

# Cloud Technology Enabled eHealth Is the **Future of Healthcare**



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The integration of cloud technology in healthcare has been transforming healthcare for the better, as it has for many other industries. What started as a federal mandate in the US to maintain electronic healthcare records, has gradually evolved to enable the Healthcare industry to be safer and more efficient, while also helping ensure better coordination amongst healthcare providers and higher levels of privacy and security for patients.

Besides the more obvious reasons behind this steep curve, such as rapid digitization, improvements in the service and care processes, and other related upgrades, what seems to have truly accelerated the adoption of Cloud Computing in the Healthcare sector is the sudden paradigm shift that the world witnessed, due to the COVID-19 pandemic. During times as uncertain as today, when even the simple act of visiting the doctor to seek medical attention is rife with risks, both patients and healthcare providers have welcomed the age of virtual medical consultations through phone or video calls, enabled by cloud technology.

Although the wheels of global cloud adoption in healthcare have already started rolling, with about 66% of healthcare providers already making use of cloud technology, it is also true that currently, almost 96% of healthcare organizations admit to not having the appropriate infrastructure for upgrading their Electronic Medical Records or EMR. The good news is that many of these providers are planning to adopt cloud computing technology within the next couple of years.

***The Healthcare Cloud Computing market has already been predicted to be worth \$64.7 billion, growing at a whopping 18.1 % per year.***



# Key Benefits of Cloud-enabled eHealth Services

## Better quality of patient care and coordination

- Unified patient medical records
- Comprehensive patient medical history
- Readily available information on safety and healthcare quality
- Aggregated data to be gauged against established quality indicators

## Better utilization of scarce resources

- Remote medical services in rural communities
- Specialized services without needing dedicated experts on site

## Reduced infrastructure costs

- Collaborative economic environment
- Sharing of overhead costs among participants
- Advanced IT infrastructures without high investments
- Global availability of medical records, saving costs for data exchanges

## Better planning

- Readily available eHealth data for planning and budgeting
- Integration with other cloud services for predicting future needs
- Efficient allocation of physicians, beds, labs, equipment, and other resources

## Efficient financial operations

- Automation of financial processes like billing
- Faster approval of claims and settlements

## Globally accessible medical repository for multiple purposes

- Data mining models enabling new medical discoveries
- Better medical research and faster clinical trials
- More efficient management of disease outbreaks



# Cloud Computing Deployment Services in eHealth

There are several types of cloud service models, each of which caters to the specific needs of a healthcare organization.

## Software as a Service (SaaS)

The most rudimentary cloud computing service, SaaS solutions are deployed and maintained by service providers, who facilitate data storage and access for customers, in exchange for a fee.

### Provider services:

- Applications
- Data runtime
- Middleware
- Operating system
- Virtualization
- Servers

### Customer benefits:

- On-demand cloud resources from globally spread-out servers

### Best for:

Healthcare organizations with small IT departments, and requiring basic health IT functions :

- Electronic health records
- Health information exchanges
- Practice Management systems

## Platform as a Service (PaaS)

In the PaaS model, customer organizations develop and manage software and/or app solutions, while service providers furnish the necessary infrastructure for creating and launching the solution.

### Provider services:

- Software development kit (SDK)
- Data storage and management
- Operating system
- Storage
- Servers
- Network

### Customer benefits:

- Freedom to easily develop and deploy custom applications
- Increased control over the digital environment

### Best for:

- Medium-sized healthcare organizations with a modest IT department
- Specialist practices with scope to benefit from tailor-made solutions

## Infrastructure as a Service (IaaS)

In this model, a cloud service provider offers automated and standardized computing, storage, and networking resources that they own and host, to serve the needs of general users.

### Provider services:

- Virtualization
- Servers
- Storage
- Network

### Customer benefits:

- On-demand computing and storage scaling
- Control over apps, data, runtimes, middleware, and OS

### Best for:

Large healthcare organizations that have dedicated and capable IT departments comprising :

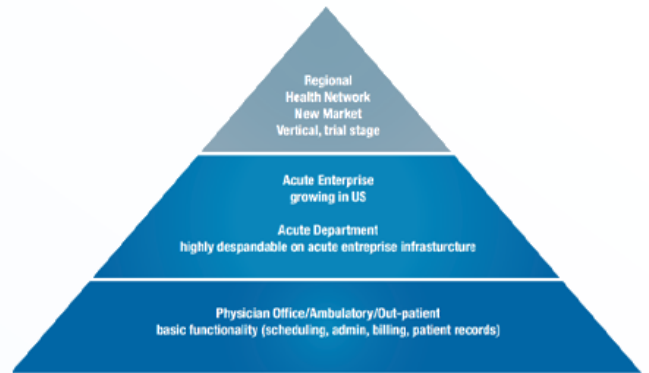
- Platform engineers
- DevOps engineers
- Data engineers
- Application engineers
- Security engineers





