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National Digital Infrastructure and India's Healthcare Sector: Physician's Perspectives

Rajesh Chandwani

Indian Institute of Management Ahmedabad, rajeshc@iima.ac.in

Saneesh Edacherian

University of Birmingham Dubai, saneeshe@iima.ac.in

Mukesh Sud

Indian Institute of Management Ahmedabad, mukeshs@iima.ac.in

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Abstract

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Keywords

power dynamics, change management, information ecology, India, Aadhaar, large scale health IT project, interpretive research

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National Digital Infrastructure and India's Healthcare Sector: Physicians' Perspectives

Rajesh Chandwani¹, Saneesh Edacherian², and Mukesh Sud¹

¹Indian Institute of Management Ahmedabad, India

²University of Birmingham Dubai

Patient-centric digital infrastructure can potentially enhance the efficiency of healthcare systems. However, even in developed nations, evidence suggests low adoption rates for such infrastructure and lack of support from clinicians is considered as one of the most critical hindering factors. In this study, we examine physicians' perceptions of the proposed large-scale information technology initiative in India that aims to transform the health sector and provide universal health coverage to all residents of India. We employed the information ecology lens to understand the broader changes in the healthcare system that could result from the initiative. We use focus group discussion and in-depth interviews to comprehend the perceptions of doctors about the initiative. Drawing upon Foucault's conceptualization of power, we find that physicians, the key stakeholders in this initiative, are skeptical about the changes in the locus of power in the new ecosystem. Specifically, they perceive that knowledge power has shifted from a historical "expert knowledge power" to power related to "data management." The physicians believe that changes are expected to manifest through monitoring, controlling, and managing the data rather than providing knowledge-based services. We present recommendations to engage physicians' perspectives in implementing large-scale patient-centric digital infrastructure.

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Introduction

Due to increasing healthcare costs and its effect on productivity, governments across the world are attempting to design and implement systems that can provide affordable and quality healthcare to their citizens. The potential benefits offered by healthcare technologies such as Electronic Health Records (EHR) have prompted governments to design and implement large-scale health IT projects (Robertson et al., 2010). While the adoption of technology in healthcare has been generally poor (Baus, 2004; Kaplan & Harris-Salamone, 2009; Littlejohns et al., 2003) the failure rate has been especially high in large scale projects (Goldfinch, 2007; Mason et al., 2017). Large-scale health IT projects are highly complex and involve very diverse stakeholders having different requirements, attitudes, and constraints (Herzlinger, 2006). As many projects straddle both the public and private sectors and span across organizations and individuals, they face challenges like differing political agendas and varying degrees of government controls.

Examples of large-scale health IT projects include the 2009 Health Information Technology for Economic and Clinical Health (HITECH) Act in the US, where the aim is to build a nationwide information infrastructure, achieve widespread use of EHR to facilitate data exchange, and provide incentives to encourage healthcare organizations and providers to adopt

and conform to the Health Information Exchange (HIE). Despite projected potential benefits to patients, physicians and hospitals, however, the adoption of these IT systems remains poor (Almoaber & Amyot, 2017). It is estimated that mutual transfer of data happens only between 78.8% of family physicians in Canada and other healthcare organizations (Collier, 2015) and as of 2013, only 30% of hospitals in the US were participating in HIEs (Adler-Milstein et al., 2013). Yet another example of a failed large-scale health IT project is England's National Program for IT (NPfIT), which created nation-wide EHR implementation and data exchange similar to the HIE. The project was abandoned in 2011 after it was operational for a decade (Justinia, 2017). Scholars cited several reasons for its failure, including political influences, unrealistic targets, and lack of engagement with key stakeholders (Justinia, 2017; Robertson et al., 2010). Large scale IT health projects should be regarded as a continuous process and user engagement should be incorporated in the early stages of the project (Cresswell et al., 2011). While several challenges were listed, lack of support from clinicians was cited as one of the critical factors that led to the failure of NPfIT (Brennan, 2007; Justinia, 2017). Though clinician apathy has been cited as an important aspect of the failure of healthcare IT projects, especially large-scale ones, the perspectives of physicians related to IT projects have largely been underexplored, with scholars calling for additional research in this domain (Fuji et al., 2008; Kaelber et al., 2008; Nazi et al., 2010).

This study has been conducted with the backdrop of a nation-wide health IT initiative being implemented in India, the National Health Protection Scheme (NHPS), or Ayushman Bharat (also known as "Modi care"). The Ayushman Bharat initiative, which has an insurance cover for each household, is projected to significantly empower the Indian patient and could be a game-changer in Indian healthcare (Bhargava & Paul, 2018). Relying on Aadhar, the nationwide UID (Universal Identification) project (Singh & Jackson, 2017), the NHPS aims to link the EHR to Aadhar, enabling patients to access healthcare seamlessly. Apart from the Aadhaar-linked EHR and health insurance coverage, Ayushman Bharat also envisages the use of digital technologies to regulate India's fragmented healthcare system. In the new digital infrastructure being implemented – National Health Stack (NHS) – all stakeholders, including patients, doctors, hospitals and others, will be registered and have the means to interact with each other (NITI Aayog, 2018).

In this study we explore the perspectives of physicians towards the design and implementation of the initiative. The initiative, like other health IT implementation projects, has a focus on patient centricity – broadly defined as the process through which patients regulate the information flow during the care process to adopt their options guided by their values and beliefs (Robbins et al., 2013) – and is based on the concept of shared decision-making. The launch of Ayushman Bharat and implementation of related digital infrastructure has been discussed extensively in the popular press (Bureau, 2018; Neelakantan, 2018). Therefore, it is important to understand the physicians' perspectives about the phenomenon as they will not only be key generators but also the users of the data, with their practices and routines significantly affected by its implementation (Nazi et al., 2010). Further, as highlighted above, the acceptance of the initiative is dependent upon early participation of stakeholders, right from the design stages. Traditionally, healthcare professionals have been powerful stakeholders, as they have "expert power" derived from their professional training and experience (Doolin, 2004). Indeed, the threat to this power could be a key reason for their resistance to health IT (Chandwani & Kulkarni, 2016; Fayard et al., 2012; Walter & Lopez, 2008). Understanding physicians' perspectives towards the system becomes especially relevant in the Indian context, where the power dynamics are highly skewed towards doctors (Chandwani & Kulkarni, 2016). To comprehend the perceptions of doctors about the NHS and its effect on their practice, it is important to understand their views about potential changes in power dynamics that the initiative can cause (Chandwani & Kulkarni, 2016; Doolin, 2004). As

discussed previously, an early engagement with key stakeholders is critical for the success of large-scale IT health projects. We employed the information ecology lens to understand the broader changes in the healthcare system that could result from the NHS. The information ecology lens permits the investigation of the broader healthcare ecology and also highlights the physicians' views on power dynamics in the ecology.

