fit for their product [CEO E]. The proof of economic and technical gains was also challenging, as most of the patients with chronic illnesses were often the elderly, illiterate or those from low socio-economic background and thus potential returns to investment seemed low [CEO B, C].

However, one distinct characteristic of healthcare digital health innovations is that the payer of the service may not be the user, or a direct customer. For instance, an application that improves clinical outcomes could result in economic gains for the insurer but not the provider. However, the startup would have to pitch their product or service to either patients or healthcare providers who would incorporate the product into their treatment or workflow and would often be selling these services to health systems, as seen in startup B, C and D. Some of these applications, such as telemedicine [Startup E] direct patient behaviors directly and could be a business to consumer model, if patients were paying out of pocket for insurance coverage. However, often, healthcare providers are critical intermediaries in the adoption of these digital health innovations. Most healthcare providers are unable to adopt the technology due to the lack of financial incentives to do so. This was often a barrier that startups had difficulty crossing. Healthcare providers asked for help in getting insurance reimbursement for these digital health innovations [CEO B, C, D]. Startups thus had to try to gain legitimacy amongst insurers to facilitate adoption. The Center for Medicare and Medicaid Services released a ruling in 2015 on Chronic Care Services Management that will pay a fixed sum per patient per month towards the payment for digital health solutions should the product meet the care management criteria.

The need to satisfy multiple stakeholders also resulted in the need for contextualization and versioning of digital health solutions. For instance, patient populations with certain diagnoses needed alerts in the systems configured in a different way than when used in another clinical setting. Clinical settings also varied in their requests for new features. Even when the scope of the digital health innovation was narrow, contextualization continued to be a problem. As CEO D explained, “we could speak to 20 different physical therapists and they would give us 20 different opinions. But the game and application we designed contains all sorts of customization options so that the clinician can adapt the software to fit the patients need.” This was also seen during our observations at Startup C.

The need for contextualization in healthcare IT software has been demonstrated by scholars [8,34]. Scholars have found that generic systems used to foster coordination and communication amongst clinical specialists have often been unsuccessful [18]. The failures occur because of the disciplinary and task specific nature of clinical processes and workflows [11,16]. Bjorn et al [8] have proposed the need to account for the variations in local work practices even across similar clinical functions (e.g. emergency departments) in different organizations in designing HITs. As Davidson and Chisman [15] demonstrated, how providers interact with HIT user interfaces is a function of their knowledge and goals. The customizability capability needs to render knowledge accessible and actionable for different goals and knowledge needs in different organizations.

However, tension between generalizability and contextualization of software was a problem for digital health startups; startups need to balance and divide resources between these two endeavors. However, as Ries [37] described, startups are designed to deliver a new product or service under conditions of extreme uncertainty and limited resources in terms of manpower.
and funding [37]. Also, they are commonly exploratory in nature, lacking clear requirements, customers and even business models. Efficiency, in terms of minimizing the development effort while maximizing value gained, is thus a top priority. As such, startups face the tension between creating generic platforms and meeting the local needs of clients. As an engineer at startup C described, it is a “balancing act between what is demanded by the customer versus our long run product vision” that determined what would be considered for product development. Not all customer requests were incorporated into the application, given the startup’s time and resource constraints. Despite the startup being relatively young, the focus in terms of product development was not exploration, as would be common for other young organizations. Instead, leaders at startup C often had to remind the staff members to focus on leveraging its existing product and capabilities to build features that could be generalized for all clients use as much as possible, instead of devoting resources to features that were client-specific.

Lastly, the incumbent HIT solution vendors often did not “play nice” and were not willing to facilitate integration [CEO B]. The lack of interoperability inhibited diffusion of innovation. Often there was no API for these startups to plug into as a result of the programming dialects used in the existing HIT systems. Healthcare providers often enquired about interoperability between the startup’s products and the hospital’s existing IT systems, so that adoption of the digital health solution would not further disrupt workflow. This was observed during a sales pitch by startup C. A hospital CEO said that startups that marketed their services “all say they can be integrated with the existing [electronic medical record] but have no real idea what this means or how to go about doing that.” The ability to understand and articulate how their products could be integrated was exacerbated as startups were often not familiar with healthcare operations or existing HIT infrastructure and did not often have the chance to understand or interact with the existing health IT systems, as a result of patient confidentiality, to understand how their products fit with the existing system. It was not easy for startups to educate nor convince the incumbents and healthcare providers of the outcomes of institutional change. To that end, previous employees of traditional HIT vendors have started consulting firms to act as boundary spanners for startups and to provide guidance on how to achieve integration.

