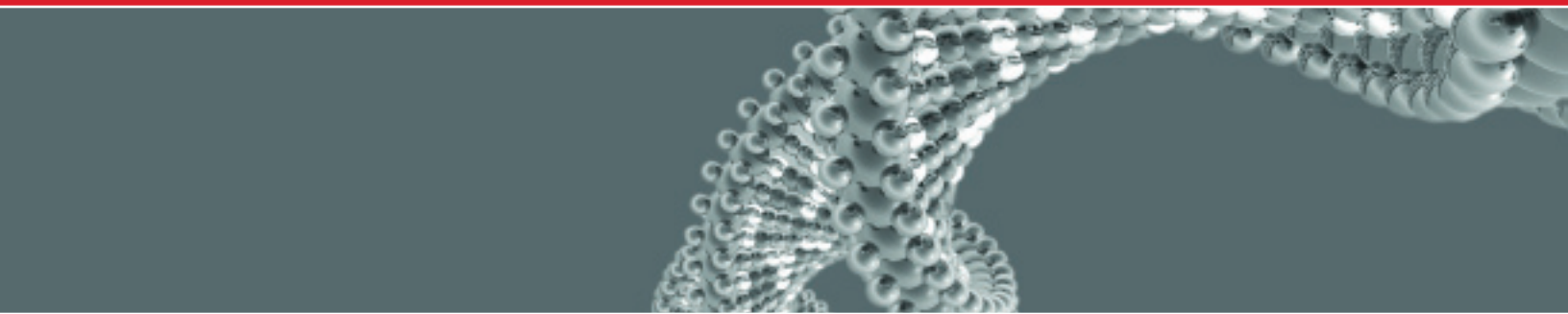**Kalorama Information**

Cloud Computing in Healthcare

CLOUD COMPUTING IN HEALTHCARE

A KALORAMA INFORMATION MARKET INTELLIGENCE REPORT

Cloud Computing in Healthcare has been prepared by Kalorama Information. We serve business and industrial clients in the United States and abroad with a complete line of information services and research publications.

Kalorama Information Market Intelligence Reports are specifically designed to aid the action-oriented executive by providing a thorough presentation of essential data and concise analysis.

Author: Melissa Elder

Publication Date: September 2013

T A B L E   O F   C O N T E N T S

Table of Contents

Table of Contents

L I S T   O F   E X H I B I T S

Executive Summary

OVERVIEW OF THE HEALTHCARE INDUSTRY

Healthcare providers around the world are facing rising costs while they attempt to maintain or improve care quality. At the same time, governments are implementing new laws or methods to leverage health expenditures downward and to increase efficiency. Therefore, hospitals and other healthcare providers are seeking out new ways to streamline their services, reduce costs, improve patient care, and meet new healthcare mandates.

Healthcare information technology (HIT) is a key component of streamlining healthcare in a way that can provide benefits to those involved. One of the key challenges involves implementing the best technologies to truly improve care and save money. Cloud computing is a newer way of using existing technology to modernize the healthcare industry. Cloud technologies are generally off-site, third-party-managed computing resources that can include computational resources, additional data storage and advanced software services such as electronic medical records (EMRs) or data analytics.

A driver of change in wealthy countries like the U.S. is excessive spending and sometimes unproven outcomes. Wealthy countries tend to spend more on healthcare—and conversely the poorer countries spend less. The level of spending however doesn't always translate to efficient care. In Japan, the rate of spending per capita on healthcare is $3,200 compared to $8,500 for people in the U.S. However, in Japan the life expectancy is one of the highest around the globe, at 83.9 years. The U.S. is 78.5 years. There are a considerable number of factors that contribute to life expectancy but the population, government and healthcare system should strive to control factors applying pressures that are driving up costs and lowering efficiency.

CLOUD COMPUTING IN HEALTHCARE

Cloud technologies are generally off-site, third-party-managed computing resources that can include computational resources, additional data storage and advanced software services such as electronic medical records (EMRs) or data analytics. Cloud systems rely on several underlying technologies like clustering, the internet, and virtualization to achieve efficiency that users are looking for.

