

A person wearing a white lab coat and a striped tie is holding a white tablet computer with both hands. The person is sitting at a desk with a white keyboard in front of them. The background is a soft, out-of-focus office setting. The text is overlaid on a semi-transparent grey rectangle in the upper left quadrant of the image.

UNLOCKING THE NEXT DIGITAL VALUE FROM INDIA'S FIRST INTEGRATED HEALTHCARE ECOSYSTEM

Why Healthcare Enterprises Should
Get Integration-Ready Now

MANTRA LABS White Paper

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Abstract

The Indian Healthcare system is moving towards a wellness-driven model of care delivery from its historically siloed & episodic intervention approach. The streamlining of healthcare creates a new wealth of opportunities for healthcare enterprises.

The hospital industry in India accounts for nearly 60% of the overall health ecosystem's revenues. The addition of new frameworks for Health ID, PHR, telemedicine and OPD insurance

will create macro-level demand beyond local in-patient catchment zones.

The basis of this white paper is to highlight the potential value that can be generated for healthcare providers by preparing for **integration-readiness** with the national digital health ecosystem.



Brief Overview

The COVID-19 Pandemic has elevated digital health seeking behaviour within the public consciousness and renewed India's impetus towards healthcare innovation. Traditional modes of healthcare delivery are being phased out, in favour of new and disruptive models.

The creation of the National Health Stack (NHS), a digital platform with the aim to create universal health records for all Indian citizens by 2022, will bring both central & state health verticals under a common banner.

The action plan to fulfil the creation of the NHS is laid out in the National Digital Health Blueprint (NDHB), which also outlines the vision for Universal Health Coverage—a long awaited *first* for India's poor.

This is where the National Digital Health Mission (NDHM) comes in to the fray, as the entity responsible for the successful implementation of the aforementioned Blueprint and subsequent Health Stack.

The concomitant **digital health ecosystem** that India will create for its 1.4 billion citizens will duly leverage open, interoperable, and standards-based digital systems.

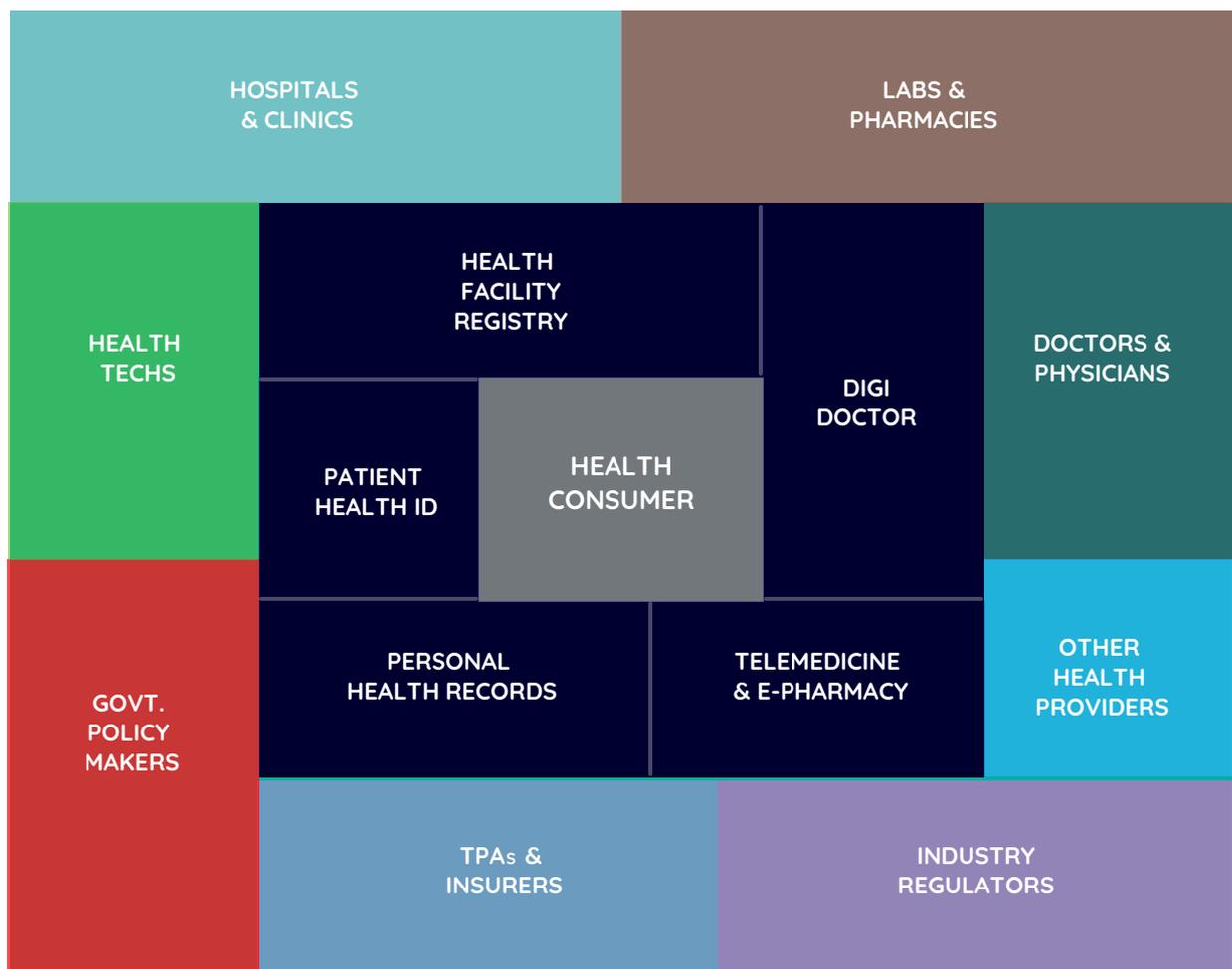
With rapid rates of digitalisation and increasing demands from connected consumers, an integrated ecosystem will allow healthcare providers to deliver value-based care & outcomes in Real-World settings.

