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Readiness in adopting digital healthcare strategies and policies: An Indian perspective

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Summary

The healthcare sector has seen tremendous transformation all over the world especially in the adoption of digital strategies. These strategies have proven to be the most effective vehicles to deliver quality and cost-effective healthcare at scale to large population. Many countries all over the world have adopted smart healthcare strategies to effectively reach quality healthcare services to their citizens. Indian Government is also actively rolling out the Ayushman Bharath Digital Mission (ABDM) which was officially announced in the last quarter of 2021. As this ambitious flagship programme of the Indian government makes steady progress, it is very important to assess and evaluate the factors determining readiness in successfully adopting such a large-scale smart healthcare programme. Preparedness of all the stakeholders to successfully embrace such a change is important. Although smart healthcare strategies are the best vehicles to deliver quality healthcare at scale, all such implementations are not necessarily successful and a large number of them end in failure. The objective of this research is to systematically examine published literature to identify and enumerate a list of readiness factors across the healthcare ecosystem in a digital transformation mission. Critical knowledge and assessment based on these readiness factors is important to the success of the ABDM programme. PubMed, Scopus, EBSCOHost, Science Direct and Open Access databases were systematically searched for full text, peer reviewed, English articles that have listed such readiness factors in the adoption of smart healthcare. The ABDM portal and its document store have additionally been used as a source of material and for analyses, especially since the primary scope of this study was in India. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines were used to select eligible articles. After the full screening, 17 articles that met the criteria were analysed and used to identify six key factors and areas of readiness across the healthcare ecosystem for adopting smart healthcare strategies. These will enable the policy makers and the other stakeholders to understand and evaluate the readiness in the different areas of the ecosystem and accordingly strategies could be deployed. It is concluded that the success of ABDM is dependent on its adoption by public sector, private sector, end users and healthcare sector decision makers. Future research is needed to enable institutionalising a framework to ensure readiness and in measuring the

readiness against each of the identified areas/factors across the ecosystem. Measure of readiness is an important indicator to successful adoption.

Keywords: Healthcare services, smart technology, smart healthcare, readiness factors, preparedness, digital health, eHealth.

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Introduction

Healthcare in India is poised to make an unprecedented transformation. Healthcare service delivery so far has been ad-hoc, disconnected and provided mostly by individual general practitioners in small clinics or small hospitals (Thakur, et al., 2018). Also, patients mostly pay from their own pocket with insurance coverage being very minimal. As the aging population of India is growing – the UN Population Fund reported that the aging population of India is expected to grow to 173 million by 2025 and approximately 240 million by 2050. The population share of senior citizens is expected to increase from 8% in 2015 to 19% in 2050 and 34% by the end of the century. This factor alone is critical enough for the Government of India to establish an efficient and robust healthcare delivery system. India is also a signatory to Sustainable Development Goals 2030 - Goal 3: Good health, well-being and Universal Health Care Framework which was adopted by the UN General Assembly in 2019. The National Health policies and particularly the ABDM which was officially announced in September 2021 have been formulated taking all these into consideration. ABDM is India's flagship healthcare services scheme and is the world's largest government funded healthcare programme. ABDM aims to develop the backbone necessary to support the integrated digital health infrastructure of the country and bridge the existing gap amongst different stakeholders of Healthcare ecosystem through digital highways. ABDM (2021).

The mission's strategy - ABDM Strategy (2018) section 3, states that, with increased ease of use, acceptance by the people and adaptation by service providers, digital health interventions can accelerate progress towards Universal Health Care (UHC) and improve population health outcomes. By establishing a comprehensive, nationwide integrated digital health ecosystem, national digital health mission (NDHM) will contribute significantly to achieving the goals of National Health Policy (2017). This ambitious digital initiative aims to improve care and reduce costs across healthcare by creating a database of health records that will connect patients to a digital ecosystem with providers and payers. However, digital transformation is not simply about technology, it is about adopting a change management process enabled by technologies to increase the benefits for patients, clinicians and healthcare system.

