Cloud Computing: Building a New Foundation for Healthcare
A transitioning industry in need of innovation

The healthcare industry is in a period of accelerating change that requires continual innovation. The chronic disease epidemic, changing population demographics and advancements in medical technologies are key contributors to escalating costs. All stakeholders expect more value for their money. And, patients are beginning to play greater roles in managing their care. Driven by economics, emerging care and business models aligned with personal values and well-being are signaling a major shift in how healthcare organizations will compete and operate in the years ahead.

A recent CEO Study conducted by IBM revealed that only 34 percent of healthcare provider CEOs are focused on simplifying operations to manage complexity more effectively. Similarly, only 55 percent of healthcare payer CEOs believe their organizations are ready for the impending complexity. Yet most recognize that there is a new environment in which they have to operate.

Cloud computing is a new IT approach that offers new economic benefits, rapid deployment of services and tight IT alignment with business goals. This paper reviews the potential for cloud computing in the healthcare industry and makes specific recommendations for how the healthcare industry can take advantage of this technology to thrive.
The potential of cloud

In healthcare, the pace of change is increasing, along with the complexity of delivering higher quality care for significantly fewer dollars per patient. Hospitals and physicians are looking for strategies to increase business flexibility, while demonstrating greater healthcare value. To do so, a transformation from institution-centered, data-poor systems to patient-centered, information-rich health systems is needed.

Regardless of segment, the healthcare industry is facing a multitude of issues (Figure 1).

A flexible and scalable approach to applications and infrastructure can help healthcare organizations support new business approaches and seamless patient experiences. Emerging care delivery and business processes will drive transaction volumes and complex analytics-driven workloads to new levels never envisioned by healthcare organizations. These drivers require a larger IT footprint to enable new capabilities, yet growing IT complexity threatens to hold organizations back.

Cloud computing offers new and flexible ways to provision, manage and pay for technology resources. It is allowing new, more efficient business models.

What does cloud offer?

Cloud computing is a general term for anything that involves the delivery of technology over the Internet. It is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (for example, networks, systems, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. It is characterized by:

- On-demand self-service
- Ever-present network access to computing resources
- Rapid and elastic provisioning with minimal management effort or service provider interaction
- Pay-per-use
Cloud computing changes the delivery of IT services in much the same way that ATMs changed banking, Amazon.com and iTunes have changed the music and entertainment industry and the Internet transformed commerce. The overall goal of cloud computing is to manage complexity more effectively, using simplification to speed the deployment of new capabilities that can enable innovation. Although cloud computing has been associated more with infrastructure, the ability to generate new business value in terms of process innovation and significant cost savings is on the horizon.

Cloud computing provides a platform for business-to-business and business-to-consumer collaboration and enables organizations to focus on differentiating activities as distinct from transactional processes (Figure 2).

Today, organizations and businesses are implementing three primary delivery models for cloud computing (Figure 3). Private clouds allow flexible implementation — either in an enterprise or on a service provider site. Today, we see strong interest in moving many IT activities or workloads to a private cloud.

![Figure 2: Cloud computing service models.](image1)

![Figure 3: Comparison between private and public clouds.](image2)
Hybrid clouds combine services from both public and private clouds. Public cloud providers sell services to anyone on the Internet.

IBM supports the creation of private and enterprise shared service clouds, which enable multiple tenants to share common resources securely. IBM delivers public cloud services (for example, IBM LotusLive™ for collaboration) and provides services to clients for delivering public cloud services. However, IBM does not support a pure public cloud, such as the Amazon credit card model.

**IBM vision for cloud in healthcare**

The healthcare industry is shifting toward an information-centric care delivery model, enabled in part by open standards that support cooperation, collaborative workflows and information sharing. Ultimately, an ecosystem will evolve that continually generates and exchanges insights and brings relevant insights into health and care decisions. It will be efficient, with the flexibility to respond dynamically to changing needs and the latest medical breakthroughs. Cloud computing, information management and business analytics will be key enablers of these capabilities. Services delivered by cloud computing will evolve to support a wide variety of healthcare processes.

In a cloud-enabled future (Figure 4), healthcare begins with the individual in the center, who receives better, safer, less costly and more convenient care and has better overall health because of consistent interactions with stakeholders.

Figure 4: An example of how cloud could enable healthcare in the future.
Closest to the patient is the primary care physician, who leads a core team of nurses, physician assistants and care coordinators and an extended team that includes hospitals, specialists, pharmacists and others. Practice and population-scale information and insights are available in near real-time. This availability ensures that the most current, complete insights and clinical knowledge are available to support care provider decisions and, most critically, to deliver comprehensive, integrated and coordinated care focused on value creation rather than consumption. Information is harvested and repurposed for more appropriate referrals and medical research to support the promise of personalized health and care.

Public and private insurers strive to improve each individual's satisfaction, to act as health advocates offering health and wellness products and services and to lower healthcare costs. They process digital claims and update patient records continuously with current data to improve the timeliness of care and insurance processes.

To optimize the effectiveness of cloud computing and to achieve efficiencies, we expect organizations to adopt standardized processes and focus on achieving differentiation through collaborative partnerships and use of information. Common processes, data and standards can improve quality and operational effectiveness. Rapid, flexible and scalable IT can change how information is used and delivered.