The NDHE can potentially create over **US\$200 billion** in economic value for the health sector, over the next 10 years, according to BCG analysis.

HCP Building Blocks for NDHE

By design, the NDHM envisions the healthcare ecosystem to be a comprehensive set of digital platforms—sets of essential APIs, with a strong foundational architecture framework—that brings together multiple groups of stakeholders enabled by shared interfaces, reusable building blocks and open standards.

The NDHM Ecosystem



 HEALTH ECOSYSTEM STAKEHOLDERS

 ECOSYSTEM BUILDING BLOCKS

 ALL CITIZENS & PATIENTS

The Blueprint underlines key principles which include the **domain perspective**—Universal Health Coverage, Security & Privacy by Design, Education & Empowerment, and Inclusiveness of citizens; and the **technology perspective**—Building Blocks, Interoperability, a set of Registries as single sources of truth, Open Standards and Open APIs.

In order for the digital health ecosystem to evolve, a minimum viable set of building blocks is being created. While the Blueprint identifies 23 such blocks, for the purposes of this white paper, we will explore the six most relevant to healthcare providers.

Six Key Building Blocks for Providers



HEALTH ID

The entry point for any patient into the health ecosystem, mapped with longitudinal health history



DIGIDOCTOR

A platform for all doctors at healthcare providers that want to participate in the NDHE



CONSENT MANAGER & GATEWAY

Exchange of health information is done through a consent manager and gateway



HEALTH FACILITY ID

Each health facility can participate in the ecosystem with its own unique ID



HEALTH FACILITY REGISTRY

A registry of all private and public health facilities such as hospitals, clinics, diagnostics labs, and pharmacies



OPEN HEALTH SERVICES NETWORK

An interface layer that makes the ecosystem more accessible and interoperable.

The healthcare ecosystem allows for registered participating entities, to integrate with these building blocks. An **entity** is a type of software service provider that facilitates integration for healthcare providers. For the purpose of this white paper, we will explore four 'entities' relevant to healthcare providers.

Four Key Entity Types



HEALTH INFORMATION PROVIDER (HIP)

Any healthcare firm who creates health information using NDHM compliant EMR software, in the context of providing healthcare.

Ex: Hospitals, clinics, diagnostics facilities



HEALTH INFORMATION USER (HIU)

Any entity that requires access to the health records of an individual for performing value added services .

Ex: Insurers, hospitals, clinics, PHR apps or other mobile apps that display a user's health data to them



HEALTH REPOSITORY PROVIDER (HRP)

HRPs are software service providers who offer NDHM compliant software and long term record storage to hospitals, diagnostic centers, and clinics.