# Applications of Cloud Tech in Healthcare

Cloud computing deployment



*Cloud computing deployment by Healthcare setting*

- Management Information Systems (MIS) to streamline internal and external information flow
- Telemedicine services that facilitate remote consultation and monitoring, telesurgery, and teleradiology
- Practice Management services to track and manage administrative and financial processes related to medical
- Clinical decision support system (CDSS) for faster, real-time diagnoses and treatment
- PaaS and SaaS-based Health Education services for the masses, regarding diets, sanitation, fitness, and much more
- Cloud-based digital libraries for medical students and researchers with built-in indexes and query languages
- Virtual Medical Universities (VMU) to provide on-campus and off-campus medical academic learning through online
- Simplified drug discovery processes based on IaaS cloud computing models
- Population Health Management to track and manage outbreaks of infectious diseases
- Bioinformatics cloud for data storage, acquisition, and analysis to optimize biological algorithms and data-heavy

# Types of Cloud Computing Currently Being Used in Healthcare

A large number of healthcare organizations use the cloud primarily for EMR applications, which they run majorly in private or hybrid clouds, followed closely by public clouds.

## Private & Hybrid Cloud Architecture

Most smaller to mid-sized healthcare organizations rely on the hybrid model of cloud computing, wherein the core environment is either privately owned or managed by a service provider while the organization gets full control and access.

Larger healthcare organizations do tend to go for the public cloud; however, the configuration they use is still hybrid. This means that these organizations could be using popular cloud services like AWS or Azure, but most of the time the cloud-hosted infrastructure is not completely offsite.

A major reason for this is the lack of interoperability of some of the critical subsidiary, third-party applications between the various cloud architectures.

## Public Cloud Architecture

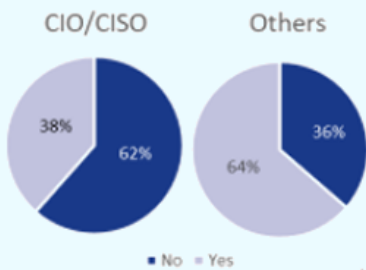
In contrast, large healthcare organizations have more opportunities to make use of public cloud architecture provided by providers like AWS and Azure.

While it just doesn't make sense for smaller outfits to invest heavily in the public cloud distribution model, for an organization with thousands of employees, and thus more scale in their system, the return on investment (ROI) is high enough to justify the investment. This is quite similar to on-site hardware infrastructure, in terms of yielding increasingly better ROIs, as the scale increases.

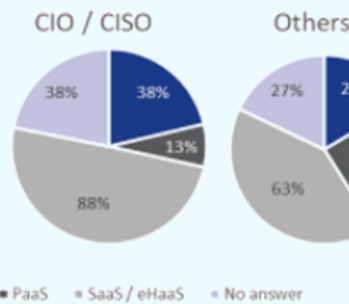
Cloud service providers tend to offer great prices for their services to such large healthcare organizations, where the sheer scale of the employee & user base automatically dilutes the cost.

# Existing Landscape of Cloud Adoption in the e-health Sector

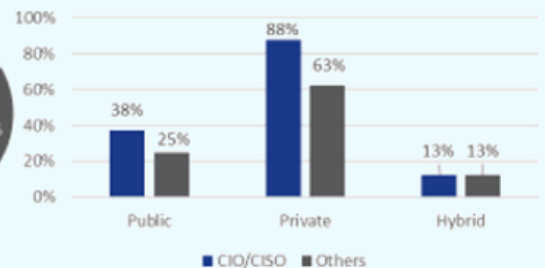
Do you implement/use/deploy cloud computing services to support eHealth system/services?



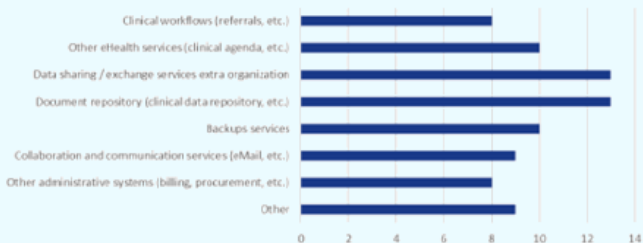
What is the cloud service model? (more than 1 answer possible)



What is the cloud deployment model? (more than 1 answer possible)



Which services do you support or plan to support using cloud deployments?



