Creation of Smart Hospital Ecosystem in India

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Paper on Conceptualisation of Smart Hospitals

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Sapio Analytics, a government advisory firm, that is working closely with Government of India bodies in helping get our economy back on track of growth, has conceptualised a “Smart Hospital Ecosystem” in India, through creation of a unique healthcare model, that can help existing government hospitals get converted into a smart hospital, while making sure new hospitals and health care centres are born smart.

The concept paper is based on ready technologies, systems, and tools, that enable the same. It is a summarised explanation of the concept that has been the backbone of such development.

The purpose of the paper is to introduce its readers to the changing healthcare system in India, using the power of new age technologies, driven not only by intelligent hardware but also software and data.
Background:

In 2015, Government of India launched the Smart Cities Mission. The Smart Cities Mission by the Government of India is an initiative to drive economic growth and improve the quality of life of people by enabling local development and harnessing technology as a means to create smart outcomes for citizens. It believes that comprehensive development occurs in areas by integrating the physical, institutional, social and economic infrastructure.

In 2020, honourable Prime Minister of India, Shri Narendra Modi, announced National Digital Health Mission, as a holistic, voluntary healthcare programme that will reduce the existing gap between various stakeholders such as doctors, hospitals and other healthcare providers, pharmacies, insurance companies, and citizens by bringing them together and connecting them in an integrated digital health infrastructure.

The vision of making India smart, by relying on the power of technology that is driven through artificial intelligence, with a robust healthcare programme that connects all stakeholders, can be achieved through a special programme focused on hospitals and other healthcare centres, making them smart. Such a special programme will be able to extract high value out of the National Digital Health Mission, by ensuring its benefits reach out to all stakeholders it is intended for, besides creating a revolution in the way our citizens are provided treatment and care. This programme can take steps much beyond NDHM, by getting our hospitals ready for a future that can harness smart outcomes for all its stakeholders.
When India starts becoming more digital, with higher penetration of technologies making them mainstream, it is important that India is also ready with the smartness to harness the power of such digital transformation. Digital transformation is a given future of India, but the effectiveness of the same is dependent on how it is executed, and who is guiding such execution.

Let us imagine a super brain, a guide that is able to help a hospital navigate through its complexities while keeping the interests of all its stakeholders in focus.

Think of this brain as an entity that can think like the following:

- Like an architect (working on making the limited space within a hospital get utilised to the maximum),
- Like a business manager (working on optimising the heavily complicated processes within a hospital and taking care of mundane tasks that can be automated through robotic systems),
- Like a revenue manager (making sure the prices are optimised and ensuring higher revenues and profits, helping run a hospital more successfully),
- Like an inventory and resources manager (working on ensuring optimization of resources within the hospital, its availability with no wastage),
- Like a multitude of general physicians (knowing how to direct patients towards the right specialists and helping the GPs achieve more through what they do now)
• Like a multitude of specialist doctors (being able to think like all the possible doctors across different departments, providing them “basic” and “specialised” guidance with processes and keeping in mind their satisfaction), Like a business manager (working on optimising the heavily complicated processes within a hospital and taking care of mundane tasks that can be automated through robotic systems),
• Like patients (knowing what they need and helping them with personalised treatment and even ensuring their treatment beyond the walls of the hospital, just like a dedicated family doctor would do) Like an inventory and resources manager (working on ensuring optimization of resources within the hospital, its availability with no wastage),
• Like patients (knowing what they need and helping them with personalised treatment and even ensuring their treatment beyond the walls of the hospital, just like a dedicated family doctor would do)
• Like a hospital CEO (taking care of the needs of the staff and vendors of the hospital, helping them with personalised support wherever needed, making sure that they do only those tasks that they can do best, and automate whatever is considered mundane and repetitive),
• Like a local researcher (reading and understanding locality-level issues faced by the citizens of the area, and create localised research by analyzing patterns and doing predictive modelling within the historical context of the locality, effectively helping prevent spread of diseases before they occur, and have solutions and resources well in advance).
This super brain is able to think like all of the above mentioned roles, while being cognizant of each role, effectively increasing its complexities to layers much deeper than where human brains can reach.

Now, imagine that this super brain is at the service of the following stakeholders of a hospital:

i. Doctors (by making their lives easier and works more productive, ensuring that they focus on what they do best and not do any clerical job, while helping enhance their intelligence wherever possible),

ii. Patients & their caregivers (by helping and guiding them at every step of their engagement with the hospital, and being with them even when they are not with the hospital, by guiding them during treatment as well as prevention)

iii. Nurses & other caregivers (by working on all tasks that make their job mundane, and helping them constantly learn and evolve based on their specific skillsets and areas of interest, while guiding them in their works)

iv. Vendors, Pharmacists, and all other stakeholders associated with the hospital (by helping them with their works through a decision support system made to ease their decision making)
v. Management of the hospital (by helping them with a decision support system with respect to every aspect of the hospital’s decisions)

vi. Government and Research Agencies (by helping them with the right research to serve its citizens)

Such a super-brain when servicing these stakeholders ensures that hospital is no more a building, but has become an entity that’s present in the hearts and minds of those associated with it.

**How does this Super Brain work?**

The entire vision that has been presented here, is based on actual tools and processes that have been developed, hence proving the concept’s feasibility and potential.