To understand the physicians' perspectives on the evolving power dynamics within the ecology, we draw on Foucault's conceptualization of power (Foucault, 1980) which considers knowledge and power as inseparable and posits that power is evident in the numerous knowledges, practices, routines, and technologies that facilitate the actions of other individuals (Hindess, 1996). Digital technologies influence the knowledge and therefore power of participants in a relationship, and that power is relational and is exercised in social action (Clegg, 1989); for example in the physician-patient (Kumar et al., 2022) or in the manager-physician interaction (Doolin, 2004). Foucault's conceptualization of power, therefore, complements the information ecology perspective which recognizes the stakeholder's capacity for local action within the ecology.

Background

Indian Healthcare System

With few financial protection options such as direct payments made by government or other agencies to obtain health services, and low adoption of health insurance services among the Indian population, the healthcare system is characterized by high out-of-pocket expenses. Further, with three fourths of healthcare facilities (infrastructure and manpower) concentrated in urban areas (accounting for one third of the nation's population) the rural-urban divide is significant (Patil et al., 2002; Srivastava & Shainesh, 2015). Apart from this divide, the inter-state variation in healthcare provision and financing is also significant, with some states like Tamil Nadu having reasonably good healthcare infrastructure as compared to other states such as Orissa (Balarajan et al., 2011). This variation is attributed to the varying efficiency of state governments under whose responsibility this domain lies. The role of the central government has been confined to the implementation of national programs targeting specific diseases (Reddy et al., 2011). Consequently, the quality and scope of healthcare services vary across states (Reddy et al., 2005).

Furthermore, EHR penetration in India is extremely low, limited to a few big hospital chains in cities, and often exist in silos without any interoperability that allows the exchange of patient information and healthcare history stored in EHRs across healthcare systems and institutions (Koppar & Sridhar, 2009; Srivastava, 2016). Most of the available health data has been captured through paper-based records during visits to hospitals. The data collected at the points of healthcare delivery such as hospitals, pharmacy, labs, etc. are often customized to the requirements of billing and data retrieval with limited focus on its meaningful secondary use, which includes indirect use of personal health information for purposes such as research, public health, marketing, and other commercial activities (Safran et al., 2007). With health data standards and guidelines at a very nascent stage and the resulting lack of standardization of data, the usefulness of available data is also very limited. In other words, the quality of healthcare data in India is a major concern (Balsari et al., 2018).

Conceptualization of Ayushman Bharat

In an attempt to provide universal health coverage, in 2018 the government of India announced the formation of the National Health Protection Scheme (NHPS) (Bhargava & Paul,

2018). NHPS, also known as Ayushman Bharat, is a large-scale public health insurance program that offers insurance cover of Indian Rupee (INR) 500,000 (approximately \$7000) to roughly 500 million Indian citizens. Unlike the previous government insurance schemes that were fragmented across different states, NHPS is under a central government directive. Earlier insurance schemes, designed by both state and central governments, have often proven inefficient and have been largely ineffective in providing healthcare (Selvaraj & Karan, 2012). The shortcomings of these schemes included ineffective penetration among beneficiaries, insufficient participation of providers, lack of accountability, incompetent and/or fraudulent detection, and rudimentary information technology systems. Lessons learned from previous schemes and the large-scale nature of the NHPS compelled the government to consider a national-level digital infrastructure that can serve as the backbone for effective implementation and also ensure seamless functioning (NITI Aayog, 2018). To address these issues, in July 2018, NITI Aayog – the policy think-tank of the government – proposed the blueprint for National Health Stack (NHS), the national digital infrastructure. In the next section we discuss this.

National Health Stack

The NHS, described as a set of cloud-based services, is intended to build a framework for digital infrastructure that can be shared between state and central governments and help achieve seamless care across various levels. This is a federated, patient-centric digital ecosystem which allows data to be captured and stored at a particular source and recalled by various applications that use the stored data with the aim to achieve significant reduction in healthcare costs for beneficiaries (Balsari et al., 2018). The proposed NHS is expected both to cater to beneficiary needs as the NHPS is rapidly rolled out while also finding innovative solutions such as single window payments across services, telemedicine, and portals for healthcare information exchange within the complex healthcare system. This integrated system would allow for diverse stakeholders such as NGOs, researchers, and watchdog organizations to engage in the emerging digital health marketplace, which in turn would enhance the efficiency of the system (NITI Aayog, 2018).

A key requirement for an efficient health information exchange such as NHS is the ability to identify each participant through a unique identifier (Yasnoff et al., 2004). In this case, the feasibility of the nation-wide patient-centric digital infrastructure is built on the high penetration of Aadhaar, a biometric ID, among the citizens of India. NHS has proposed that the entire system should be built on the unique identities of all participants, including patients, doctors, hospitals, labs, and other healthcare service providers in the ecosystem. According to this blueprint, NHS comprises a digital infrastructure built on the master data of all healthcare services named as the National Registries Layer, which serves a single source of healthcare data for the country. This national-level data source could be used to build solutions for targeted healthcare programs for specific groups such as children and women, and special initiatives to address specific diseases. Despite the current debate over privacy in Aadhaar (Mali & Avila-Maravilla, 2018; Srinivasan & Johri, 2013), the NITI Aayog has proposed a commitment to privacy through features that include anonymization of patient data and storage of data in private secure environment as integral components of the health infrastructure design. An effective digital infrastructure entails a roadmap for effective use of collected patient data, such as using real time data as an input for policy decisions and research (Rodolfo et al., 2016). Further, NHS will provide an existing base through an application program interface (API) (Balsari et al., 2018), which is a software intermediary that allows multiple applications to communicate and exchange information across them, for entrepreneurs and new entities to harness the power of data while devising innovative solutions for Indian healthcare problems.

Related Literature

Large Scale IT Projects in Healthcare

Increased interest in providing safety, quality, and efficient healthcare has encouraged the use of IT across nations (Catwell & Sheikh, 2009; Protti, 2007). Compared to small-scale projects, large nationwide IT initiatives have additional benefits including the use of data for secondary purposes such as policy, research, and even commercial objectives (Cresswell et al., 2011). While there are proven benefits of IT in healthcare, the barriers to adoption rates exist and failure rates are relatively high (Lapointe & Rivard, 2007; Sligo et al., 2017). Previous research has also highlighted that IT projects in healthcare have notable challenges including altered speed of workflow, high upfront cost, steep learning curve for physicians, over-documentation, and concerns over privacy and data security. While IT project implementations have been prone to failure, there has been an increase in recent failures as compared to rates documented in previous decades (Ashurst et al., 2008). These failures are especially high for large-scale IT initiatives (Goldfinch, 2007). Previous attempts to implement national health IT systems in the UK (Cresswell et al., 2011) and the USA (Furukawa et al., 2014) have either failed or experienced abysmally low adoption rates.