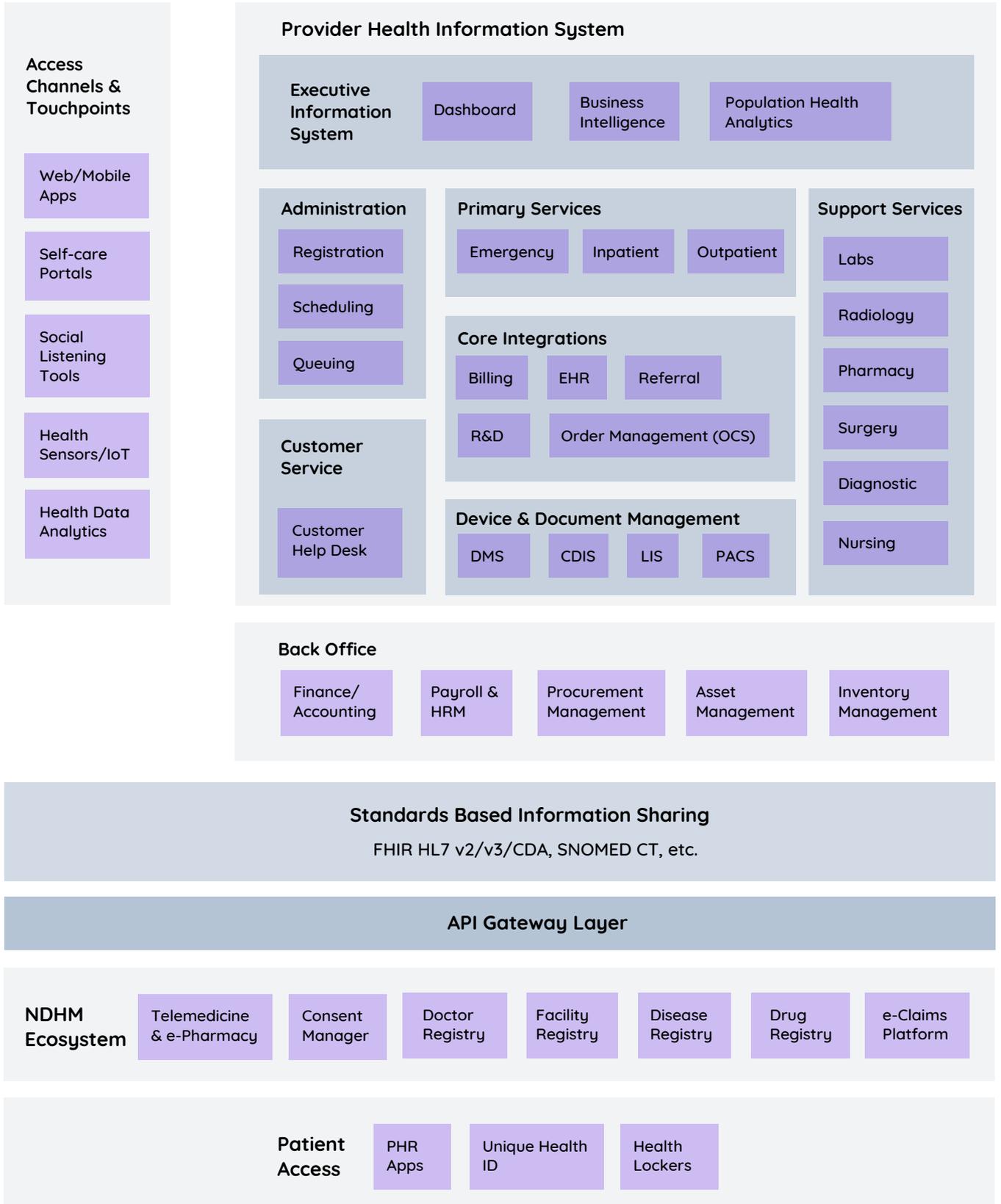
HEALTH LOCKERS

Health Lockers are software service providers who offer long term storage of records to individuals.

Note:

- 1.HIPs will need to store digital records of both out- and in-patient treatments in long-term storage, and make them accessible. For this, HIPs must partner with HRPs for implementing this obligation.
- 2.Concurrently, HRPs enable healthcare providers to become HIPs or HIUs and to meet their obligations of sharing and securely maintaining health records of patients digitally.