Because of India's mammoth size and diversity, this endeavour will have challenges (Nundy, 2021). The Indian Government laid out the key principles in the National Health Policy (NHP) blueprint (2017) to include universality, citizen-centricity, quality of care and accountability for performance. This evolved through the National Health Stack (NHS, 2018) to the present ABDM (2021). The ABDM is the result of a journey of transformation from policy to a digital blueprint that encompasses goals, core digital components and implementation guidelines. The National Digital Health Blueprint lays out the policies and the implementation framework for the National Health Stack (NHS). This blueprint also takes into account the global best practices in adoption of smart digital strategies. However, adopting digital healthcare at scale

is complex and even a well-defined implementation framework is insufficient to ensure successful adoption of digital healthcare. The ABDM's ecosystem is complex, comprehensive and brings together all the different players and stakeholders starting from the public sector organisations to healthcare providers, insurance firms, third sector, diagnostic labs and healthcare service users. Understanding the readiness and preparedness of the different stakeholders in the National Digital Health Ecosystem (NDHE) including the end users in adopting the digital framework is critical to the success of the ABDM. This review aims to fill this knowledge gap of determining the readiness factors and their applicability to the ABDM ecosystem. Once these readiness factors are identified, both ABDM's approach to ensure readiness of the ecosystem and subsequently the evaluation of the ecosystem parts at their readiness levels are investigated.

Figure 1: The ABDM Ecosystem
Source: ABDM (2021)

Research Gap

The words smart healthcare, eHealth and digital health are used interchangeably in the literature. da Fonseca et al., (2021) provides another definition of e-health where e-health can be defined as a set of technologies applied with the help of the internet, in which healthcare services are provided to improve quality of life and facilitate healthcare delivery. Yaqoob et al., (2021) noted that handling smart healthcare systems in a secure manner has become very challenging because the data is spread across various healthcare facilities. Mauco et al. (2020) stated that how e-health implementations are not always successful, noting how historically, failure rates of up to 70 percent have been reported and many digital health interventions have failed during clinical implementation. Also, most of existing healthcare systems are centralized that are vulnerable to single point of failures and information leakage due to the rise of cybersecurity attacks. The leakage of patients' personal and critical information can lead to serious consequences. Therefore, the adoption of digital strategies fails due to several reasons

or can have severe consequences when due care is not taken at every step. Implementations will succeed only if the digital health intervention is taken up by users, adds high value, and facilitates the desired change or action (WHO, 2019). Henceforth, it is imperative to carefully build the preparedness across the ecosystem partners so that the adoption of digital strategies is successful with little or no disruption to delivery of healthcare services. Since, ABDM's strategies and the guiding policies are relatively new or still developing, it is important to be able to define, measure and evaluate readiness. Digital readiness in the healthcare sector has two aspects: the motivation to adopt the digital technologies and the competence to adopt it effectively.

Though India had the NHP defined by 2017 and subsequently launched the ABDM programme in the third quarter of 2021, a systematic framework for building the readiness and the evaluation of readiness has not been elucidated. Therefore, the purpose of this research is to investigate and identify these readiness factors that enable the successful adoption of ABDM within the Indian healthcare sector organisations. Identified readiness factors enable healthcare policy makers and leaders to understand and accurately evaluate the possibility of successfully adopting smart healthcare strategies and to ensure that proactive and early interventions are put in place to address any risks or shortcomings. The stakeholders, especially the decision makers may also put in place the requisite strategies, policies and implementation plans clearly defining how readiness can be ensured in the system and people.

Methodology

The study follows a systematic literature review, which can be defined as a tool to identify, evaluate and interpret available and relevant studies regarding a particular research question (Kitchenham, 2004). The review is guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA). The raison d'etre of this paper is 'what are the different readiness factors in the adoption of smart healthcare at scale in India via the Ayushman Bharath Digital Mission?'.

Literature Search and Study Selection

The search was done on various electronic databases like PubMed, EBSCOHost, Open Access and Science Direct. In addition to this search on the databases, literature directly available from the ABDM portal has been used in the review. A hierarchical drill down search approach was used and in-built search engines with advanced capabilities provided by the databases themselves were used independently to narrow down to relevant content. The searches were then merged, sanitised, duplicates removed and filtered down to the most relevant articles related to the area of interest. The search algorithm followed the below steps:

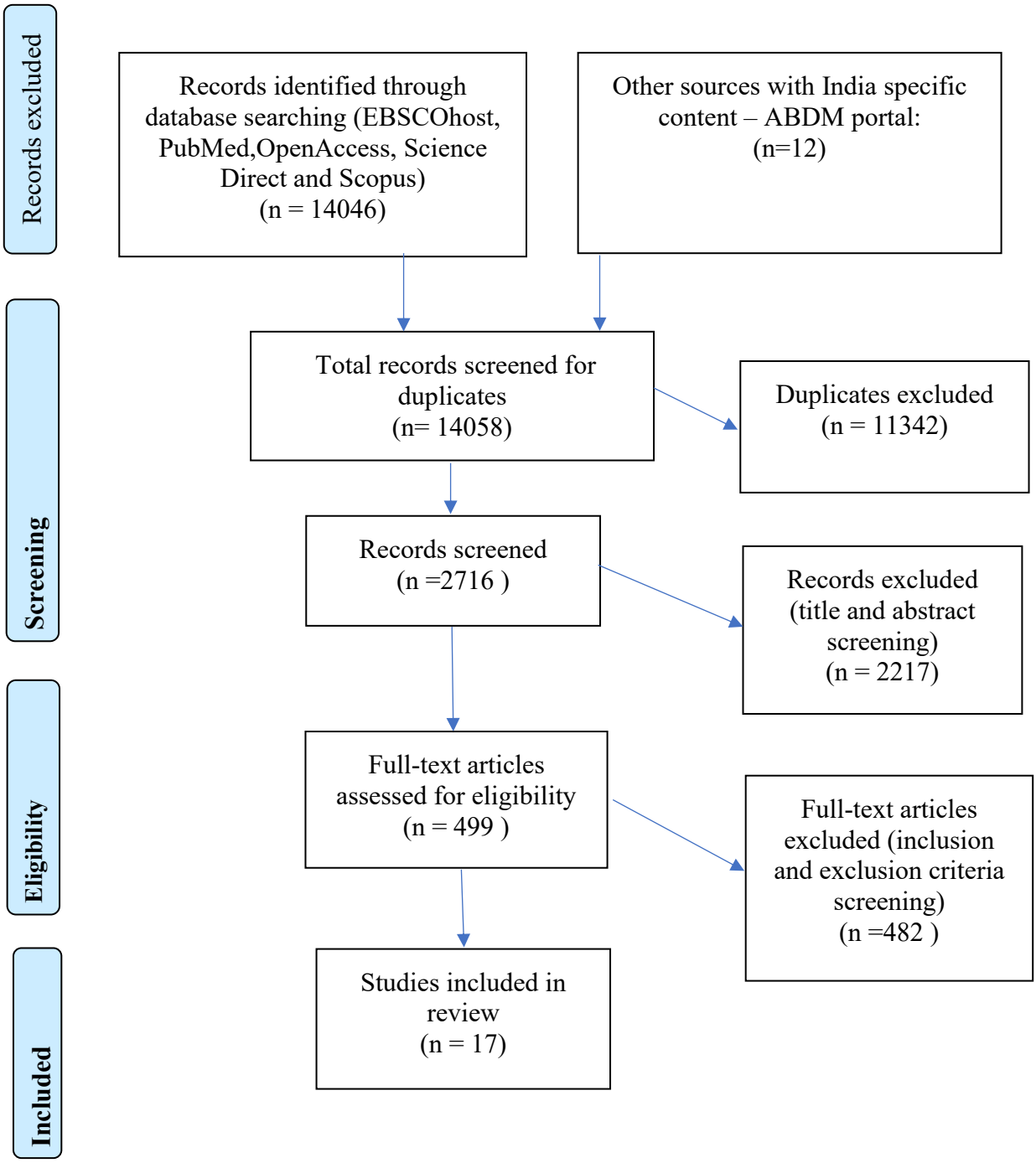

Figure 2: PRISMA article screening process.

Start with an initial scope of all articles with terms like "smart healthcare" OR "digital health" or "e-health" or m-health" in the abstract. This will be a rather large result set filters like "readiness" OR "preparedness" OR "transformation" OR "change" OR "adoption" was added to search terms in 'abstract'. This reduced the result set size considerably. At this search stage, the search result can be regarded as comprising of articles "being related to health/e-health, smart health" AND which are having some content related to "readiness" or "preparedness" or "transformation" or "change" or "adoption". Then, "readiness" OR "preparedness" OR

"readiness factors" were added to the filters in "ALL_TEXT". This query then results in a list on which the relevant ones must be manually selected. Since our area of interest geographically is "India", an additional filter term, "India" was included. Some search engines specifically allow adding "country" to limit the results while in some others "India" is just an additional search term. Applying the "country" filter brought the result set down to a very limited number. But, since the result set without the country context yielded relevant material, some of those have also been selectively used in the review.