Unlike small-scale IT systems, where the major challenge lies in integrating clinical and workflow of the organizations, in large IT systems, the major challenge lies in customizing the national level IT to the local context (Coiera, 2009). Benefits of the secondary use of data from large-scale IT projects are only possible if the project adopts interoperability as a fundamental characteristic of the project design. However, this makes customizability to the local organizational context an uphill task. Prior studies have found that this challenge increases if the implementation of large projects involves upgradation and integration of existing individual local IT systems (Jensen & Aanestad, 2010). Researchers have also found that involvement of stakeholders at the local level is crucial to the success of large national-level health IT systems (Cresswell et al., 2011). In healthcare settings involving professionals with defined roles, power structures that regulate the workflow practices will emerge. The implementation of new IT systems can influence the information flow within the organization and result in a redistribution of power, leading to resistance from some sections of the organization. In the example of national health record implementation, contracts were negotiated at the national level, leaving very little inclusivity locally. This design could lead to a lack of communication between local organizations and design-level representatives.

Another significant challenge faced in large health IT implementations is judging costs and timelines for implementation. Prior research has documented that ambitious timelines often led to failure both because the planning phase is often unrealistic and does not accommodate additional costs in scaling up (Sligo et al., 2017). Projects should allow for customization in the design as they evolve. It has also been observed that projects should involve end-user groups in all phases through guidance, training, and feedback sessions to facilitate its smooth implementation. Large-scale IT projects such as EHR implementation and the significant change they entail have been illustrated adopting an information ecology perspective (Bogers et al., 2018).

Information Ecology

The idea of ecology as a lens has recently gained prominence in HCI research and practice (Norris & Suomela, 2017). Consequently, frameworks employing the idea of “ecology,” such as information ecology, have been proposed to analyze and understand technology in a system of complex relationships in its entirety. Information ecology, a

multidimensional framework, is based on the idea of a biological ecosystem and comprises a complex system of individuals, routines, standards, and technologies pertinent to a specific local environment (Nardi & O'Day, 1999). Unlike other perspectives that assume technology as being politically neutral and beyond the control of individuals who use and consume it, the information ecology perspective views technology as being influenced by social and human factors within the local context. The information ecology perspective entails that the expertise and agency required for technological change is not limited to the designers and administrators of the technology but also extends to the users and the local context (Hart-Davidson, 2000). Moreover, the key participants of the information ecology co-evolve with technology influencing human behavior as much as the people influence the development of the technology.

Researchers have used the information ecology perspective to study the design of technology for connected interactive ecosystems such as personal health ecosystems (Bogers et al., 2018). Its connected nature creates complexity due to multinodal interactions among users, which allow users to interact with the system using multiple modes as well as interaction between physical artifacts such as paper-based records that are present in clinical practice despite the introduction of electronic record systems and digitally-recorded patient data (Zamarripa et al., 2007).

The information ecology perspective broadens the scope of analysis and encompasses the interdependencies, interactions, and dynamics amongst the environment, artifacts, users, and information (Fidel, 2012). Researchers have also attempted to position their work based on various characteristics of information ecology; namely, system, diversity, coevolution, keystone species (who are artifacts or individuals who hold the information ecosystem together), and locality (Bogers et al., 2018). The system characteristic emphasizes the relationship between artifacts and users. It is helpful to understand various relationships such as artifact-human, which involves how human participants interact with the system, and artifact-artifact, which involves how different systems within the larger ecosystem engage with each other. The diversity characteristic deals with the differences in the roles and functions defined in the ecosystem. The ecology is not static, with the members, artifacts, and relationships constantly evolving. Koshy (2014) describes how doctors redefine their existing role in terms of a new hybrid function as a clinician-IT professional. Information ecology allows us to study how technology change occurs by the influence of local action (Koshy, 2014).

Nazi (2013) studied how the introduction of secure messaging, a new service that allows patients and healthcare providers to engage in secure transfer of electronic messages, altered the nature of relationships in the existing ecology (Nazi, 2013). "Keystone species" are artifacts or individuals who hold the information ecosystem together (Nardi & O'Day, 1999). Physicians and the patients in a "shared decision-making model" can be regarded as the keystone species that are critical for the information system. Specifically, in the Indian context, which is characterized by low doctor population ratios (except for a few urban regions) and a physician-dominated strong hierarchical structure, the role of physicians is extremely vital for a health information system (Chandwani & De, 2013). While in the recent past there has been an increasing emphasis on data-driven work-ecologies in healthcare, scholars have raised concerns over a change of relationship involving key stakeholders that can impact the long-term sustainability of the ecosystem (Bossen et al., 2016).

Physician and EHR Adoption

HCI researchers have studied the impact of the introduction of information systems such as EHR in healthcare settings (Hartwood et al., 2003; Sharda et al., 2003). Since

conventional healthcare organizations are heavily dependent on human resources, the introduction of EHR in these settings necessitates changes in the existing workflow practices and realignment to suit the new technology configuration (Tang et al., 2015). The majority of the research on EHR focuses on understanding either the benefits of implementing an EHR or challenges and barriers for accepting EHR within the organization.

HCI researchers have also found that amongst the barriers to adoption of EHR, physician-system interaction has a significant role (Reddy & Bradner, 2005). Physicians are the primary users of EHR in healthcare and a majority of the EHR has not met the expectations of primary users in terms of support offered to their workflow, with the implantation of EHR restricting individuals, including volunteers and paid employees, from performing activities that they were trained to do before the implementation of EHR (Tang et al., 2015). Healthcare professionals often find that the EHR design creates challenges in their workflow, resulting in dissatisfaction and adoption failures. There is also evidence that inefficiency caused by EHR deployment has resulted in unintended medical errors (Boonstra & Broekhuis, 2010; Campbell et al., 2006). For example, Koppel et al. (2005) highlighted that the use of computerized physician order entry (CPOE) systems resulted in 22 types of medication error risks.

Despite its proven benefits, physician resistance to EHR implementation has been attributed to the high cost of implementation, uncertainty about benefits, lack of training, and psychological barriers (Boonstra & Broekhuis, 2010). One of the key barriers to EHR adoption has been physicians perceiving it as a threat to professional autonomy (Walter & Lopez, 2008). In hierarchical setups like healthcare, physicians value their professional autonomy and fear that the advent of EHR will enable governmental or other parties' control over their professional decisions. Since physicians are on the front line, their resistance can significantly impact both the adoption and effectiveness of EHR in healthcare (Ford et al., 2009).