This super brain has to be trained and data is the best fodder for brain. The following data sources are used, in an integrative manner, to create this super brain for each hospital:

i. Data from Systems & Equipment used in a hospital: For hospitals getting created from scratch, use of IoT devices can enhance the level of data getting received. But even for the hospitals that do not have the best systems, it’s possible to create certain level of smartness by using the limited data received from the existing systems.
ii. Data from Information Technology and Business Process Systems used in the hospital: Again, digitised systems will help ensure data collection is easy, while non-digitized hospitals will need to go through certain digitization processes to ensure that they become data-givers to the super brain.

iii. Data from Patients (Anonymized): This has to be handled through systems that engage with the patients and help them become better.

iv. Other Data from various stakeholders (gathered through use of systems that automatically capture the same and can be shared easily, or through manual processes that need to be automated using Robotic Process Automation systems)

The following diagram helps explain the manner in which the super brain of any smart hospital functions.
As you can see, the following are the constituents of a Super Brain:

- **Traditional IT Layer**
  1. Advanced HIMS
  2. ERP & CRM
  3. HRMS
  4. Workspace & Other Productivity Tools

- **Smartness Layer (Tools)**

  1. Hyperlocal Predictive Tools
  2. Smart Customized OCR Tools
  3. Speech to Text Tools
  4. Image Processing Tools
  5. A.I. Diagnostic Tools
  6. Multiple Analytics Tools
  7. Citizen Cost Optimization Tools
  8. Artificially Intelligent Feedback Loops

- **Smartness Layer (Platforms & Systems)**

  1. R&D Systems
  2. Performance Matrix and Compliance Systems
  3. Decision Support Systems
  4. Training & Skill Development Systems

- **Smartness Layer (Super Bots)**

  1. Patients’ Guide
  2. Nurses’ Guide
  3. Doctors’ Guide
  4. Localised Knowledge Bases (that feeds the bots)
  5. Process Automation Bots
  6. Other R.P.A. Bots
As one can see, such a brain requires an ecosystem to come together. The following products and solution providers will form the said ecosystem (this is a non-exhaustive list and reflects some of the major solution providers who can become part of this ecosystem):

- Hospital Information Management Software,
- Enterprise Resource Planning Software,
- Healthcare Insurance Management Systems,
- Healthcare Bots,
- Patient Management Platforms,
- Doctor Management Platforms,
- Workforce Management Platforms,
- Workforce Management Platforms,
- Research and Development Tools and Platforms,
- Localized Research Facility Management Systems,
- Decision Support Systems,
- Government Compliance Management Solutions,
- Patients’ and Guests’ Hospitality Systems,
- Robotic Process Automation Systems,
- Automated General Physician Bots,
- Artificially Intelligent Diagnostics Solutions,
- Cyber Security Systems,
- Equipment Enabling Smart Systems.

Combination of Super-Brains

One Super Brain is representative of one smart hospital.

When thousands of such super brains come together sharing their intelligence with each other, creating gazillions of permutations and combinations, the intelligence gathered by the governments that work with all these hospitals, will help create a truly smart healthcare ecosystem.
Such a model should be divided into 4 major segments:

- **Existing Hospitals Focused**: Smartness Layers need to be added to existing IT layers of such hospitals; if there are hospitals with no or low digitisation, basic IT layers need to be created before adding the smartness layers.

- **New Hospitals Focused**: When a new hospital is getting created, the entire infrastructure can be anchored in the layer of smartness; this will not only help in easy creation of a smart hospital, but will also do it at a significantly reduced cost as compared to a traditional hospital.

- **New Primary Centres in Rural Areas**: In order to make sure every village in India has a centre that can provide basic healthcare facilities, the concept of smart hospital can play an important role. Smart Hospitals can help provide solutions with limited human resources, even with limited digitisation in the areas. Healthcare Bots,

- **Research & Development Focused**: With a combination of multiple smart hospitals, R&D can push India to a level where it is even better prepared to handle any new health disasters, while also using its immense power of data to drive its economy and geopolitical significance further.

A parallel focus on each of these segments shall lead to creation of the smart ecosystem as envisioned.

**Benefits of the Smart Hospital Ecosystem**

This paper has attempted to explain the concept of smart hospitals, through summaries of what it entails to build the same.
It has talked about how smart hospitals is primarily a creation of a “smartness layer” over and above the traditional layers of information and technology, ultimately leading to creation of a “super brain” for each hospital or healthcare centre, which when combined with other super brains, can help push India into becoming a society ready to lead the digital transformation of healthcare with real “intelligence”.

It’s very important to understand the difference between what digitisation will do versus what enabling smartness would do, otherwise we will make the mistake of assuming that we are becoming smart while we are not.

That’s how we will be able to look at the macro-benefits of what this concept can bring. Following are some of the benefits expected out of the creation of such a smart ecosystem (non-exhaustive):

- Easy & Cost Effective Expansion of Health Care Centres and Hospitals in every part of India
- Better Healthcare Resource Optimization across India
- Preventive care for citizens through a micro-level localised evaluation
- Better preparedness for any epidemic or any new health issues
- Better facilities for citizens in existing hospitals (at almost no cost, as the expenses for smartness layer can be compensated by the growth in the efficiency of the hospitals which is used to save costs)
- More participation from doctors attracting the best talents
With almost no additional budget, we create a society where doctors are more involved with government hospitals, patients feel connected to hospitals with a comprehensive treatment combined with preventive care, and an overall economic growth is enabled through a healthier society, more prepared to tackle health issues, both known and unknown.