Presence of multiple stakeholders and their ability to inhibit digital health innovation requires startups to be strategic about their steps. Startups thus need to identify the stakeholders, their relative power, influence and interests and the institutional environments in which these emerge [2]. In the healthcare setting, even when operational efficiencies are demonstrated, the practices would not automatically become “taken-for-granted,” because the various stakeholders had different ideas about what is legitimate [35] just as adopters of the technologies had different theorizations and institutional pressures driving early adoption. Tanriverdi [44] also showed in the case of telemedicine, that unless technical feasibility is accompanied by medical validity, physicians are not convinced of the value of applications. The difficulty and mechanism for gaining legitimacy in a multiple stakeholder context with multiple institutions warrants further attention.

4.3 Finding III: Asymmetric impact of regulatory pressures

The CEOs all reported that the healthcare providers, pharmaceutical and medical device companies with whom they interacted often lacked urgency in making decisions about in vetting and adopting the products and services offered by the startups [CEO A, B, C, D, F]. Regulations have led to hospitals embarking on lengthy periods of due diligence for fears of litigation. CEO B commented, “HIPAA is a good example – it started out with good intention. But now, IT departments have no incentive to make decisions quickly. They don’t want to get sued.” Some CEOs felt that regulatory pressures have led to inertia to adopt or experiment with novel digital health solutions amongst the healthcare facilities. Startup CEOs described hospitals as being “notoriously allergic to innovation” and described their rate of adoption as “nauseating” given that providers are still evaluating the value of mobile health, even though other industries have already embraced multiple versions of applications in their industries.

Although the investment in the startups’ products were often a fraction of what healthcare providers would pay for the installation of a HIT, digital health startups often went through the same due diligence process as that of a major healthcare IT vendor. This was detrimental to the development and sustainability of startups, as they often have limited funds and need cash and capitalization to survive the long sales cycles that result from slow decisions made by healthcare providers.

The CEOs felt that the concerns were unfounded; startups often felt that they have been sufficiently educated and prepared to meet the Health Insurance Portability and Accountability Act (HIPAA) requirements to protect the confidentiality and security of healthcare information. All the CEOs interviewed were generally not worried about the regulations; it was considered the “cost of doing business”. There were existing support services to help digital health startups in the market navigate and meet these healthcare regulations. This included some recommended technology practices and protections that had to be put in place to fulfill HIPAA requirements, but the CEOs
recognized that these protections are basic good practices for product design.

CEOs B and E also reported having to comply with multiple rules, some of which varied according to the state in which the business operated (for business-to-business services) and some depended on the startup’s business model and product offering, e.g. telecommunication consumer protection act. For instance, CEO E described how the “patchwork of rules and the need to understand the rules” affected their operations and business models depending on locality. This could affect how the startups engaged with consumers or their business strategy, “for example, in some states, such as Texas, they don’t allow direct to consumer sales, but in other states this could be an acquisition strategy for hospital, as the hospital now gets your medical records [while providing primary care through telemedicine].” Regulatory pressures have also limited the areas and services in which startups are willing to operate. For instance, startups reported avoiding diagnoses related services or incorporating alerts systems to flag providers for fear of litigation. However, overall, most of the CEOs reported having satisfactory experiences with the regulatory boards.

However, overall, regulations itself did not seem to be a strong institutional barrier for startups; instead, the asymmetric impact of regulatory pressures have led to healthcare providers being reluctant to adopt novel digital health solutions, even if those solutions may have met regulatory standards for confidentiality and security protection.

4.4 Finding IV: Rhetoric morphs with context to facilitate diffusion

Boundary spanners were also employed in the top management teams. Some of these other decision makers in the startups were healthcare consultants, previous healthcare administrators or clinical staff on advisory boards that was essential for these startups to speak the language and devise solutions that would be operationally appropriate. As CEO E advised, “get someone who understands healthcare. This could be a physician, nurse practitioner. And healthcare economics – This could be a board member.” Boundary spanners may also help entrepreneurs interpret and overcome the barriers resulting from the existing institutions.