An exact result of the above methodology as applied on the PubMed and OpenAccess databases is elaborated below. The query: ((Smart healthcare) OR (ehealth) or (digital healthcare) or (mhealth)) AND (((readiness) OR (preparedness) OR (transformation) or (change) or (adoption)) resulted in 278 counts. The article types included in the filters include: Journals, conference papers, books, policy documents, dataset, and review papers. The exercise of carefully selecting the relevant articles yielded 17 relevant papers. This process of narrowing down to the relevant set was through a manual effort of carefully reading through the abstracts of 278 papers or articles and marking those which are relevant. These results aided in the enumeration of the readiness factors as relevant to the Indian ABDH mission.

As shown in Figure 1, the initial broad-based search retrieved 14,046 articles and 12 additional records were identified from other sources. In total, 14,046 articles were screened for duplicates and 11,342 duplicates were identified and excluded. Further, title and abstract screening was conducted on the remaining 2,716 articles and 499 potentially eligible articles were selected for the next stage. A full-text review of the remaining 499 articles was then conducted using inclusion and exclusion criteria described as above and a total of 17 articles were identified as eligible and therefore analysed for this study.

FINDINGS

After reviewing and analysing the relevant literature, six key smart healthcare readiness factors that emerged, include: organisational readiness, technological and infrastructural readiness, governmental readiness, healthcare service provider readiness, societal readiness and end users' readiness. These encompass other sub themes but confines to identifying the set of key readiness factors and how it has or has not been addressed by the ABDM programme. The categorisation may overlap in some cases, but the factors can be categorised distinctly under one theme based on its relation to the ecosystem players. The categorisation has been affected in the context and understanding of the entire ABDM ecosystem with its different stakeholders and how ABDM proposes to address these readiness factors. The list of these six factors stems primarily from a deductive review of literature (e.g., Brar et al (2022); Mauco et al., (2020); Dudu Bilgic, et al., (2021); Kashthuri (2018); Ngusie et al., (2022); Hammerton et al., (2022); and Lennon et al., (2017), many articles dealing with the evaluation of particular readiness factors. Each of these key readiness factors in the context of ABDM is discussed in detail below.

Organisational readiness

It is the preparedness of the organisation or an institution in order to support and adopt digital healthcare strategies and its implementations. This includes the support and policy guidelines provided by the top management. Clear policy guidelines must be defined, a cultural awareness and readiness to adopt digital strategies should be promoted by the top management. In the context of the ABDM ecosystem, organisational readiness is relevant to multiple stakeholders

or ecosystem partners. Organisations here range from health facility providers (HFPs) like clinics, hospitals and labs to insurance firms, HealthTech companies, third sector and associations. All of these organisations across public and private sector play a key role in the ecosystem and all of them have to adopt digital strategies for the entire ABDM to be accomplished in full. This is a humongous task. Failure in any part of the ecosystem can adversely affect the delivery of healthcare services to users. Each of these organisations, therefore, must individually assess and evaluate their own preparedness to ensure that delivery of health and well-being of patients is not compromised.

ABDM has not outlined the exact readiness factors in its policy or strategy documents. However, ABDM recognises the disruption that may be caused and therefore lays out detailed implementation plans on how to increase and attain preparedness. The ABDM blueprint provides an action plan with scope and outcomes for implementation – section 5, NDHM Blueprint. The disruption has to be anticipated and organisational readiness to absorb the disruption has to be built in. ABDM in the NHDM Blueprint, section 4 on capacity building and change management recognises that significant changes would be affected in the existing protocols, processes and systems and in the mind-set of the people currently managing the same. Therefore, a highly professional approach is needed in the area of leading change.