Healthcare Provider-NDHM Integration Block Architecture



The Consent Manager System

It functions as a set of open APIs that allows providers to access both the longitudinal (historical) and vertical (episodic) view of a patient's health record collated from multiple hospitals, clinics and labs.

Every Health ID in the NDHE is linked to a health data consent manager.

Health IDs are denoted as: patientname@ndhm, where '@ndhm' represents the health data consent manager.

HIPs link a '**care context**', which defines information about each health encounter (episode) of the patient for any period of time, and for any health related activities with the consent manager.

Each care context can include health records like out-patient consultation notes, diagnostic reports, discharge summaries, and prescriptions.

Once the care context is set, doctors or other users can send the patient 'consent requests' for their data, using a unique identifier—much like 'collect requests' in the UPI system, using a VPA (virtual payment address). The patient can grant, deny, and edit these requests.

The Rise of Care Delivery Platforms

IPD Hospitals & OPD Clinics, together account for 67% of the domestic healthcare market. IPD Hospitals will grow from \$51 Bn to \$180 Bn over the next ten years, at 12% CAGR.

Health Techs will also benefit from the NDHE, propelling their share from 1% to 7% by 2030, growing at 33% CAGR—the fastest pace among health players.

The Consent Management Process

User Creates Consent Manager ID

The User registers with a PHR app via mobile number & OTP



The User creates an account with a unique Consent Manager ID



User then links their account to a HIP via mobile number & OTP

HIU Creates Consent Request

An HIU makes a **consent request** that must include:



- User's consent manager ID
- Purpose of consent request
- Details of HIU
- Consent time period
- List of health information types

The request flows through a consent manager gateway



A **discovery request** is initiated with the HIP to see if such a Health ID exists



The consent request is time-bound; after time has elapsed, the HIU cannot view that data

User receives consent request from HIP, which they can then approve, reject or modify



HIP receives a 'consent artefact' or request, which tells them what data needs to be shared



As response to the discovery request, the HIP must send several basic masked details including care context, without sharing critical information

Data is anonymized at the primary source (the HIP). The **Anonymizer** then removes all personally identifiable information before sharing with HIU

Linking Care Context For Health Episodes

HIP completes a health care encounter (episode) with a patient



The consent manager notifies the patient that a new health record is available



The consent manager enables the patients to access the same on their mobile or save a copy into their Health Locker

HIP must link the 'care context' for that episode with the health data consent manager

Data & Interoperability

The availability of timely medical information for both patients & providers will further improve the analysis of historical medical data for future use. The Blueprint lays out three Interoperability types that needs to be in effect and the applied standards that will be enforced around it.

For '**Technical interoperability**' considerations, all participating health ecosystem entities will need to adopt the standards defined by the IndEA framework. This will allow integration of all disparate systems under one roof to securely achieve exchange of clinical records and **patient-data portability** across India.

The '**Semantic & Syntactic Interoperability**' standards will address the necessary formats for **health-related data exchange**.

The latest standard for electronic healthcare information exchange is the FHIR, or **Fast Healthcare Interoperability Resources - R4 specification**.

Built upon the HL7 series of Standards, the adoption of FHIR ensures that electronic health records are available, discoverable, understandable, structured and standardized to support automated Clinical Decision Support (CDS).

The building blocks of FHIR are '**resources**'. FHIR specification defines a set of 13 modules with 143 resources. For essential data capture, the Blueprint identifies a set of 8 essential health record artefacts that are critical for interoperability.

8 Essential Health Record Artefacts for Data Capture



Patient demographics & Care provider details
 FHIR Type: Diagnostic



Medical history and Diagnosis
 FHIR Type: Summary



Vitals, assessments & Wellness parameters
 FHIR Type: Diagnostic



Adverse events & Alerts
 FHIR Type: Summary



Medication, wellness, diet, lifestyle & vision
 FHIR Type: Medications & Care



Admission, discharge, transfer & referral
 FHIR Type: Admission



Medical procedures
 FHIR Type: Care



Insurance parameters
 FHIR Type: Financial

Privacy & Data Security Standards

To ensure a 'Privacy-by-design' implementation of any healthcare system created by any participating entity within the NDHE, the Blueprint recommends the following standards for the complete preservation of patient's privacy.