Use of rhetoric to facilitate change was a common strategy and was sometimes driven by boundary spanners. This was an emergent adaptive process, as providers and startups did not always have clear ideas about their value propositions with regards to how their service should interact with the providers’ existing workflows or products. This was exacerbated as the providers often did not allow startups access to clinics and patients, although these discussions and observations could better inform product design. Additionally, some of the interviewees felt that the flashy ideas that were not practical and not grounded in healthcare operations were also more likely to get funded. As such, as a startup, a lot of time and money are spent developing the rhetoric to sell their services in a way that would engage and educate users and healthcare providers.

Because this is a nascent industry with multiple opportunities for business strategies and model, startups were also trying to define themselves. As CEO B described, they had to “be careful in their phrasing to play on the strategic agenda”, as their product was not a focus of healthcare providers. Startups thus frequently changed their rhetoric and discourse to align with the local needs of the context in which they were planning to implement their solutions.

This has been substantiated by Leblebici et al [28] and Hirsch [24], who found the use of discourse and framing to increase legitimacy and promote institutional diffusion of practice. This was consistent with how scholars have started to think about IT artifacts as created, reinforced and transformed within and between organizations (e.g., [35,36]) through a recursive process, as startups talk to stakeholders from various organizations and learn from their implementations. As an engineer at startup C described, “I have always tried to think in scale [in my other startups and programming jobs] and want to design for scalability. But how optimized does it really need to get? We have such a small patient population… Over time, I just started to see everything as a pilot.” This demonstrated the morphing and dynamic nature of digital health innovations in the nascent stage as they become implemented in clinical settings and become modified in the process. Nielsen et al. [35] contended that for new IT ideas to emerge and become legitimized across organizational fields, they are reinforced and transformed over time through interactions with the usage arrangements within organizations in which they are implemented and these ideas go through become theorized and articulated to future clients. The discourse changes as a need to gain or maintain legitimacy [43].

5. Discussion

As our preliminary findings have shown, strong institutional barriers from the industry and stakeholders (Figure 1) have made it difficult for digital health startups to effect IT diffusion. For instance, digital health startups were often constrained by the availability of financing and thus adapted their discourse and strategies (e.g. target population) to fit the priorities of the customer. However, tensions were inevitable as the customer may not be the payer of the service. As such, efforts to selectively appropriate and contribute ideas may still be futile, if these adapted strategies and ideas did not align with current institutional pressures and priorities. As healthcare facilities are increasingly implementing electronic
health records, the conflicts and tensions between these multiple institutions have to be continuously worked through. As one of the CEOs interviewed said, “we are years ahead and started too early” [CEO C]. He felt that if the company had started a year or two later, the stakeholders (healthcare providers, HIT vendors and insurers) would have been better educated about the complementary efforts and potential benefits of digital health startups’ applications. This could have enabled collaboration the barriers would not be as strong, and they could perhaps enact change more effectively and efficiently.

The findings echoed existing healthcare information technology (HIT) research; privacy concerns, interoperability and resistance to HIT were amongst the key factors that inhibit the adoption of HIT [39]. Privacy has been a dominant concern in the HIT literature [4] due to the sensitivity of the data and the potential for exploitation. There have also been legal liability concerns [5] that inhibited the uptake of HIT. The absence of interoperability between existing HIT systems [30] has also been a deterrent to adopting yet another IT system.

Secondly, a clear understanding of the variety of stakeholders involved, their interests and needs can help startups navigate the complex institutionalization process. Abrahamson et al. [1] have likened the adoption of innovations to S-shaped diffusion, in which Kennedy and Fiss described early adopters as seeking primarily technical gains [26]. However, in the current state, startup CEOs described difficulties in trying to prove gains due to the conflicting institutional demands that act on the field and amongst the many stakeholders. The use of the institutional framework thus allows us to understand how these diffusion practices are influenced by and influence existing institutions. As such, if we were to think of the spread of new digital health solutions as an S-shaped diffusion curve that starts slowly, the healthcare industry is still in the early adoption stage. Knowledge of the constraints posed by the various stakeholders can help scholars and practitioners understand how to speed up that diffusion. How can we facilitate early adoption? How can stakeholder mapping increase understanding of the connections and relationships in the ecosystem that need to be managed to facilitate diffusion?