One difficulty for healthcare personnel is using and managing data while keeping security a top priority. In a cloud scenario, some vendors/providers may be willing to accept the responsibility of securing data on the cloud taking some of the burden off the health center.

The benefits of cloud computing in healthcare involves the ability for health providers to reduce costs, adapt more quickly, improve hospital resource usage, automate tasks, improve security, increase data usage efficiency, and stay abreast of standards such as electronic patient records and security.

Table 1-1

Advantages and Disadvantages of Cloud in Health Environments

Advantages	Disadvantages
Relatively fast deployment	Compatibility/interoperability challenges between different vendors and operating systems
Lower costs than internal IT infrastructures	Security concerns
Technology and services maintained by third party	Potential for system downtime
Compliance with new mandates such as disaster preparedness and EMRs	Reliance on third-party support instead of an internal IT team
Less time spent on records keeping contributing to improved patient care	Reliance on the long-term commitment of vendors to maintain a specific cloud environment or software interface
Possibility of reduced overhead or employee wages due to increased efficiency	
Advanced software analytics available through cloud vendors contributing to fast data analysis	
Improved collaboration between physicians and patients and physicians	

Source: Kalorama Information

SCOPE AND METHODOLOGY

The market for cloud computing in healthcare is focused on providing an overview of the cloud industry, its functions, and both benefits and drawbacks. In the health industry, the cloud market includes a number of applications, including but not limited, to EMR/EHR services, archiving, storage, patient-provider interactions, financial services and more.

Market numbers discussed in this report are focused on the global market with special market coverage of specific regions, including the United States, Europe, Japan, China, India, Brazil and others. Revenues are displayed at the manufacturers' level in U.S. dollars. Although the sales figures are displayed at the manufacturers' level, in many instances, this figure represents a close

comparison to the retail level as many end users are purchasing directly from the original developer/supplier.

The base year is 2012, with forecasts provided through 2020. The market was evaluated via a combination of healthcare IT trends, population trends, healthcare demands in the future, vendor trends, innovations, federal and industry standards and regulations. Both primary and secondary sources were consulted in developing market estimates.

Telephone interviews and email correspondence were the primary method of gathering information. For the purpose of this study Kalorama Information conducted interviews with more than 70 key industry officials, software and IT service vendors, IT consultants, health care providers, and government personnel. These sources were the primary basis in gathering information specifically relating to revenue data presented in this report. Specific interviews with IT company representatives included marketing directors, division managers, and product representatives.

Secondary sources such as company literature, databases, investment reports, and medical, information technology and business journals were used to complement primary information.

TOTAL MARKET SIZE AND NEW OPPORTUNITIES

The global market for cloud computing in healthcare is estimated to reach $3.9 billion for 2013. This represents 21.1% growth over the 2012 year, for which cloud sales and service revenues for this sector were estimated at $3.2 billion. The push to adopt a higher level of IT in healthcare, growing government mandates, and limitations in digital storage have been primary drivers for the healthcare cloud market. Additionally, staffing shortages and a lack of internal IT infrastructures in many countries have provided a great opportunity for the cloud to be implemented.

The continued adoption of cloud services in the health industry is expected to drive the market to reach $15.3 billion by 2020. The growing availability of services and vendors will increase access to cloud systems and provide more options directly focused on meeting the demands of the health industry. Growth is expected to remain steady, averaging more than 20% annually.

Table 1-2

Global Healthcare Cloud Market 2010-2020

(in millions of dollars)

Year	Revenues	Percent Change
2010	$2,200	—
2011	2,670	21.4%
2012	3,240	21.3%
2013	3,925	21.1%
2014	4,780	21.8%
2015	5,850	22.4%
2016	7,155	22.3%
2017	8,740	22.2%
2018	10,650	21.9%
2019	12,800	20.2%
2020	15,277	19.4%