According to Hospodkova et al., (2021) the main factors that must be monitored for a successful and sustainable change management strategies include a clearly defined and widely communicated vision, early engagement of all stakeholders, precisely set rules, adaptation to the local context and culture, provision of a technical base, and a step-by-step implementation with strong feedback. ABDM recognises this and has therefore proposed in the NDHM Strategy, section 4.12, that a proof-of-concept and a sandbox environment approach is warranted. Recognising the complexity of the components and the building blocks and the risks of failure, it strongly recommends that the NDHM shall undertake a few proofs-of-concepts in respect of all the critical components, before production level designs are made. In addition, a set of environments in the form of a set of regulatory and technology sandboxes in selected areas shall be made available. This allows a mechanism for early feedback and evaluation. Organisational readiness in its cultural dimension involves the management being able to infuse the willingness in its people to adopt the organisation's digital policies and guidelines and realise the benefits of doing so.

Technological and infrastructural readiness

Successful adoption of digital healthcare systems on a scale like in India requires availability of the enabling infrastructure. This includes software and hardware systems, information and communications technologies (ICT), adoption of new and emerging technologies like cloud and IoT, skilled human resources required to implement, manage and maintain these services, quality infrastructure for Public Health Centers (PHCs), uninterrupted power and water supply, to name a few. All of these also have to be made affordable. Building this massive infrastructure takes meticulous planning and implementation. Brar et al., (2022) in their study in the state of Punjab, India, note that there is a significant knowledge and skill gap and also conclude that it is imperative for the State and local level interventions for the strengthening of the physical infrastructure in setting up of health and wellness centers. ABDM being a digital mission, elaborate strategy, policy and implementation plans pertaining to digital services are made available by ABDM itself. ABDM also provides a sandbox where an environment is made available for building and testing the system before actual integration. The ABDM handbook defines the sandbox as a digital space which is detached or separated from the actual digital

health ecosystem. It is a space for experiment of integration before the digital health product is made live for the actual use. This is key to building readiness for adoption. Not only does the sandbox allow for isolated development and testing, but the progress on the sandbox is also guided and monitored. Once the integration is tested, a central integration team will follow up through to live integration. The sandbox therefore is a means to achieve readiness and an automatic mechanism to evaluate readiness.

Detailed webinars have also been conducted by ABDM and many educative videos have been made available that especially enable Health Tech companies to build the digital solutions according to the ABDM technical specifications. The central digital infrastructure-the NHS had already been made available as a set of APIs along with detailed documentation. ABDM is based on open API based ecosystem – NDHM strategy, technology principles. Core APIs for creation of ABHA, for registration of Health Information Providers (HIPs), Health Information Users, Unified Health Interface (UHI), etc. have already been made available. Technological readiness in terms of the availability of core digital infrastructure is therefore already available and is being continuously improved upon.

Digital infrastructural readiness also involves the readiness and upskilling of personnel using and operating these systems. Therefore, requisite training has to be imparted. ABDM recognises this factor for preparedness in the NDHM Blueprint, section 4.11 - Criticality of Capacity Building and Change Management. Trainings for upskilling for capacity building has been identified here. The National Health Policy (NHP) also advocates coordination between National Council for Skill Development, MOHFW and State Governments for engaging private hospitals/private general medical practitioners in skill development. This is critical to readiness to adopt e-health initiatives.

Government readiness

The Governments, both central and the states have a very major role in such a massive digital mission. The governments must support end to end – right from the formation of policies, bringing stakeholders together, promoting awareness, creating the requisite cultural ambience for the adoption of the mission, communicating the benefits of the mission to all stakeholders and importantly, and funding the mission. The National Health Policy (2017) laid the foundation for the mission and then progressed into the National Health Stack (2018) and finally to the ABDM (2021). The Government of India has reiterated its readiness and seriousness to the successful implementation of the mission. India being a federal setup and health being a state subject, it requires active involvement of every state. However, ABDM being a central mission, it is responsible for clearly outlining the strategy and the policies. ABDM publications' repository lists and makes available several strategies, policy and consultation papers, which are key to the subsequent implementation. These aided the mission's readiness driven by the Government of India. The Government also must make available the core digital infrastructure and components which was affected through the National Health Stack (2018). The Government of India has also committed requisite funding with an eventual goal to raise the expenditure to about 2.5 percent of the GDP. Granja et al., (2018), in their study on factors determining success and failure of e-health interventions note that costs is most mentioned as contributing to the failure of eHealth interventions. Therefore, it is important to have requisite allocation and monitor the costs. apart from the requisite allocation, ABDM also has a Digital Health Incentive Scheme (DHIS), through which ABDM intends to support different healthcare facilities like clinics, diagnostic centres, hospitals, and

laboratories in adopting the ABDM ecosystem to make available the benefits of digital health for all the citizens of India.