SECURITY

DIGITAL CERTIFICATE,
 TLS/SSL, SHA-256, AES-256



ACCESS CONTROL

ISO 22600:2014 HEALTH INFORMATICS -
 PRIVLEDGE MANAGEMENT AND ACCESS CONTROL

Implementation Waves

The journey towards an **Open Health Ecosystem** is still nascent in its development, and its transformative impact can only be realised through the participation, collaboration and approaches of all health ecosystem players. The effective rollout of the project will be carried out over several waves.

WAVE 1

We predict that the **first set of assets**—including a secure health network, health directories and universal adoption of data standards—will be the hardest threshold to cross and will likely be completed within 12 months.

WAVE 2

The **second wave** will be based on ensuring the security & privacy by design policies are in place along with the creation of health lockers and telemedicine infrastructure, requiring 6-12 months for its completion.

WAVE 3

The **final wave** will last 12-18 months to establish health privacy ops command centres, health call centres and audit plans that will be used to track and measure the effective implementation of the Blueprint.

Reimagined Care Provider Experience

Healthcare Providers typically have to create a large influx of IPD (inpatient demand) against low digital channel penetration for creating large OPD catchments.

Given that providers earn maximum revenues from their IPD conversions, current models are unable to keep up with operating cost pressures, increasing demand for value-added care, and the challenges posed by collecting, storing and learning insights from historical health data.

The creation of a single patient identity and integration into the NDHE will allow providers to get exposed to new demand pools. This will help offset fixed costs and change pricing for the treatment funnel, that was previously price-indexed for a localised populace only.

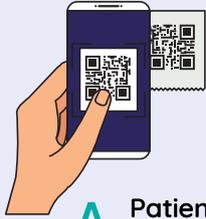
In the 'open health' era, providers will also benefit from maintaining up-to-date health facility registries, which acts as a single source of truth for all their registered doctors on their payroll. The registry also allows providers to reduce fraud, validate workforce credentials and enable faster onboarding.

The Patient will see you *all, now*

The NDHE will allow providers to gain better reach to new demand pools in OPD & IPD care. India's OPD rates are currently only at 4 per day per 1000 population.

For the patient this means more preventive check-ups, lower out-of-pocket expenses, timely access to referrals, follow-up care, and improved health seeking behavior.

The New Digital Healthcare Provider Experience



A Patient scans their Health ID QR code at the hospital front desk using their PHR app



B Hospital instantly receives patient's basic information including ID, name, age, gender and mobile number



C Hospital then sends 'consent request' to the patient for accessing their medical records



E Consulting doctor receives complete patient medical history in real-time, enabling faster diagnosis

F Patient chooses their insurer from an insurance platform and selects with single tap for pre authorization

D Patient receives request via consent manager, then chooses what data to share and for how long



G Doctor shares treatment plan, e-prescription medical reports and notifications via mobile

H Patient receives 'consent request' from Insurer to access relevant medical records



K Health data used in this episode, will facilitate training of ML models to gather new insights for providers