Compound Annual Growth Rate

Period	CAGR
2010-2015	21.6%
2015-2020	21.2%
2010-2020	21.4%

Source: Kalorama Information

Figure 1-1

Global Healthcare Cloud Market 2010-2020

(in millions of dollars)
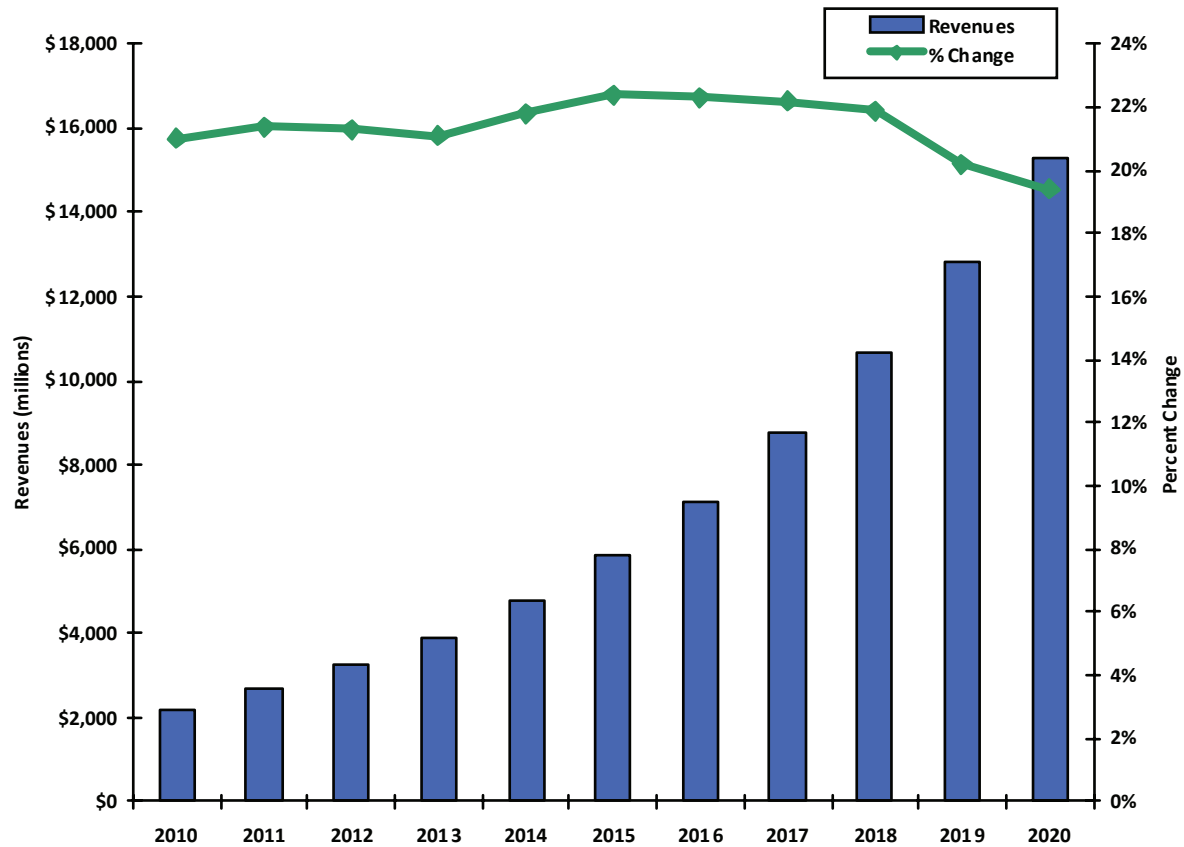
Source: Kalorama Information

ISSUES AND TRENDS AFFECTING MARKET CONDITIONS

Although technology is the mainstay of advancements in healthcare, there are times when the pace of technological achievements runs faster than they can be utilized and not all industries embrace changing equally. Many areas of the medical community are noted for lagging in IT area advancements. However, the industry is starting to catch-up but not without addressing a number of issues. Some of the issues affecting the industry are those that have been ongoing for more than a decade, others are newer and typically the result of the fast-paced technology boom in healthcare.

Issues and trends driving the market for healthcare IT, which includes cloud computing, includes:

- Aging of the population

- Increasing life expectancy

- Healthcare expenditures

- American Reinvestment and Recovery Act of 2009

- Security and HIPAA concerns

- Government demands

- Healthcare efficiency

- Emphasis on reducing hospital days

- Addressing decreasing healthcare resources

- EMR adoption and its impact on the health market

- Cost effectiveness

- Electronic prescribing

- Health Information Exchange

- Demands in archiving, particularly image archiving

- Growing demand for wireless and advanced technologies

INDUSTRY TERMS

The term "cloud" may pertain to a variety of resources but there are generally three service terms used to describe available products from the venders in the marketplace including:

- **Infrastructure as a Service (IaaS)** - IaaS is a cloud service that is offered to clients that generally controls the lowest amount of what the client uses or sees. The client maintains the operating system, the data, and the applications. The providers controls and offers hardware, virtualization, networking, and storage. This system is more flexible but requires more work on the part of the client.