Cultural readiness

This is the readiness of the people and of the different players in the entire ecosystem, culturally, to be ready to embrace the digital technology driven systems. The Indian Government makes the policies and provides the required infrastructure. But it is important for the ecosystem partners and more importantly the public/patients to feel motivated to become part of the digital health mission. For this, it is necessary and imperative for all to understand the benefits. ABDM strategy (2018) lists the benefits to all the stakeholders. These benefits have to be effectively communicated so that there is voluntary motivation to enrol with the digital mission. Along with benefits, safety of data and assurance of data security is key to successful uptake of digital healthcare. Mauco et al., (2020) also cite the level of dissatisfaction in the current state of healthcare services to be a factor that drives readiness to adopt digital health services.

Healthcare provider readiness

This is the provider's willingness and receptiveness to use digital healthcare technologies. Though organisational readiness covers many healthcare providers, the ABDM's healthcare provider ecosystem consists of individual doctors, practitioners of alternate medical systems, small labs, pharmacies, diagnostic centres or small care centres which are not big enough to be called organisations or institutions. They form a substantial part of the ecosystem and therefore are important for seamless integration of these players into the digital mission. Again, it is important therefore that the benefits of the programme are clearly articulated to all the potential stakeholders.

End users' readiness

The extent to which members of the public and patients adopt these digital healthcare practices defines the readiness. The more willingly the public take to it, better is the chance of the mission's success. Many sub-factors influence this. Firstly, it should be obviously beneficial to use it. The usage itself should be simple and non-disruptive. This could mean ease of handling of end-user applications, simple user interface screens, and easily available information/data. Razmak et al. (2018) define ease of use as the degree to which an end user deems the use of smart healthcare strategies as free of effort. Therefore, using the digital tools should be simple. User experience plays an important role in the acceptance of technology. The readiness to adopt digital technology especially by the end-users is a direct function of good user interface. ABDM proposes a Unified Health Interface (UHI) and provides a reference implementation. More importantly and critically, the data has to be secure, and the patients/public should trust the systems and trust the data security. Also importantly, the affordability and easy access play an important role in the patients' readiness to adopt digital technologies.

Conclusions and recommendations

The current study reveals that achieving digital healthcare transformation means change for the health sector, and that such a process of change depends on the ability of stakeholders and individual healthcare providers and patients to manage and work with new knowledge. Digitising health in the rest of the world has been challenging and a number of failures are still

being recorded. Having investigated on current literature, six main readiness factors that affect the adoption of digital healthcare are identified. The six factors identified are: organisational readiness, technological and infrastructural readiness, governmental readiness, healthcare service provider readiness, societal readiness and end users' readiness.

The paper concludes that digital healthcare transformation is a complex process and is not simply about taking to technology. It is about change management that affect organisations, institutions, governments and the public. In order to efficiently and effectively deliver health services, it is important to foster a positive culture of acceptance of new technologies by the people and organisations. To accomplish this, ABDM should establish a robust governance framework to support change management and a culture of digital transformation. ABDM should formalise a structure for ensuring readiness by the ecosystem partners, especially healthcare providers and also incorporate a scientific assessment framework for measuring readiness. Readiness in end users, both in handlers of the digital systems and in patients, requires training and education. This also must be accommodated and formalised by ABDM.

Mauco et al., (2016) underpin the need for developing such a readiness assessment framework and also emphasise that formulating such a generic framework, especially for the developing world would require further research. ABDM should work towards establishing a robust assessment framework for its successful adoption across the ecosystem.

Given that the research reported in this paper is based on review of literature, the results presented here are only tentative and of limited value for the purpose of generalisation. Therefore, additional empirical research with more elaborate and better articulated designs is therefore called for, to further explore the aspects of building and measuring readiness in the Indian healthcare sector which is transforming through the Ayushman Bharath Digital Mission. End to end study of multiple use cases of the adoption of digital technologies through ABDM will provide concrete insights into preparedness at different levels and different partners of the ecosystem.

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