I Patient approves consent, gets claim approved and payments transferred 

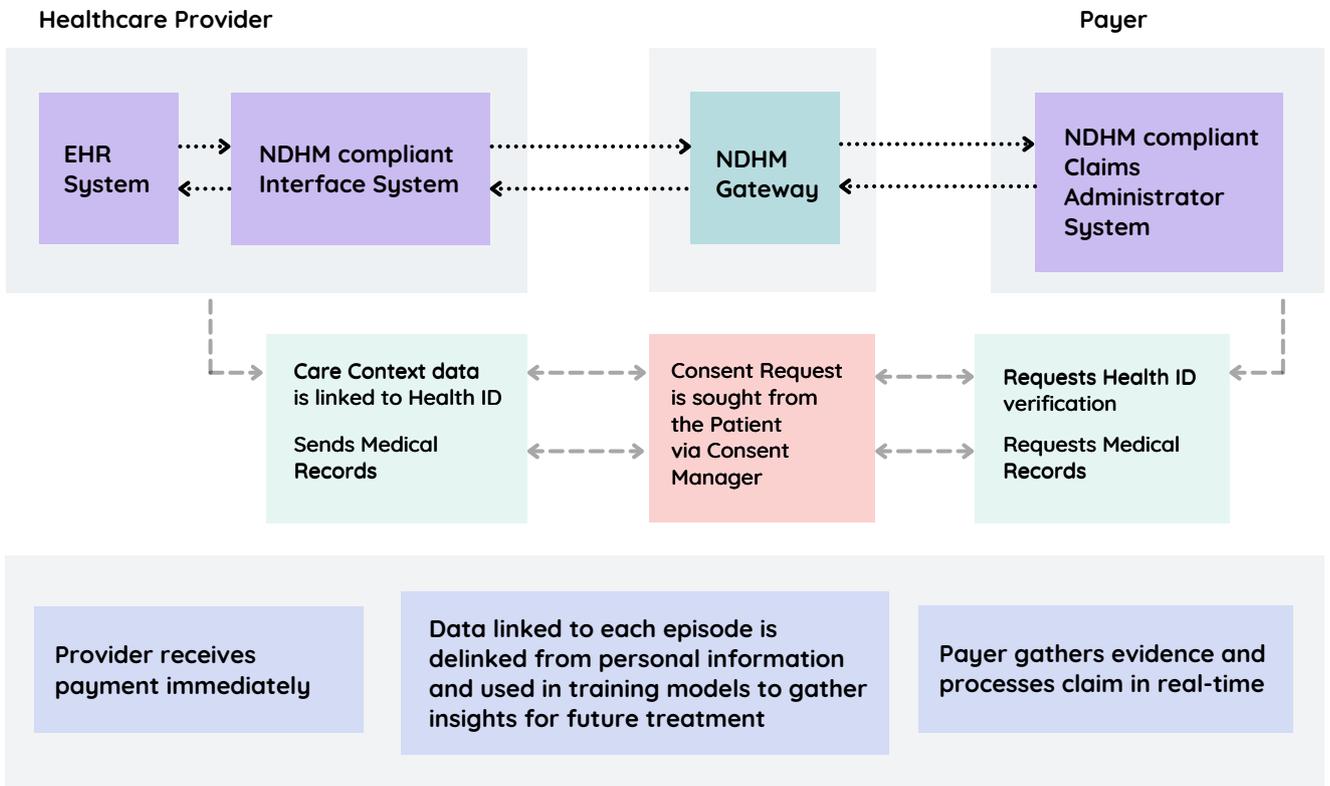


J Digital pharmacy fulfils e-prescription order and delivers to patient's home

Hospital Providers eager to seize early value from the ecosystem, will look to adopt **API-level integration**. At present, there are approximately 25 Lakh health facilities in the country; of which 60% of health facilities are already

registered with the NHRR (National Health Resource Repository) which has successfully verified over 1400 data sets per facility. Each facility is also issued a unique NIN, a key requirement for interoperability.