Method

The study was conceptualized by three authors. The lead author is a medical professional with experience in qualitative research in information systems. The second author is a researcher with experience working in healthcare setups as part of consulting assignments. The third author is a researcher with extensive experience in engagement with technology-based entrepreneurs. The lead author has been involved in studies related to doctors' perceptions about and adoption of technologies such as Internet health information (Chandwani & Kulkarni, 2016) and EHR (Kumar et al., 2022). These studies highlight the role of changing power dynamics in the doctor-patient relationship that can influence the physicians' perceptions of technology. Further, these studies emphasize the critical role of physicians' perceptions about technology in shaping their behavior toward technology. While the above studies had focused on understanding the evolving power dynamics in the doctor-patient relationship, NHS could potentially alter the entire ecosystem of the healthcare organizations. Thus, while the prior knowledge of the power dynamics in doctor-patient relationships provided the motivation for initiating the study about physicians' perception about NHS, the extensive changes in the ecosystem envisaged in NHS provided a fertile ground for exploring doctors' perceptions about different stakeholders involved.

All the authors were fully aware of and intrigued by the government's plans for National Health Stack (NHS), the national-level digital infrastructure, which was conceptualized as a backbone for effective implementation of the NHPS. Prior literature (Chandwani et al., 2018) as well as the studies conducted by the first author suggested that physicians' acceptance of and participation in NHS would be critical for achieving the desired outcomes. Indeed, as mentioned above, physicians' resistance has been a key reason for failure of several large-scale health IT interventions (Chandwani & Kumar 2018). Hence, the authors

initiated a study to explore practicing physicians' perceptions about NHS, specifically aiming to understand their fears and concerns, which in turn, could lead to resistance. Such study could potentially provide useful insights about appropriate design and implementation of the intervention.

Design

Our methodology has been driven by our research objective to explore physicians' perceptions about upcoming large-scale health IT implementation programs and especially the NHS. In India, this is the first nationwide IT health implementation project and can potentially impact the ecology of the healthcare system for all stakeholders. The unique context of Indian healthcare and the need to understand the physicians' perspectives made us adopt an exploratory approach rather than advancing the paper from pre-planned theoretical lenses (Ngenye & Kreps, 2020). Hence, in our study we explored the idea of NHS and its potential implications with focus group discussions (FGD) and semi-structured interviews. As evidenced in previous literature, focus groups are highly suitable for exploring a novel concept (Pope & Mays, 2020). Focus groups involve small groups of people with particular characteristics convened for a focused discussion of a particular topic (Kitzinger, 1994).

Further, group work and group discussions are instrumental in investigating perceptions about a novel phenomenon as the participants draw from each other's accounts and narratives (Karen, 2001). Accordingly, we used FGDs to generate discussion that enabled the creation of jointly-produced narratives by the participants on physicians' perceptions of the NHS. Semi-structured interviews followed the FGDs.

Recruitment and Participants

The lead author of this paper was conducting an executive education program titled, "Reputation Management and Changing Face of Healthcare in the Era of Social Media" for physicians in September 2018. The focus group participants were selected from the medical doctors who attended the residential executive education program. The executive education program had participants from various healthcare specialties and from multiple parts of the country. We were hence able to recruit physicians from regions across the country for our study, both for FGDs and the interviews, with physicians from diverse settings: urban, semi-urban, and rural areas, public and private sectors, and large and small hospitals. After the focus groups, some participants were requested, and they then volunteered to participate in a semi-structured interview on the topic. Our FGD and interview participants were practicing physicians with an average experience of more than ten years in their respective specialties. All participants have experience using information technology systems in their workplaces to interact with patients and staff in their respective organizations.

FGD & Interview Setting and Procedure

In total, five focus groups were held in separate study rooms allocated for participants as part of the executive education program. Each focus group lasted for 60-90 minutes. Each focus group had entirely different participants with no overlap across groups. Two of the authors were leading it, the third author, himself being a medical doctor, kept track of the time and visited each room while discussions were in progress. The participants were introduced to the policy change about NHS towards the end of the executive education session. The discussion about this was initiated in the focus groups. Sub-themes included healthcare in India, the role of IT in clinical practice, privacy, litigations, and the role of government. The

discussion opened with one of the authors introducing themselves and encouraging participants to express their views on the impact of the NHS on patients, doctors, and other stakeholders. Specifically, they were encouraged to elaborate on how the initiative will impact their practice going forward. The discussion was led by questions raised by the participants and then the discussion snowballed. The participants were informed that the FGD were being audio recorded, and the recordings were transcribed verbatim.

After the focus groups, we requested participants for one-on-one interviews and some of the participants exhibited their interest in participating in semi-structured one-on-one interviews. The purpose of the interviews was to give the participants an opportunity to explain their perspectives in detail and also build on some of the perspectives they gained during the FGDs. Based on their interest in participating, we conducted in-depth interviews with 14 physicians who volunteered to be interviewed.

Analysis

Data from FGD and interview data were analyzed systematically in alignment with the interpretive approach (Walsham, 2006). In line with the interpretivist approach, we did not approach our data with any particular theory. We organized the transcripts of all the interviews and followed an iterative coding process to develop codes at three levels: codes, categories, and themes. First, the authors coded the data individually and shared their codes. We continued this iterative process until a consensus arrived across authors regarding the codes generated. The data analysis progressed iteratively, moving back and forth between the theoretical concepts and empirical data, exploring emergent themes, and ascertaining recurring patterns. The final themes were arrived at through brainstorming sessions amongst the authors.

The initial codes were intricately linked to the data; for example, “electricity and other physical infrastructure is poor,” “internet penetration is not extensive in the rural areas,” “government hospitals are most lacking in the infrastructure,” etc. In subsequent levels of coding, we linked the first level of code to second-level categories. For example, the codes mentioned above were connected to the second-order category, “infrastructure not ready yet.” We then organized the group of second-order categories to the themes that emerged. For example, three second order categories (i.e., “infrastructure not ready yet,” “lack of awareness amongst patients,” and “issues related to privacy of health information”) were grouped to theme “perceived issues with the system.” We have listed the coding scheme with first order codes, second order categories and themes in Table 1.