Today cloud-delivered pilot programs are helping organizations support wellness programs and make medical information available to individuals.
Realizing the benefits of cloud computing

Cloud computing can help transform healthcare. Cloud technology supports collaboration and team-based care delivery and the ability to use applications based on business model requirements and a common set of clinical information. It can be done on a platform that allows healthcare organizations to deliver, use and integrate new services based on a comprehensive and longitudinal view of patients irrespective of where or by whom the care was delivered. This will require maintaining a level of security and privacy equal to or greater than what traditional IT provides.

Building your cloud strategy

Cloud computing requires an integrated and orchestrated strategy. A strategy assessment is fundamental to the thoughtful definition of how you will take advantage of cloud computing and the value it will create for your healthcare organization. This will include:

- Understanding the value proposition for cloud
- Exploring cloud workloads and deployment models
- Developing a cloud solution based on the value proposition, workload and deployment model
- Developing a plan to monitor key performance indicators to validate business benefits

Using the cloud for wellness services

In Taiwan, a government-run national health insurance initiative is partnering with IBM Research to develop wellness services. Participants in this cloud-delivered project include hospitals, doctors, insurance companies, community organizations and companies that manufacture devices and instruments. For example, remotely monitored blood pressure measurements are uploaded to a cloud for analysis, record-keeping and doctor review. New device-related solutions deliver new services; device manufacturers can expand their offerings, enabled by cloud-based services that involve mobile access, huge data volumes and analytics.
Workloads vary according to business criticality, protected health information (PHI) involvement, complexity and IT requirements. Figures 5, 6 and 7 show examples of physician, hospital and health plan/insurer workloads that can benefit from a cloud approach.

*Figure 5: Physicians:* Examples of workload candidates for cloud computing.

*Figure 6: Hospitals:* Examples of workload candidates for cloud computing.
Healthcare organizations are currently drawn to cloud computing because it helps reduce IT costs and speeds service and infrastructure availability. Cloud computing can reduce capital expenditures and the need to replicate hardware environments at each facility. It also makes it possible to add capacity rapidly when it is needed.

Therefore, part of a cloud strategy should include forecasting potential savings from a cloud-delivered approach, just as an organization would do for other initiatives in an enterprise data center strategy.

**Data security and confidentiality**

While organizations can see value in real cloud-delivered applications today, challenges remain. Security is one of the more significant concerns.

Organizations need to manage the security of their infrastructure carefully, taking into consideration everything that could happen throughout the life cycle of PHI. The US HIPAA HITECH Act presents one of the better ways to support the exchange of PHI, built on a HIPAA baseline. At the same time, the epSOS European eHealth project is on a path to create a Europe-wide system for patient data exchange between member states.1
IBM is working to implement secure delivery models, deploying platforms for industry clouds that are “secure by design.” With these secure models, when healthcare organizations or communications services providers deliver services, they can trust that their services are not compromised.

**Change is possible. The tools exist today**

IBM is working with clients to help them use cloud to reduce operational costs, increase business flexibility and realize faster time to market. Our clients are also beginning to see the value of using cloud to move beyond operational cost-cutting to transforming business processes.

IBM can help you assess and plan cloud adoption, whether it is to reduce strain on your clinical, business and technical infrastructure caused by growing patient data or transforming the way you deliver care. IBM can help organizations identify and prioritize cloud computing initiatives, including considerations for their strategic use to deliver, consume and integrate new health services. We can help develop business and care delivery strategies, extend IT optimization strategies and build a roadmap (Figure 8).
Our roadmap methodology can help you understand not only which cloud strategy meets your needs but also which service is best suited for delivering specific clinical and business use cases.

Figure 8: IBM offers six proven steps to help you get started with cloud computing.

What IBM offers healthcare organizations

- **Clear economic value.** IBM helps you work through the right mix of delivery models and choices to reap the maximum benefit. An innovative healthcare client shared lessons gained from a IBM CloudBurst™ (infrastructure as a service) implementation that introduced a pay-as-you-go model to increase project flexibility and allocate freed up resources to other high value activities. The investment in cloud computing required creativity and a strong commitment to realize benefits.

- **Integrated and open solutions.** IBM actively supports healthcare standards development, working with policy makers, building consensus and delivering unique, innovative new technologies. IBM initiated a community-based effort to drive new standards for cloud computing. Our open standards approach encourages a broader ecosystem, including developers, independent software vendors and resellers, which leads to collaborative partnerships that will be critical to the deployment and success of healthcare cloud platforms.

- **Secure solutions that are ready for business.** The IBM Security Framework and Blueprint provide a comprehensive method for addressing all aspects of security and an equally comprehensive portfolio of security offerings and services. In addition, IBM Research is helping clients to navigate and manage the cloud security landscape.

- **Designing for simplicity.** From sourcing to usage to maintenance, IBM cloud solutions are simple, intuitive and designed for how healthcare organizations actually work.

- **Globally relevant.** We’ve established 11 global cloud computing laboratories to help local organizations, governments and research institutions design, adopt and reap the benefits of cloud technologies. Each lab serves as a gateway for local clients to tap into the knowledge of IBM software, services and research labs around the world.