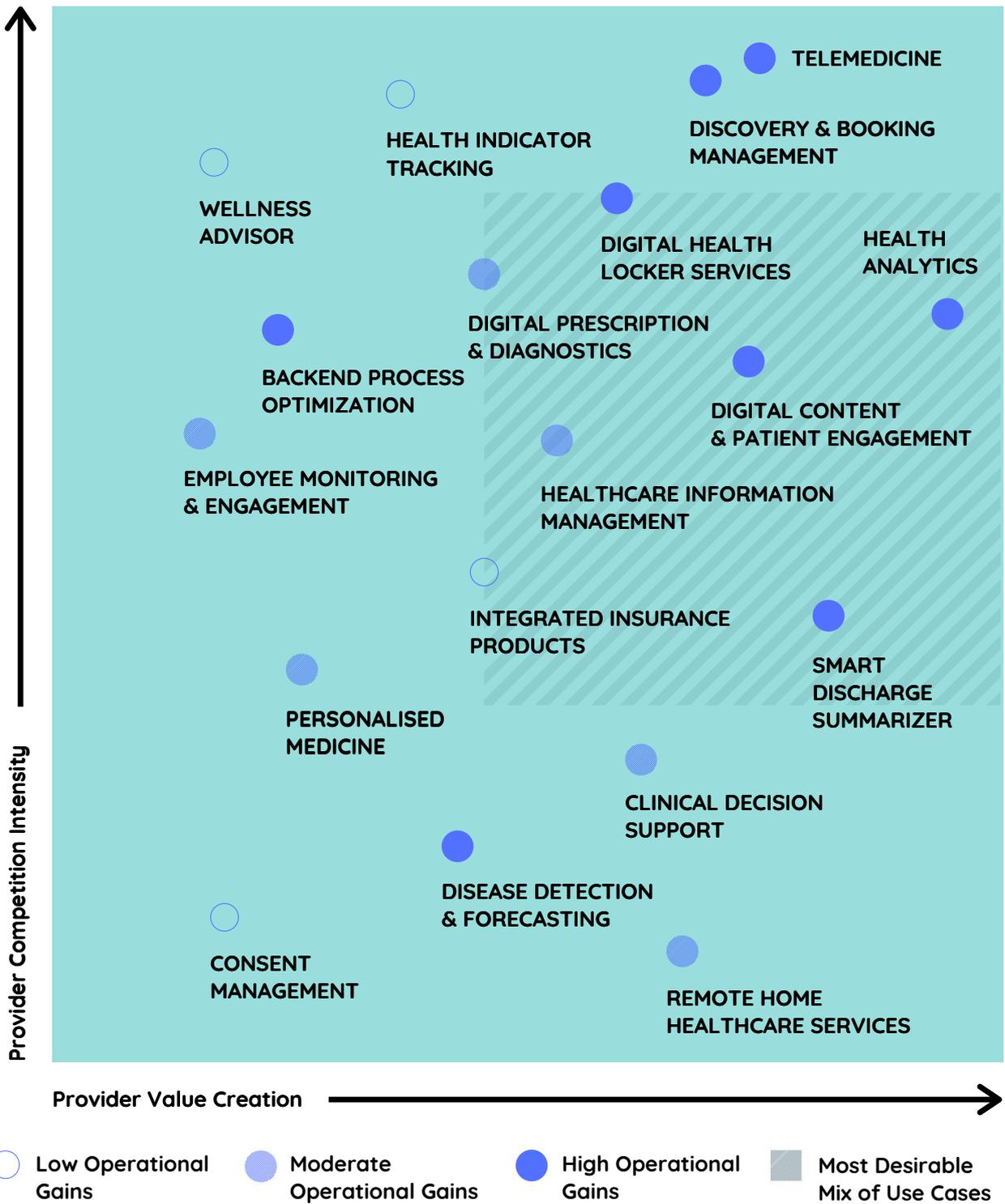
Mantra Labs Integration-Readiness Model for HCPs



A rich compilation of patient data based on digitally stored information such as prescriptions, diagnostic reports and previous hospitalization records will help healthcare providers design a personalised treatment plan for

each individual. We estimate it will create between **55%-60% improved prediction of patient room turnover** and **80%-85% reduction in payer's payment turnaround time**.

Digital Healthcare Opportunity Landscape: Providers



Employee Monitoring & Engagement

System that enables onboarding of employees, background verification and attendance tracking, using geo-fencing based facial recognition.

Wellness Advisor

AI-driven health advisor that guides users on nutrition, wellness and lifestyle choices through DIY or instructor led modules.

Back-end Process Optimization

AI & ML algorithms are used across hospital operational pipelines to predict hospital stay durations & patient churn-rates to optimise bed utilization efficiency.

Health Indicator Tracking

Using connected mobile solutions to manage and track activity levels, weight, diet, sleep patterns, blood pressure & exercise routines.

Disease Detection & Forecasting

ML is used to predict the spread of diseases and to calculate probability of individual-level contraction, and then provide health advice and guidance.

Personalised Medicine

AI driven system that combines genomics, data analytics, and population health to produce targeted therapies with the best response and highest safety margins.

Remote Home Healthcare Services

Remote patient monitoring tools to collect health data for chronic disease management that includes geriatric care and post operative care

Healthcare Information Management

Interface software layer that can securely access patient medical history and use advanced analytics solutions to manage non-clinical operations.

Discovery & Booking Management

Digital platform with appointment management system to search, list and book a range of healthcare services.

Digital Health Locker Services

Digital platform for self management of prescriptions, diagnostic results, lab reports, and historical medical records authorized with Health ID.

Digital Content & Patient Engagement

Health information portals and content based engagement apps where type, frequency, and mode of communication can be controlled.

Digital Prescription & Diagnostics

App and web-based solution for generating e-prescriptions, analysing OPD practice, plugging revenue leaks and last mile delivery of medicines

Health Analytics

ML modelling of patient data sets to gain insights on patient profiles, workflow improvement, in- & out-patient forecasting, and treatment adherence.