Thirdly, this work replicates the findings of Nielsen et al. with respect to the recursive discourse and implementation that occurs by digital health innovators in the healthcare setting[35]. However, by studying this phenomenon from the perspective of the startup, we are able to identify how some of these institutional barriers shape the digital health artifact and business strategies undertaken by startups, often as a result of the resource constraints. Understanding how firms make sense of the perceived institutional barriers and logics could enable deeper understanding of the mechanisms of IT institutionalization [47]. The mechanisms through which startups cope and adapt can thus shed light on the IT institutionalization process that lead to the legitimization of a digital health industry.

Lastly, these findings suggest the need for an ecosystem to support digital health startups for startups to work with the multiple stakeholders to collaboratively design a solution that could improve health services delivery. Hargadon and Douglas also suggested that incumbent institutions (traditional HIT vendors) often have political allies, preferential regulations or overwhelming barriers to entries [22]. The pervasive anti-challenger bias seemed to be in place, as the efficacy of these digital health solutions may not have been proven viable and are thus not legitimate solutions. The authors suggested that incumbent institutions can only be displaced by other institutions, and not single actors or ideas. For digital health innovations to displace or even be considered as a legitimate institution stems from having an ecosystem that is coherent that could displace the incumbent system. This leads to questions of how boundary spanners described earlier help startups navigate and align the rhetoric to that of existing institutions? We could further leverage the work of supply chain management in recognizing the stakeholders as members of the supply chain and the recognition of supply chain integrators in these efforts (Parker and Anderson, 2002), for instance, through incentives design and shared information systems for collaboration (Amaral et al., 2012). Efforts to integrate digital health solutions thus far have been disparate; digital health startups could perhaps collaboratively articulate a coherent vision of how its services and offerings could supplement existing institutions and the resources needed to enable development of digital health solutions. This includes getting insurers, governments, incumbent HIT vendors aligned to offer an integrated service that leverages digital health solutions to complement existing quality and operational improvement efforts. An alternative, or even complementary, solution would be for some large HIT supplier, such as AthenaHealth, to articulate a viable ecosystem of suppliers much as IBM did for the personal computer in the 1980s.

6. Future Research

Further interviews are being conducted to triangulate the findings in this paper and to identify mechanisms and potential boundary conditions for the institutionalization of digital health innovations. The CEOs and the majority of their top management teams were periphery actors and thus external validity is limited. Additionally, this leads to questions as to whether the institutional pressures are ameliorated or if the digital health solution gains legitimacy when the idea emerges from central players. Greenwood & Suddaby suggested that the central players in the
mature field can also become institutional entrepreneurs and adopt innovations if they are exposed to field level contradictions or awareness of alternative solutions as a result of their network positions can influence change motivation, especially when faced with poor organizational performance [20]. For instance, academic leading medical centers, such as the Mayo Clinic and UCSF, have experimented with digital health innovation, but little is known about their success or diffusion. The centrality of these periphery actors and their abilities to form networks with their venture capitalists and other stakeholders to capitalize on the knowledge and connections of their networks may increase success of the digital health solution.

A survey is also being developed to increase external validity and get the perspectives of the other stakeholders in the digital health ecosystem; the survey will incorporate the measures of institutional pressures developed by Teo et al to determine the effects of institutional pressures on adoption of technology [45]. Additional in-depth multiple case studies of digital health solutions could be conduct to gain insight about the mechanisms for successful and failed attempts at IT institutionalization. Finally, longitudinal studies could also be conducted to see how digital health firms gain, support and maintain legitimacy over time.

7. Implications for practice

Learning health system (LHS) scholars and practitioners have a vision for a fully integrated health data network that can learn and rapidly adjust to the needs of the population and conditions. Digital health innovations developed by startups offer potential capabilities, such as information gathering or enabling patient behavior change, to supplement LHS efforts. However, the tensions and conflicts imposed by the multiple stakeholders are unlike those faced by traditional HIT vendors. To leverage the capabilities of digital health innovations, practitioners need to understand the barriers faced by the creators of these innovations. Understanding of these barriers will allow practitioners and scholars learn how to mobilize these solutions through design science or policy and incentives design to facilitate the development of innovations that support the LHS vision.

8. References