Table 1
Coding Scheme

Exemplar First Order Codes	Second Order Categories	Themes
Electricity and other physical infrastructure are poor	Infrastructure not ready yet	Perceived issues with the system
Internet penetration is not extensive in the rural areas		
Government hospitals are most lacking in the infrastructure		

Patients unaware about the government schemes such as Ayushman Bharat	Lack of awareness amongst patients	
Uneducated patients from the rural areas are not techno savvy		
Poor and uneducated patients won't be able to ascertain quality of treatment and hence can't effectively rate the services		
No clarity about the ownership of private health information	Issues related to privacy of health information	
Potential misuse of information by actors such as Insurance or technology companies		
Liability of the actors regarding sensitive health information is unclear		
Agencies will monitor the professional practice of the physicians	Monitoring the physicians	Perceived issues with the use of data
System affords recording of minutest details		
Patients will be able to affect the reputation of the physicians	Manipulating the doctors	
Agencies like insurance companies, government, etc. will influence the practice of the doctors		
The agencies can make the doctors compete/ fight with each other for ratings		
Rating agencies (and not patients) will become powerful	Manipulating the data, ratings, etc.	
Data can be interpreted in a way to suit the actor		
Tech companies will be able to manipulate the data and ratings etc.		
Accurate and detailed patient health information will be available to all the doctors at any time	Enhanced patient centricity in the design	Perceived effect on Doctor-Patient interactions
Patients will have power to choose their treating doctors on the basis of data - expenses, availability, experience, etc.		

Power shifts from doctors to patients		
Hospitals/physicians start focusing on the financial aspects as every action is linked to financial returns	Focus on bottom line rather than patients	
Choice of drugs/ procedures guided by financial implications		
Ayushman Bharat rates are too low leading to excessive financial constraints		
Physicians might pick up cases which are not complex to decrease the variability in the cost	Cherry picking in professional practice	
Crowding out of “difficult patients” to government hospitals		
“Health and access for some and not all”		

Results Section

This section presents the three different themes that emerged from the data. The themes represent the perspectives of physicians on various aspects of the technology embedded in the NHS, namely, (1) perceived issues with the system, (2) challenges with the use of data, and (3) concerns about the effect on Doctor-patient relationships. This section is structured around the above three themes.

Perceived Issues with the System

The physicians perceived that while the NHS can enable linking EHR with Aadhaar identity, which in turn can enable implementation of EHR across the country, there were several issues with the system design and implementation. Their concerns were related to (a) lack of suitable infrastructure for proper implementation, (b) lack of awareness amongst patients, and (c) issues regarding privacy of health information. These aspects are detailed below.

Infrastructure Not Ready Yet

The physicians raised concern over the government’s own readiness to implement a scheme of this magnitude. A scheme of this scale and technological complexity requires the availability of proper technological infrastructure at government hospitals, which currently lack even basic facilities.

But government themselves don’t have the infrastructure. Nine of ten government hospitals still believe in paperwork. They don’t even have the basic infrastructure...

Other doctors added that the situation is not different in many private hospitals in smaller cities.

India has the slowest rate of network connectivity. From what I know it is worse than Bangladesh and Pakistan. If your facilities are not of that standard you can't implement ideas only. If your network is failing and 500 people are queuing up in a line, there will be chaos, it will fail ultimately... everybody has to be geared up for that....the report cannot be generated, the report cannot be ordered, there will be chaos. And if you mix, today the system is not working, do it by paperwork then the system completely fails. It has to be 100% all or none.

Physicians suggested that the scheme should be implemented in phases.

Do it in the metros first than gradually to tier 2 (smaller) cities and then rural areas.

Lack of Awareness Amongst Patients

Physicians highlighted that most of the patients in the Indian context belong to the lower socioeconomic strata and there is significant lack of awareness about health, diseases, and technology. One physician remarked,

The Ayushman bharat has been implemented for 5 years now, look at the awareness. Many of the patients come to us who are not aware of the scheme and about the diseases covered. NHS requires much more complex understanding. How will it be implemented...I don't know...

Prior research has highlighted that one of the issues with scaling up of Ayushman Bharat is the limited awareness about the program. Another physician emphasized that the unaware and uneducated patients may not understand the implication of the system affordances. He specified,

Our patients are mostly uneducated and are not aware of the disease, treatment etc. How will they assess the quality of treatment, how will they rate the hospital or the doctor? It can be disastrous.

Issues Related to Privacy of Health Information

The issue of privacy was an overriding concern and was highlighted by several physicians. They were unaware of the legal implications of data leaks and were skeptical and concerned about the security of data they were providing.

Suppose some data which is not relevant to my care may get revealed – whether we are impinging on his privacy. It may have a lot of impact on his social life, married life, family and all. Sometimes insurance knows all these things and may not insure him also.

Healthcare data is very sensitive and there can be emotional and social ramifications if the patient's health data became widely available. I think the

first and foremost thing that you mentioned that the data pilferage; secrecy of the patient; the data loss; the hospital data and not only the collective data but individual data may be.

Since patients have the sole authority to permit access, they perceived that there was a chance of data being shared with other entities. Further, since data was co-generated in the physician-patient interaction, without any clear laws on privacy the liability could fall on the doctors. With the ensuing privacy debate in the country, there could potentially be a huge issue with the liability associated with data safety.

Who is liable if the data is lost? For example, as you said in the morning somebody is HIV positive and somewhere it is leaked in some portal and this patient comes and sues and says that I got operated at your hospital and except you I have not got my tests done anywhere else and your lab knew I was HIV positive ultimately you the doctor, you hospital and your lab is responsible because I don't know anybody.

Physicians felt that with patient data and clinical notes likely to be shared with non-health professionals, personal information about the patient would no longer be sacrosanct. They specifically were skeptical about the use of data by third parties like the insurance sector for financial gains.

Why should my personal information be shared with somebody who is not going to be the healthcare delivery provider which is a doctor or the hospital? If you go by the law the hospital knows through the doctor only. The hospital is not supposed to hold the records for your personal disease or disorders. It is through the doctor that the hospital holds your secrecy code of disclosure.

What if the insurance guys get hold of some health records...they may refuse the insurance cover...what happens to the patients then...and what about the doctor, is he liable for the loss to the patients...

Perceived Issues with the Use of Data

One of the important aspects of the NHS was the use of health data for enhancing affordability, accessibility, and quality of healthcare services in India. While the physicians concurred that proper EHR would help in enhancing the quality of care, they were worried about the consequences of use of the data in the “cloud” by agencies, public and private, for purposes beyond enhancement of patient care: for monitoring and manipulating the doctors’ behaviors. Further, they were concerned about the possibility of data manipulation by such agencies. These three aspects of their concerns about the use of data are described below.

Monitoring the Physicians

Physicians posited that patient dynamics and the response to treatment are specific to individuals and hence the treatment evolves dynamically. It would be very difficult to assess the quality of treatment against some set standards. Some physicians, for example, were apprehensive that if, on the basis of new evidence, a doctor changed her diagnosis it could reflect on her competency.