Integrated Insurance Products

Readymade & Value based health services backed with data analytics and insurance built in, acts as a single source of health financing and delivery.

Clinical Decision Support

Analyze data within EHRs to provide prompts and reminders to assist health care providers to deliver evidence-based care outcomes.

Discharge Summarizer

AI based system that prepares discharge summary drafts, making it easier for clinicians to approve/modify reducing administrative burden.

Telemedicine & Remote Clinical Services

App & web-based two-way video conferencing tools, with Second Opinion Network via video, Remote Physiotherapy, and Nurse Advice services.

Consent Management

Enables HCPs to manage patient consent for the transparent & responsible incorporation of digital health data into patient care and research.

Choosing The Right HRP Partner

Mantra proposes the following strategic actions for Healthcare Providers as they **prepare for integration-readiness**. With the right technology partner providers can—get to market faster, stay focused on the core business, and be confident that systems & data are secure and compliant.

1

Match with organizational needs & goals. Identify & create an internal checklist of both business and end-customer requirements.
Ask: Is the partner a custom-fit and technically compatible to bring in value?

2

A roadmap for smarter patient experiences. Examine the ways hospital teams can optimize the use of digital and deep technologies for the development of patient care strategies.
Ask: How does the partner solve complex patient challenges, and what customer experience solutions has the partner developed so far?

3

Follow the privacy-by-design crumb trail. Providers must carefully scrutinize enterprise data management and privacy related risks.
Ask: Does the partner strictly follow compliance norms, and embed PbD frameworks for security encryption and data protection?

4

Extensive service levels & support. Evaluate degree of on-demand support required for pre-, during, and post-implementation phases.
Ask: Can the partner support, resolve & enhance through evidence-based protocols?

5

The 'value-added' cherry on top. To remain strategically aligned with the right technology partner, evaluate how they will move your business forward with demonstrable experience, expertise & ideas.
Ask: Can the partner solve beyond my current business needs and anticipate the challenges I will face next?

Conclusion

In the **next ten years**, Cisco predicts that 500 billion sensory devices with 4-5 signals each will be connected to the Internet of Everything.

This will create about 250 sensory data points per person on average. This wealth of data is ushering in a new wave of opportunities within healthcare.

Deriving new interactions from the patient's journey can be quite arduous. As the health consumer is being ushered into the 'age of experiences', the onus is on digital healthcare enterprises to make them more relevant, emotional and personalized.

Mantra Labs proposes a new identity for the healthcare experiences future—where we use insights harnessed from data and human expertise to bring sensory value to each interaction—what we call IX, 'Intelligent Experiences'.

By preparing for integration-readiness, healthcare providers can access new patient demand pools from tier-2 & tier-3 cities, identify insights about the health consumer's lifecycle needs and leverage new technologies to draw in more value from these interactions than ever before.

As a result, hospitals will be able to **drive improved margins from reduced administrative costs**, and **gain higher utilization** through increased demand.

About The Authors

Parag Sharma

Chief Executive Officer

He is an AI Expert & Entrepreneur, who pivoted India's first online grocery shopping portal—BuyEasy, helped build a globally renowned Mental health therapy conversational bot—Wysa and holds 19 years of industry experience.

Mikhail Mitra

Chief Product Officer

He is recognised among the Top 100 Growth Hackers in the World by Oracle, who pivoted Selfash—India's first social reseller's platform, and holds 15 years of experience building digital products for global enterprises.

Nivin Simon

Lead Research Analyst

He is a current go-to-market team member who holds 8 years of experience leading the discovery, validation, positioning and launch plans for global digital products.

About Mantra Labs

Mantra Labs is an AI-first products & solutions firm with a core team of 200+ digital tinkerers and experimentalists, having delivered 125+ projects around the globe. The company specializes in solving real-world front & back-office challenges faced by Digital Healthcare, InsurTech and Consumer Internet enterprises using Artificial Intelligence. Mantra Labs has worked with some of the World's leading organizations like Abbvie, Alkem Laboratories, Manipal Hospitals, SBI General Insurance, Care Health, DHFL Pramerica, Aditya Birla Capital, and AIA Hongkong with several strategic technology partnerships including MongoDB, IBM Watson and Nvidia.

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Contact

For more information, please visit

www.mantralabsglobal.com | hitee.chat

Email: hello@mantralabsglobal.com