- **Platform as a Service (PaaS)** - PaaS is the next higher level of service provider involvement. In this service format the provider takes over the operating system from the client and retains the hardware, network, storage and virtualization as with the IaaS system.

- **Software as a Service (SaaS)** - SaaS is the most completely provider-controlled application. The provider might offer access to a user though a web-based portal but the user relies heavily on the provider to store, control, secure, and display data. A web-based patient electronic medical record (EMR) application is an example of a SaaS system. The application provider takes the data from the client and manages the workflow behind the scenes although the process is highly automated.

General cloud platforms and other IT terms are described here:

- **Public Cloud** - A relatively accessible cloud infrastructure available to the general public. Public clouds include Amazon's Elastic Computer Cloud, Microsoft's Windows Azure cloud services, and IBM's Blue Cloud.

- **Private Cloud** - A private cloud is a restricted model that allows access only to those behind a specific firewall such as a single corporation.

- **Hybrid Cloud** - Users of a hybrid system use both a private cloud and a public cloud. A hospital may use the private cloud to process or hold details about specific patient reports but then access complimentary information on a public cloud platform.

- **Community Cloud** - A community cloud offers access to multiple tenants of a common computing group. It attempts to bring together the benefits of a public cloud but with some security and privacy of a private cloud.

- **Health Information Exchange** - Health information exchange is the process of sharing health information in a private and secure manner across organizations within a region.

- **Health Information Technology for Economic and Clinical Health (HITECH) Act** - The HITECH Act, was signed into law in 2009 as part of the American Recovery and Reinvestment Act (ARRA) of 2009. These laws provide funding for healthcare providers developing a "meaningful use" of health information technology. Under HITECH, eligible health care professionals and hospitals can receive Medicare and Medicaid payments when they adopt certified EMR technology and use it to achieve specified objectives such as implementing e-prescribing methods. Those who do not implement technologies face reductions in Medicare and Medicaid payments. Stage 2 of the meaningful use criteria of these new standards focus on advanced use of: exchanging health information, patient-controlled data, e-prescribing, and incorporating lab results. It also focuses on electronic transmission of patient care summaries across multiple settings. This stage of the Act is scheduled for the year 2014. The last stage is to be implemented in 2016.

- **The Health Insurance Portability and Accountability Act of 1996 (HIPAA)** - Simply put, HIPAA requires health providers to secure the health information of patients. This process is gaining more attention as health information is being held or transferred digitally.

- **Data encryption** - Digital data can be secured by the use of encryption, using a mathematical algorithm to scramble text and make it unreadable. This protects sensitive information such as financial account numbers, social security numbers and other important patient or client information.

SYSTEM PROVIDERS

The companies in the market for cloud computing in healthcare can offer several types of solutions, or a combination of solutions. Most of the bigger players have a wide geographical presence and have offices located around the world. The companies enter into contractual relationships and strategic alliances with resellers and distributors through which they broaden their distribution network as well as cater to industries which are not served by the direct sales force.

Large providers like Cisco Systems, provide solutions for a range of customers with a product line to suit numerous industries. For example, in wireless networking, companies may serve the healthcare markets but will also have solutions for energy, aviation, education, energy, media, home entertainment, and more.

Company profiles include companies with a primary focus on cloud services directed at the healthcare industry and/or are a major technology provider and collaborate with smaller healthcare focused companies to provide a complete solution. These include:

- Allscripts

- AT&T

- Cerner

- Cisco Systems

- Dell, Inc.

- EMC Corporation

- Hewlett Packard

- Microsoft

- VMware

- Xerox

Introduction to Cloud Computing

OVERVIEW

Cloud computing resembles a utility in a way. It is a service that is handled primarily off-site. When you need the resources of this service you connect to it via an internet connection and the resource is available to you. Some devices may connect wirelessly via Wi-Fi or cellular data connection and some through wired ports.