What type of external users can access the Cloud Services?



# Challenges Impeding Cloud Adoption

Will all its myriad benefits notwithstanding, certain challenges still dissuade healthcare organizations from migrating their ecosystem to the cloud.

- It can be difficult to accurately plan for allocating cloud resources based on existing workloads.
- Inaccurate estimations of resource requirements can end up in extra costs for healthcare organizations.
- For certain organizations with high bandwidth requirements, cloud solutions can fail to provide adequate bandwidth levels.
- Organizations that lack proper documentation of their existing systems, can end up with disastrous results with cloud adoption.
- In organizations with multiple departments sharing resources, getting the buy-in for cloud migration from all involved stakeholders can be difficult.
- There are significant risks in fully migrating to the cloud:
  - Data loss and theft
  - System downtimes during emergencies

That said, a lot of these issues do come with viable solutions.

Private cloud platforms make use of hardware and software components in such a way that all kinds of imaginable healthcare requirements are met. Some essential functionalities in this workflow are as follows.

## Authentication:

Implemented through cryptographic protocols to allow users to access private cloud resources only after successfully they verify their identities.

## Authorization:

Ensures the users are provided with requisite access to private cloud resources at any time.

## Data persistence:

Helps store and manage crucial healthcare data for a long period of time.

## Data integrity:

Helps store and manage crucial healthcare data for a long period of time.

## Data confidentiality:

Ensures that transmitted data can only be accessed by authorized users.

To further prevent unauthorized access to sensitive patient data in hybrid or public cloud models, most cloud solutions providers provide robust security measures. Modern HIPAA compliant cloud eHealth systems record each and every access attempt. They make note of usernames, dates, times, and even the relationship of the user with the patient.

To protect against data loss, cloud providers are employing the latest advancements in database management systems like SQL and Oracle, for creating innovative systems like 'hot' & 'cold' backups, database restores, mirroring, besides the standard practices of off-site backups and disaster recovery sites.

Advancements made in the field of Business Continuity Management are also helping with ensuring the reliability and round-the-clock availability of applications based on cloud systems.

## **In reality, the features of cloud solutions do provide safeguards against such concerns:**

- On-demand service and scaling: As organizations' requirements change, they can scale up or scale down their ecosystem, with immediate access to resources without involving human intervention. Organizations typically pay for only what they need and use.
- Pooling of resources: Multiple organizations with low to moderate resource requirements can share computational and storage resources, distributing the costs among them.
- Wide access to the network: Users from different locations are provided with wide access to the applications at the same time.





## What Can Be Done to Streamline **Cloud Adoption** ?

Cloud service providers can take the following actions:

- Partner with healthcare organizations to collaboratively work on cloud implementation
- Educate organizations on the fundamentals of cloud-based services and applications
- Properly highlight the key success factors of cloud deployment
- Share insights on failed implementation strategies, pinpointing the major pitfalls Provide guidance to organizations on assessing their own readiness for cloud
- Bridge training gaps related to change management within the organization
- Provide detailed information on established standards and interoperability of systems

On the other hand, healthcare organizations can also take measures to make the process of cloud migration smoother for themselves:

- Shift health IT investments to their operational budgets, as opposed to CAPEX, easing the budgeting process with evolving needs
- Train in-house employees on cloud computing technology and systems, to enhance their understanding of data security and other aspects of the business model



## Conclusion

As complex as the process can be, extensive adoption of cloud computing technology in the Healthcare sector is eventually inevitable. The digital transformation of the healthcare sector is already well on its way, and healthcare organizations can now endeavor to catch up or find themselves lagging behind their competition.

A set of regulations enforcing sensitive patient data protection, the Health Insurance Portability and Accountability Act (HIPPA) is applicable to what is known as 'Covered entities.' It not only includes providers of treatment, health plans, operations, and payments in the healthcare space, but also applies to the businesses associated with them who have access to patient data.

However, cloud migration of an entire healthcare ecosystem is not something that should be rushed. Guidance from experienced professionals, along with proper analysis of requirements and planning of the adoption strategy must be conducted before making the move.

## Josh Software

A global leader in digital transformation and cloud migration services, Josh Software has helped multiple healthcare businesses around the globe to migrate their ecosystem to the cloud, while ensuring compatibility with legacy systems. Begin your journey to the eHealth cloud, with Josh Software.