It is not only about the patient even you can study the behavior of the doctors – their prescription manners/behavior; how they make the diagnosis; how is their competency or is there any variation from doctor to doctor and if that doctor is wrong – suppose after 2-3 hours or after one day or two days he makes another diagnosis then what is the impact to his profession and impact to the patient also?

The physicians also felt that every action of theirs and the hospital would be logged into the system. Hence, without clear guidelines on the possibility of human error, these recordings could prove detrimental to the physician community.

...because human error is bound to happen and now human error will get recorded – your sister (nurse) has not given that injection that day and will get recorded in the system.

Manipulating the Doctors

Physicians were worried that access of the data by agencies and private players could accentuate the vulnerability of the physicians to manipulations by these agencies and actors. Physicians perceived that new players entering the field (insurance companies, the government, call centers, intermediaries, etc.) could change the dynamics of the healthcare sector. For example, a patient's feedback could become an important part of healthcare quality. In the case where patients had an encounter with the physician that was below their satisfaction due to factors that are beyond physician's control, patient's feedback could have an impact on the reputation of the doctor.

A patient would now have the ability to tarnish a physician's reputation.

They will never speak good about somebody but they will easily speak negative things about somebody. So these things are likely to. . . they may emerge. People may not go and write a good point but they may go about and rate a bad thing.

The physicians felt the need to “protect” the profession of the physicians from malafide intentions of the “powerful” actors.

These insurance companies, government, etc. will control a lot of data and also will have the power to manipulate it for their benefits...So that also has to be taken into consideration and you have to protect the profession of the doctor and that should not be used by the government or patient to harass or sue the doctors.

Manipulating the Data and Ratings

Our study found that the new system could impact a physician's professional reputation and their establishments. This availability of data for building business models may invite new ratings devised by firms that can use aggregated patient feedback data. For example, existing appointment scheduling companies have in the past previously tried to create ratings based on patient feedback. The physicians were skeptical that these agencies and actors could manipulate the data and ratings for ulterior motives.

Juggling of rating agencies themselves will come into play. Then if the payments are linked to it then there will be unnecessary focus on just improving the numbers...

It is not the patients but they (agencies) will have extreme power...they will be able to access, interpret and manipulate data...it is the new power you see. They can actually blackmail us (physicians) as well as the patients.

Perceived Effect on Doctor-Patient interactions

The physicians highlighted that the erstwhile sacrosanct doctor-patient relationship would drastically change with the implementation of NHS, entry of new actors, and institution of new processes. Prior literature has underlined the role of technology in modifying the doctor-patient relationship. The physicians posited that though overall the NHS was designed to enhance patient centricity in healthcare delivery, and indeed the intentions might be that they were concerned that the dynamics could actually be detrimental to patient centricity. They furthered that those strict guidelines and tight financial situation perpetuated by the NHS could result in physicians focusing on bottom line rather than patients and that it could lead to unethical practices like cherry picking, where doctors only treat patients that could have a positive treatment outcome, could ultimately be detrimental to patient centricity. These aspects are detailed below.

Enhanced Patient Centricity in the Design

There was acknowledgement that the patient care could improve because of the NHS. Interoperability of patient history would potentially benefit physicians as often patients were not knowledgeable or educated enough to explain prior treatment. This could also reduce costs by avoiding replication of costly tests.

For example, if I am a cardiologist the data that he underwent appendectomy five years ago is shown but details of the appendectomy of that time of perforation, was taken out, was necrotizing, how was the specimen, what was the histology, what happened or did not happen after the surgery, was it eventful or not, want to the slides of it which has no relevance to me.

All the data wherever you go, whichever hospital he goes it can be stored in that docket. It can be linked through his unique identity –whatever it could be. It could be whatever and it is made accessible to the treating doctors and it is good because what all previously happened they come to know. Patients sometimes may not reveal anything also. They may feel it is not relevant to this scenario or they may not want to reveal also.

Physicians felt that the NHS could empower patients as patients would have more information to choose a doctor. However, he also opined that this may not have a significant impact on their practice due to the paucity of medical professionals in the country.

The power relationship will be more skewed towards the patients rather than the doctors because they will have more options to choose but there is nothing to lose even because the pool of patients is quite large.

However, physicians furthered that the above advantages could be jeopardized because of the design of the financial payment system linked to the NHS.

Focus on Bottom Line Rather than Patients

The physicians emphasized that the financial remunerations in the Ayushman Bharat and NHS were not aligned with the cost of care and that physicians (especially the small clinics and mid-sized hospitals) would struggle to survive financially. This in turn could result in focus on the bottom line rather than on the patient. The financial issues could crowd out these hospitals and clinics out of the scheme, defeating the very purpose of the NHS as an integrated platform.

He may need a drug that costs a little bit more. But my hands are tied because if I do all those things the cost is going to exceed the budget and the hospital will say that man you are treating a patient and producing a loss. You cannot treat a patient and produce a loss because the hospital cannot fail as a business model. If there is no profit it is fine but at least don't make a loss on every patient. If you keep on making loss on every patient better don't admit and don't treat the patient.

All this could result in unethical practices.

What I have heard is that in Ayushman in the caesarean section the charges are around 9,000. In Rs. 9,000 you have to admit the patient; you have to do the surgery; you have to pay the anaesthetist; you have to give the anaesthetic agents; you have to give the antibiotics; you have to treat the baby; you have to give food to the patient; you have to do all the follow ups for free; you have to pay your staff; you have to pay electricity at commercial rates; you have to earn out of it and you have to pay taxes also. How on earth is anybody going to earn out of that? If those rates are going to be there then there is bound to be either unethical practice or people will opt out of the scheme.

Cherry Picking in Professional Practice

Physicians also felt that hospitals would tend to prefer patients with simple medical histories and avoid handling complex cases. This could cause a serious dent in the government's effort to increase the accessibility of healthcare in the country.

Here you do all choosing, cherry pick the cases and do simple 100 and show 2 mortality and get a high rating agency and operate only cherry picked cases. So what will happen is that cherry picking will also be done by the patients. When will they cherry pick – when they are stable. So the good cases will naturally line up to the so-called rating and then the rating will be created by absolutely cherry picking.

Discussion

In this study, we analyzed the perceptions of physicians on the proposed NHS that aims to transform the health sector and provide universal health coverage to all residents of India. We adopt an information ecology perspective to comprehend the power dynamics emerging

with the implementation of NHS, which could have significant implications on physician's adoption of the system. Prior scholarship largely has been focused on patients or policy makers (Nazi, 2013). It is important to explore physicians' perspectives, as they are key and powerful stakeholders in healthcare delivery. They are not only affected by the system design and implementation, but also hold the key to successful implementation.

