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Cloud computing and its uses in various services

Dr. Pooja Nagpal
Assistant Professor,
Hindu Institute of Management & Technology,
Rohtak, India.

Abstract: Cloud computing is a new way of delivering computing resources and services. Many managers and experts believe that it can improve health care services, benefit health care research, and change the face of health information technology. However, as with any innovation, cloud computing should be rigorously evaluated before its widespread adoption. This paper discusses the concept and its current place in health care, and uses 4 aspects (management, technology, security, and legal) to evaluate the opportunities and challenges of this computing model. Strategic planning that could be used by a health organization to determine its direction, strategy, and resource allocation when it has decided to migrate from traditional to cloud-based health services is also discussed.

Keywords: Health care, electronic health record, cloud computing, bioinformatics, quality improvement.

I. INTRODUCTION

Cloud computing refers to an on-demand, self-service Internet infrastructure that enables the user to access computing resources anytime from anywhere. It is a new model of delivering computing resources, not a new technology. Examples of commonly used non-health care applications include Microsoft Hotmail and Google Docs, while some better known applications in health care include Microsoft HealthVault and Google Health platform (recently discontinued. However, compared with conventional computing, this model provides three new advantages: massive computing resources available on demand, elimination of an up-front commitment by users, and payment for use on a short-term basis as needed. Several articles, forums, and blogs have reported its applications in industry, business, transportation, education, and national security.

Health care, as with any other service operation, requires continuous and systematic innovation in order to remain cost effective, efficient, and timely, and to provide high-quality services. Many managers and experts predict that cloud computing can improve health care services, benefit health care research, and change the face of information technology (IT) . For example, Schweitzer, Haughton, and Kabachinski believe that cloud computing can reduce electronic health record (EHR) startup expenses, such as hardware, software, networking, personnel, and licensing fees, and therefore will encourage its adoption. Research by Rosenthal et al shows that the biomedical informatics community, especially consortiums that share data and applications, can take advantage of the new computing paradigm . As indicated in the paper by Anderson et al, data-handling problems, complexity, and expensive or unavailable computational solutions to research problems are major issues in biomedical research data management and analysis. Several informatics innovations have demonstrated that cloud computing has the potential to overcome these difficulties.

Despite the many benefits associated with cloud computing applications for health care, there are also several management, technology, security, and legal issues to be addressed. The aim of this paper is to discuss the concept of cloud computing, its current applications in health care, the challenges and opportunities, and how to implement strategic planning when the organization.

II. Types of Cloud Computing

Different cloud types can be broken down into two main categories: cloud location or the service being offered.

Cloud locations include:

- **Public** – infrastructure is not maintained by customer, but instead by cloud computing company that offers the service
- **Private** – used only by one customer or organization
- **Hybrid** – using both private and public cloud services
- **Community Cloud** – infrastructure is shared among organizations

III. Types of Services

Cloud computing is quickly becoming the standard way for technology companies to access IT infrastructure, software and hardware resources. The technology enables companies to be able to use applications and other resources managed by third party companies that are stored in high-end server computers and networks. Cloud computing systems are mainly set up for business or research purposes. In this article, we explore the different types of cloud computing solutions.

Cloud computing helps businesses to be more efficient and save on software and hardware that are important for different operations. The definition of cloud computing varies depending on your source but what is generally agreed is that it involves access of software or hardware that are in the "cloud" i.e. use of software or hardware remotely. If your company is using specialized applications where you did not have to set up server or buy hardware or software to run them, then you are probably using a cloud application.

Companies can use cloud computing to increase their IT functionality or capacity without having to add software, personnel, invest in additional training or set up new infrastructure. Below are the major types of cloud computing:

1. Infrastructure as a Service (IaaS)

IaaS is the lowest level of cloud solution and refers to cloud-based computing infrastructure as a fully-outsourced service. An IaaS provider will deliver pre-installed and configured hardware or software through a virtualized interface. What the customers accessing the cloud services do with the service is up to them. Examples of IaaS offerings are managed hosting and development environments.

Benefits of IaaS Solutions

- Reduces total cost of ownership and capital expenditures
- Users pay for the service that they want, on the go
- Access to enterprise-grade IT resources and infrastructure
- Users can scale up and down based on their requirements at any time

2. Platform as a Service (PaaS)

This type of cloud computing is similar to IaaS but is more advanced. With PaaS, apart from simply providing infrastructure, providers also offer a computing platform and solution stack as a service.The IT infrastructure may come with a graphic user interface, run-time system libraries, programming languages or an operating system.

PaaS services are mostly used by companies that need to develop, test, collaborate and deploy cloud solutions for particular applications. However, the hosting of the application is done by a third party i.e. the PaaS provider.

PaaS providers offer a fully configured sandbox and deployment environment for customers to develop, test and deploy their cloud applications

Benefits of PaaS Solutions

- **Community** – Most of the time, many people are involved in building cloud applications in PaaS environments. This creates a strong supportive community that can help your development team along the way.
- **No more upgrades** – Companies are not required to update or upgrade the infrastructure software. Instead, the PaaS provider handles all upgrades, patches and routine software maintenance.
- **Lower cost** – Companies face lower risk since they do not have to make upfront investment in hardware and software.
- **Simplified deployment** – The development team can concentrate on developing the cloud application without having to worry about the testing and deployment infrastructure.