Cloud computing essentially builds off of a virtualization platform. Cloud computing is defined as a self-service that takes little management on the part of the service provider. It is a sharing of computer technology resources with broad network access, and a measurable service level. The resources available on the cloud are diverse but the concept in its basic form is fairly simple. A cloud system is essentially an off-site server that is accessible to users at different locations, usually at anytime.

An e-mail account may be considered a very simple cloud system. It is the off-site storage of data that can be accessed remotely and the resources to store and secure that data are maintained by the e-mail provider, like Microsoft or Yahoo. In general however, the cloud technology term is applied to much more than an e-mail account.

There are also more resources available to users than simply sharing data or providing access to multiple users. Business analytics is one example. Using cloud-based analytics software a business manager can access real-time data reports of business activities and can do this on both stationary and mobile devices. Managers can choose the format used to display information, and what data is pertinent all helping make faster decisions. The difference with a cloud-type system

is that some or most of the data processing and some of the features of combining and analyzing the data is done "in the cloud" vs. on-site. A popular factor of the cloud system involves economies of scale, the ability for users to increase efficiency and share costs with other users of the cloud. This is directly related to the sharing of resources (servers, power consumption, buying power, and hardware size efficiencies) required to manage, secure and control the data.

There is also the benefit of specialization—a large technology provider like Intel, Google or Apple, Inc., can spend considerable resources creating, improving, and maintaining cloud services while buyers of the service focus on their other respective specialties. In some cases the off-site computer resources may be used to process complex tasks not typically available to small business or home users.

Scalability is another key component of cloud computing. A user has the ability to increase or decrease their level of usage as their needs fluctuate. Paying for these resources can also be adjusted by each user.

The requirements that one user places on the cloud resources can be scaled to meet the needs of different users at different times and in different geographies making the system, as long as it can meet peak demands, a highly elastic system.

Technology developers like Intel reported that the level of efficiency of using a virtualization/cloud system is much higher than in previous years. For example, *one* rack of a 2011 family of Xeon servers can produce the performance of 18 racks of Xeon Dual Core servers used in 2006 by using a virtualization system rather than the traditional system. The process of doing this creates an estimated 93% energy reduction.