The current study situates the physicians' concerns about NHS in the dominant current discourse on patient-centeredness. Current discourse on healthcare policy that highlights the shift in the healthcare system towards patient-centeredness emphasizes the role of doctors evolving from expert authorities to professional guides (Fox et al., 2005). Other researchers have questioned whether patients, especially if poorly-educated, are competent or even willing to take on this responsibility (Greenhalgh et al., 2009; Mol, 2008). This phenomenon has significant influence on the perceived changing power dynamics between doctors and patients in the healthcare sector.

We have invoked Foucault's perspective of power to comprehend the changing power dynamics in the proposed ecology. Foucault's conceptualization of power through knowledge is specifically opportune in comprehending the changing power dynamics in the emerging information ecology with implementation of NHS (Alderman & Edberg, 2011). Foucault's theory highlights the epistemology and possible use/misuse of information and knowledge, as it posits that power is expressed in the collection and use of information or in the expression of knowledge (Foucault, 1977; Rouse, 1994). The perspective of power is even more important in the context of IT implementation in healthcare organizations where power dynamics constitute an important aspect and where, traditionally, physicians have enjoyed expert power from their professional training and experience. Expert authority, historically, stems from a knowledge base built from extensive training and experience (Abbott, 1988; Freidson, 1985). The use of scientific knowledge and expertise, traditionally, has resulted in physicians being powerful stakeholders in the healthcare delivery system, enjoying a position of significant autonomy and dominance (Evetts, 2013). The shift towards patient-centeredness and empowerment, especially through technology, potentially threatens physicians' authority and expert power vis-à-vis the patient, and this could have significant implications for their resistance to technology such as internet health information (Chandwani & Kulkarni, 2016) and personal health information (Korica & Molloy, 2010). Our study reveals that knowledge power, in the new ecosystem as perceived by the physicians, has shifted from a historical "expert knowledge power" to power related to "data management." In our study, the physicians highlighted how the government and other data-related companies can use data to monitor and manipulate them, which in turn could affect their professional practices.

Prior literature has highlighted how health IT interventions such as EHR affect perceptions of power amongst physicians. Kumar et al. (2022), for example, demonstrated that the doctors resisted EHR as the technology affected the symbolic capital accrued by the doctors during doctor-patient interactions. Similarly, other scholars have highlighted that IT interventions affect doctor-patient interactions and can, in fact, jeopardize patient centricity (Korica & Molloy, 2010). Another stream of research has analyzed the effect of IT interventions on physicians vis-à-vis administrators in healthcare organizations (Doolin, 2004; Lapointe & Rivard, 2007). They showed that IT interventions led to shifting of power from doctors to administrators who could then monitor them, which in turn resulted in resistance to adoption of the technology. Another stream of research has highlighted doctors' concerns about internet information and an informed patient was more about perception of the challenge to expert power when patients begin to argue with the doctor about treatment options available and participate in the "shared decision making" process (Chandwani & Kulkarni, 2016).

The effect of IT intervention (NHS) on physicians' perceptions about doctor-patient interactions was evident in our research as well. We extend the literature on the role of power

dynamics in resistance towards health IT projects. Specifically, we look beyond the power issues between dyadic doctors-patient relationships and focus on the ecosystem involving several stakeholders envisaged to be the part of the proposed large-scale digital infrastructure. Invoking the information ecology perspective allowed for examination of the perception of power dynamics amongst physicians in a more detailed and nuanced manner. Specifically, our research found significant concerns regarding the role of government and data-related companies. We discovered that while physicians acknowledged the “inevitability” of the technology push by the government and recognize some potential benefits that can accrue to them as well as to their patients, the perceptions about government and entities that aggregate data were particularly adversarial. The novel findings related to perceived dynamics amongst physicians vis-à-vis other stakeholders are described below.

Physicians and the Government

The increasing costs of healthcare worldwide has prompted governments to impose funding restrictions, propose rationalization of expenditure and focus on efficiency, thus promoting a managerial perspective in this sector. Prior scholars have highlighted the resulting managerial dominance impacts the autonomy and authority of doctors (Freidson, 1985) and that this includes the role of markets and the state (Evetts, 2013). According to Hanlon (1998, p. 121), “the state is engaged in trying to redefine professionalism so that it becomes more commercially aware, budget focused, managerial, entrepreneurial and so forth”. Systems such as the NHS which are designed to empower patients could in fact become a source of political control over the physician community, influencing their routines, processes, work practices, and funding (McGivern & Fischer, 2012).

Our research also highlights the perceptions of physicians about the government in the new ecosystem as “panopticon” (Foucault, 1977), in which the physicians and the healthcare organizations in the private sector will be under a continuous disciplinary gaze involving monitoring and surveillance through the data (Ball & Wilson, 2000; Orlikowski & Baroudi, 1991; Sewell & Wilkinson, 1992). While physicians recognize that this can mitigate fraud in the healthcare insurance sector, they were concerned that the lack of representation of physicians and specialists in the decision-making bodies in government would result in faulty implementation leading to unnecessary cost-cutting measures. The lack of representation of specialists in decision-making bodies emphasizes undermining of expert power and overstresses data-based manipulation.

Physicians and New Data-Related Companies

Physicians were wary about the role of companies that rely on mining and managing data to influence other stakeholders, such as established aggregators, who serve as platforms to provide contact details of service providers to a particular group of people. They emphasized that while government and NHS were supporting these stakeholders by allowing profit margins of about 20 per cent, the healthcare providers themselves were being squeezed. They feared that these stakeholders would capture most of the value while physicians, who are the creators of the value, would be undermined. This concern, again, highlights the shift of power balance from expertise to data management.

Physicians and Their Peers

There was concern that various aspects of data infrastructure could lead to “unhealthy” competition amongst physicians themselves, which could be detrimental to the whole system.

The accessibility and transferability of EHR in the seamless Aadhar-linked NHS was perceived as a concern as it would lead to “unhealthy” competition amongst healthcare providers. Physicians emphasized that this could be a serious issue in the Indian context where most of the patients were uneducated and health awareness low. Prior research has underlined that clinical staff feel uncomfortable with EHR because their notes would be visible to several stakeholders and could potentially be monitored and audited (Jensen & Aanestad, 2010). Physicians in our study were concerned that the naïve Indian patient could be easily influenced by competitive peers and that they can be instigated to sue the primary physicians. As a result, the litigations against doctors might increase significantly. They also feared that the government or other stakeholders, who have access to and can manage data, may set evaluation criteria without in-depth expert knowledge, which could result in enforcing faulty norms and penalize those who deviate from them. They explained that not only might these norms encourage unhealthy competition amongst healthcare providers, but also promote “unethical practices” such as selecting only those patients for whom the “returns” were reasonable while referring the “unrewarding” cases to government hospitals.