3. Software as a Service (SaaS)

When talking about cloud services, most people think of Software as a Service (SaaS) providers. SaaS providers provide fully functionally web-based applications on demand to customers. The applications are mainly targeted at business users and can include web conferencing, ERP, CRM, email, time management, project tracking among others.

Benefits of SaaS Solutions

- Rapid Scalability
- Accessibility from any location with Internet
- Eliminates infrastructure concerns
- Custom levels of service offerings
- Bundled maintenance and Support

4. Recovery as a Service (RaaS).

Recovery as a Service (RaaS) solutions helps companies to replace their backup, archiving, disaster recovery and business continuity solutions in a single, integrated platform. RaaS providers protect and can help companies recover entire data centers, servers (OS, applications, configuration and data), and data (files and databases).**RaaS helps businesses to reduce the impact of downtime when disasters happen. RaaS is also referred to as DRaaS (Disaster Recovery as a Service)**

Benefits of RaaS Solutions

- Prevent temporary or permanent loss of critical company data
- Prevents permanent loss of physical infrastructure, including IT infrastructure
- Is a cost-effective way of recovering data
- Enables faster recovery while maintaining accuracy
- Offer greater flexibility on the type of backup required (either primary or secondary backup)

Businesses can benefit from cloud services by improving efficiency and reducing costs. Companies can adopt cloud services based on their priorities, areas of expertise and business processes. Like is the case with an IT project, careful planning and preparation should be done before switching to cloud services.

IV. ADVANTAGES OF CLOUD SERVICES

- It only takes you a few minutes or hours to set up a cloud service application with robust features, which may only cost you a few dollars per seat per month. You can access the cloud service from any computing device attached to the internet including smartphones, tablets and laptops. If you have to access a service, you can do it from anywhere; home, at the airport, at the office, etc.
- Cloud services are also scalable. As your company grows, you can increase your subscription to the resources you need to go in line with your growth. The same is the case when your company's operations shrink. Most cloud providers have packages that allow customers to choose the level of service they need.
- Finally, companies that adopt cloud services usually benefit from improved efficiency and lower costs. This gives them an edge over their competitors and can help them to quickly gain market share. For start-ups, cloud services can help them to become profitably quickly without risking investments in robust in-house IT infrastructure, hardware or software.

The Benefits and Advantages of Cloud Computing

Many businesses are moving to the cloud and for good reason. See some of the top benefits of cloud computing.

Reduction of Cost

The main benefit of cloud computing is that it leads to a significant reduction in costs. This reduction is from a decrease in operating and maintenance costs. You only pay for capacity when you need it. Further, installing a server for you company can cost quite a bit of money, not to mention maintaining it and fixing it when it goes down. Instead, utilize the cloud and another company's servers. This saves costs on hiring more IT staff and equipment.

Accessibility & Efficiency

Another benefit is the accessibility of the cloud. As long as you have an internet connection you can access your data from anywhere. When on the cloud, employees, partners and clients can access and update information from any location. Those updates with software or platforms are automatic, or in real-time. Having the ability to access information and others so easily and quickly increases functionality and helps foster innovation. Employees have their data at their fingertips no matter where they are, either roaming around the store or working on the road.Your data is safer as well. Since your data is stored in a secure data center instead of your server room, losing power does not affect the cloud. Many service providers maintain 99.99% uptime. Your data is always accessible via an internet connection.

Easy Software Updates

A significant advantage of cloud computing is the ease of updating the software. Cloud computing allows for frequent, undisruptive software updates. This ensures you have the best features of the software without interrupting your work time. Updates don't require a lengthy installation of new software.

Even the Playing Field

Cloud computing allows smaller firms to compete with larger firms as huge investments in IT infrastructure and IT staff is minimized. Paying only for what you need allows you to focus on your core product/service and keep IT costs to a minimum.

Scalability

With cloud computing, you can now increase the volume of your outputs without a corresponding increase in staff. Your cost per product or service offering decreases allowing you to produce more. Additionally, the need for purchasing more storage decreases so your company does not have to invest in expensive hardware or software programs.

V. CONCLUSION

Cloud computing is a new model of computing that promises to provide more flexibility, less expense, and more efficiency in IT services to end users. It offers potential opportunities for improving EHR adoption, health care services, and research. However, as discussed above, there are still many challenges to fostering the new model in health care. Perhaps the strongest resistance to the adoption of cloud computing in health IT centers concerns data security and legal issues. Fortunately, many main providers (eg, Microsoft, Google, Amazon) have commitments to develop best policies and practices to secure customer's data and privacy [5. Some not-for-profit organizations, such as the Cloud Security Alliance and the Trusted Computing Group, have developed comprehensive guidelines, and hardware and software technologies to enable the construction of trustworthy cloud applications. Governments also foster regulations to protect cloud users' data security and privacy. In addition, most legal issues involved in cloud computing usually can be resolved through contract evaluation or negotiations.

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