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LEVERAGING DIGITAL IN INDIA FOR IMPACT

ANALYSING DIGITAL HEALTHCARE THROUGH AN IT ARCHITECTURE LENS

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As the COVID-19 pandemic raged, the government of India launched two digital healthcare applications – ArogyaSetu for contact tracing, and Co-WIN for vaccination management. Within 13 days, ArogyaSetu reached 50 million users (downloads), a milestone that the Internet took four years to achieve! Co-WIN not only supported the largest vaccination drive in the world but also ensured that we were the only country in the world that offered a digital vaccination certificate immediately, and which was QR-coded for easy authentication anywhere. But these applications, which were digital public goods, also faced scrutiny around how secure they were, the extent to which they were privacy-preserving, and whether they led to the exclusion of citizens not adept with technology.

Not just in healthcare, but also in retail and finance (Indians were ordering online, and using UPI for financial payments to all merchants including the local kirana shop or a hand-cart vendor), education (classrooms went digital) and office-work, we were able to shift to online means and carry on with our lives. Imagine how the world would have struggled had the pandemic not struck us in 2019, but a few decades before.

In this article we will examine, through a historical lens of how computer architectures evolved, the latent role that "IT architectures" play in shaping the digital opportunities and challenges.

IT architecture and a model for measuring impact

The IT architecture, which includes components like hardware, software, networks, standards and protocols, data & algorithms, and business processes, is the blueprint used to build information systems. It has evolved over the years – from a computing perspective, it has moved from a mainframe era to minicomputing, then personal computing era, then transitioned to mobile computing and the present world of Internet-of-Things; from a consumer's (of computing) perspective, it has shifted from Web1 (accessing individual web pages using HTML) to Web2 (accessing platforms like Facebook, Apple App ecosystem, Android App ecosystem, Instagram, LinkedIn, Google Search platform) to Web3 (accessing blockchain based decentralized web pages, open-source code and apps).

An important aspect of IT architecture is that it helps in integrating or synchronizing these components to provide user-centric solutions, services and experiences. Thus, using different IT architectures, various types of solutions can be created for a given business scenario (such as a mainframe-based Vs mobile-ready, web-based hospital management system or retail commerce application). But how can we evaluate these solutions in terms of their overall impact? We propose the S-O-S model (Self / Stakeholder, Organization, Society) to measure the impact, with the best digital solutions offering a win-win-win scenario for all three constituents.

Evaluating multiple IT architectures and solutions in the context of digital health

Over a century ago, in 1907, the practice of maintaining individual patient records began at the Mayo Clinic, US. The individual patient information was stored on paper and was a precursor to the electronic medical records. The organization (i.e., Mayo Clinic) benefited the most in terms of efficiently organizing their patient's data and offering medical consultation services.

In 1965, the Laboratory of Computer Science in Massachusetts General Hospital developed, for the first-time, a PDP-1 (a mainframe computer) based remote-access, time-sharing system for admission discharge census, laboratory reporting, and medication ordering. In such a mainframe architecture-based solution, the computer manufacturer (like IBM or Digital Equipment Corporation) provided hospital users

with printouts of reports in batch mode (say once a week), and not in real-time. All data and software were internal to the centralized management information systems department of the hospital. The main benefit of this IT architecture was that it made internal company processes efficient.

As the IT architectures moved towards the personal computer and client-server era and later embraced the Internet, the solutions became more user-friendly – by offering real-time interactions, customised information reports etc. A prominent solution of this IT architecture was the Hospital Information / Management System (HIS or HMS) – a comprehensive, integrated information system designed to manage all the aspects of a hospital's operation including the medical, administrative, financial matters. However, most of these solutions were designed to primarily serve the requirements of the owner of the platform, and were not patient-centric. Thus, a patient could not take her data with her to another hospital even the information was about her.

This kind of data control exists with social platforms too – as part of monitoring our family's calorific intake, we cannot get data on the amount of sugar consumed (in the form of chocolates, ice cream, beverages, etc. bought) from our favourite e-commerce platform, even though this data pertains to us.

India's digital public-goods in healthcare

Building on its successes in creating digital public-goods such as Aadhaar (for identity) and UPI (for digital payments), India has embarked on an Indian National Digital Health Management initiative, called the Ayushman Bharat Digital Mission (ABDM), to create an 'open digital health ecosystem'. While the key building blocks of this health-stack, which include standardized health registries of doctors and healthcare facilities, a unique patient identity (Health ID), and federated electronic health records, appear similar to traditional HMS IT architecture, the ABDM stack has some key differentiators – patient (citizen) centricity, consent architecture, and Unified Health Interface (UHI) protocol.

ABDM has the patient as the center of its IT architecture. All the health-related data of a patient is fully under her control. All her medical data generated by clinics, hospitals, labs, etc. is mandatorily stored in third party digital health lockers, to which she alone has the key. When she visits a new clinic in a new city, she has the ability to unlock the medical-locker to share her health data with doctors there. The clinic is mandated to upload all her new heath data generated during the course of her treatment into her digital health locker. She can also voluntarily share specific health data with authorized service providers like health insurance companies for a specific purpose like renewing a health insurance policy. That is not all, she can also voluntarily agree to share specific anonymized health data with empanelled national research agencies for research and survey purposes. UHI ensures that a digital health service can be delivered between any end-user applications (digital app providing telemedicine service, AarogyaSetu etc.) with any health service provider (individual doctors, hospitals, labs etc.) in the healthcare ecosystem.

Emerging IT architectures like the ABDM stack not only ensure that they are user-centric but also create win-win-win outcomes. It is a win for the patient who owns and controls her data; it is a win for healthcare service providers who get access to the entire case history of the patient; and a win for the government to access anonymized data for research of surveys. While the digital public-goods like ABDM, Aadhaar and UPI are public, private entities can build innovations on them. For example, the health locker service can be provided by both public and private entities. Hospital management systems, healthcare insurance systems are provided with APIs that can seamlessly integrate them with the ABDM platform. Startups are also encouraged to provide services like providing a pay per use IT system for stand-alone labs to connect to the ABDM.

In conclusion

India has the unique opportunity to take a global leadership in IT architectures for country-scale public platforms. Solutions that work for India are likely to work for the entire planet and not just for the top 10%

of the world. India is a growing economy with a large number of mobile-first citizens accessing these platforms. We have world-class IT talent to develop and maintain these large public IT platforms. Incumbent companies and startups can innovate on top of these platforms. The Indian public IT platform architecture and the ecosystem around them create a unique model of innovation that can power affordable, inclusive, equitable and sustainable socio-economic development.

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