Physicians and the System

While the physicians welcomed the EHR based on Aadhar, which could enable seamless provision of healthcare, one of the aspects where they had significant concerns was with the ownership of data. Prior research has also highlighted the blurring of boundaries of the ownership of patient data with EHR implementation, as records are accessible by multiple stakeholders (Ueckert et al., 2003). Physicians were concerned that they might be rendered liable for patient data theft and implicated wrongly, even if the source of leak originated with other stakeholders. One of the aspects where physicians were positive about the system was the efficiency embedded in the design. Their major complaint while participating in government sponsored insurance schemes was the excessive delay in receipt of payments. Hence, they welcomed the provision that the data infrastructure would enable speedy payments.

To summarize, our study suggests that physicians value the seamless connectivity accruing to the patients, efficiency of the payment system, and minimizing frauds in health insurance as envisaged in the NHS. However, their concerns were related to the changing power dynamics in the emerging ecology where “data” and not “expert knowledge” would be the source of power and that the stakeholders with access to data power would undermine the actual service provider’s position in the emerging ecology.

Implications for Practice

The study has significant implications for the design and implementation of large-scale IT initiatives. While the failure rates of IT initiatives are high in general, the failure of large IT implementations are particularly more frequent (Goldfinch, 2007) due to potential power restructuring in the ecology and issues in integrating already existing fragmented systems (Fukami & McCubbrey, 2011). Previous research has highlighted status quo bias as one of the aspects of resistance (Kim & Kankanhalli, 2009). In our study, we find that the perceptions of changes in power dynamics are related to the skepticism amongst physicians. We explain the different aspects of skepticism which need to be considered before implementing a large-scale change process. We further highlight the broader discourse in recent past significantly influences the perception of initiatives especially if the general environment is perceived by a set of key stakeholders as adversarial (Smith & Abbott, 2014). In our case the physicians had started perceiving the government initiatives as adversarial. This research emphasizes creation

of a conducive environment and multi-stakeholder participation in the design and implementation process. Specifically, the concerns and anxieties of physicians must be alleviated before the implementation not only because they are key stakeholders involved in delivery of healthcare services, but also central to the success of the proposed data-based ecology.

We find that the physicians' perspectives have largely been undermined and their resistance underestimated in the rhetoric of patient empowerment and the ubiquity of data systems exercising control over the healthcare system. Our findings indicate that the skepticism amongst the physicians stems from their past experience of government's initiatives to control the "profession." Notably, the Indian political discourse and projections in the popular media in the recent past has emphasized that the government is attempting to contain the healthcare costs by capping the excessive margins applied to medical devices such as stents, implants, etc. (Bansal et al., 2019; Neelakantan, 2018). Physicians' enhanced resistance to the government's planned initiative and the skepticisms about the intent of government in design and implementation of NHS needs to be understood in this context. Past research has also highlighted the importance of historical context and path dependency in response to policy changes (Smith & Abbott, 2014). For example, in their study, Pal et al. (2018) highlighted the power of the nation-building discourse that accompanied the demonetization move, showing that the governments narrative of "sacrifice for national interest" was instrumental in shaping opinion towards government's push towards digital payments and demonetization (Pal et al., 2018). Indeed, the authors reported that the perception about negative effect of demonetization was lower, even amongst those who were affected adversely. Therefore, the narrative and popular discourse about physicians, which has been significantly adverse, might be influential in shaping not only the initial attitude towards the NHS, but could influence the adoption of the initiative. Future researchers should examine the contextual narrative and its effect on adoption of the NHS.

Previous experience of similar patient-centric databases has encouraged secondary use of healthcare data for purposes such as policy analysis, marketing, accreditation, and private certifications. Though secondary use of healthcare data has enriched patient experiences, promoted public health awareness, and strengthened patient compliance, use of healthcare data for secondary use is bounded by ethical, political, and social concerns. Yet, at this juncture NITI Aayog's strategy note on NHS leaves this unaddressed. With the engagement of market players as one of the key design components of NHS, the discussion on standard best practices and supportive policies that govern secondary data use for legitimate purposes is warranted.

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Author Note

Dr. Rajesh Chandwani is an Associate Professor in the Human Resource Management area at Indian Institute of Management Ahmedabad (IIMA). He is the “Dr. Lal PathLabs Chair in Healthcare” at IIMA. He has been the Chairperson of the Centre for Management of Health Services (CMHS) at IIM Ahmedabad. He is a Fellow of IIM Bangalore. Previously, after completing his MD (Pediatrics) from Baroda Medical College, he has served as a Pediatrician in public health institutions in rural and urban areas. He has wide ranging interest in the human resource management and technology issues and challenges in the service sector, specifically in the Indian healthcare sector. Particularly, current research interests include the use of Information technology to enhance the effectiveness of healthcare personnel and healthcare delivery. He also has particular interest in mindfulness based strategic decision making. Please direct correspondence to rajeshc@iima.ac.in.

Saneesh Edacherian is an Assistant Professor in Strategy and International Business at the University of Birmingham Dubai, United Arab Emirates. He earned his Ph.D. in Strategic Management from the Indian Institute of Management Ahmedabad, India. His research explores how strategic leadership groups shape strategic outcomes such as innovation and internationalization. His emerging interests lie in extending the scholarly conversation and offering practitioner insights into corporate governance and responsible business practices.

Saneesh's publications include articles in outlets such as *International Business Review* and the *Journal of Business Research*. Please direct correspondence to s.edacherian@bham.ac.u.

Prof Mukesh Sud has over three decades of professional experience divided equally between entrepreneurship and academia. After an engineering degree, Prof Sud founded several small-scale industries involved in job work of abrasive blasting and sprayed metal/plasma coatings. In 2000, he exited industry and enrolled in a doctoral program at IIM Bangalore. Prof Sud began his academic career in the US at Augustana College IL in 2006. He was later an Associate Professor with tenure at the Dolan School of Business, Fairfield University, CT. Prof Sud joined the Strategy Area at IIM Ahmedabad in 2015. He is a visiting faculty at Ashoka University, Delhi and at the Naropa Fellowship at Leh, Ladakh. Prof Sud conducts executive education programs on "Design Thinking" and "Creating Entrepreneurial Organizations." His research is focused on entrepreneurship at the individual, firm and societal levels and includes several publications in FT50 journals. Prof Sud is actively engaged with industry and is currently on FICCI's National Start-Up & R&D committees. Prof Sud has co-authored a book that has been published by Penguin Random House titled, *Leapfrog: Six Practices to Thrive at Work*. Please direct correspondence to mukeshs@iima.ac.in.

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