Figure 2-1

The Cloud System

```
        ┌─────────────────────────┐
        │  Smartphones/Tablets    │
        │      /Smart TVs         │
        └─────────────────────────┘
                    ↕
┌──────────────────┐   ┌──────────────────┐   ┌──────────────────┐
│ Desktops/Laptops/│ ↔ │     Internet     │ ↔ │     Servers      │
│     Netbooks     │   │ (router or switched) │                  │
└──────────────────┘   └──────────────────┘   └──────────────────┘
                            ↕
                ┌─────────────────────────────┐
                │       Cloud System          │
                │  (off-premise data center)  │
                │   • servers                 │
                │   • virtual desktops        │
                │   • apps                    │
                │   • software                │
                │   • storage/data access     │
                └─────────────────────────────┘
```
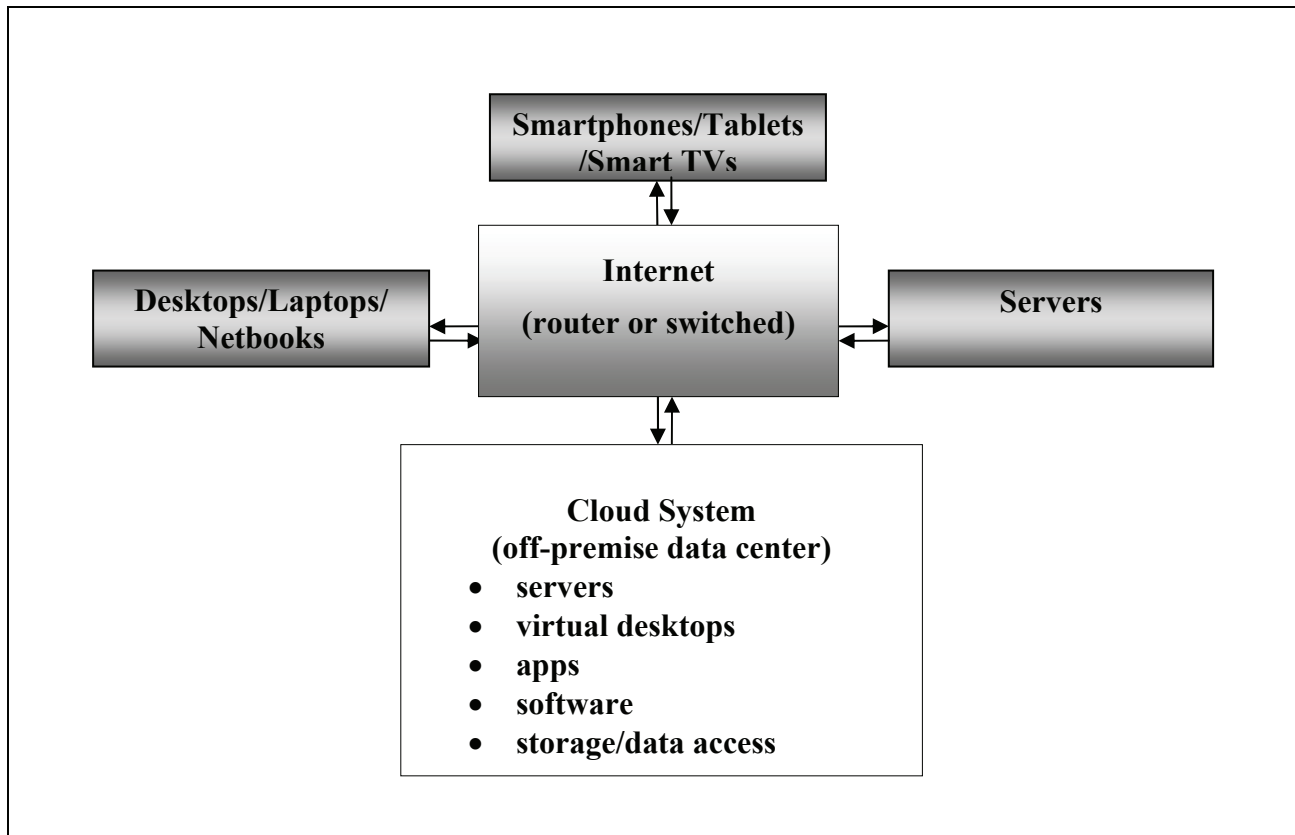
Source: Kalorama Information

Connecting Users to the Cloud

A user may access the cloud with a traditional personal computer (a "thick client" PC) which is used to process the majority of computing functions including connecting peripherals, holding/loading software, operating random access memory (RAM), and producing graphics. The average home user has a thick client for printing, playing computer games, connecting to the internet, processing photos/video and more. However, there are other computers used to provide connections to a more powerful base network including:

- thin clients

- thin client programs/applications

- ultra-thin clients (zero-clients)

Thin client computers are simpler, less expensive computers that operate on the resources of the server but still retain the use of an operating system similar to a PC. Thin clients are cheaper, are easier to replace and are often more robust systems which is a benefit for hospitals or other demanding environments. Thin clients generally use less power, but they rely on the security of the servers. This system has a single point of failure in regards to security or other failure however, security and data backup is isolated to the servers rather than to all clients.

Thin client programs such as applications primarily use the resources of the servers to process functions. There are however client-sided technologies that require the client to complete complex functions such as with Flash, an Adobe Systems program used to provide more dynamic animations or graphics in a web-based application.

Ultra-thin or zero clients drop the use of an operating system and function primarily as a decoder of the information received from the server. Even though thin clients are designed for simplicity and cost savings several thin systems for healthcare providers allow users to connect peripherals via USB or auxiliary ports.

Software-as-a-Service (SaaS) is a form of sharing the computational power and storage requirements of a networked group. A user may login to a software service hosted by another party and access a much more powerful application compared to what would be available on devices like tablets or smartphones. Additionally some companies are offering services in the cloud that use the processing power of its enterprise systems but that can be delivered to less powerful client devices.

Various hospital computer networks have used thin clients over the past several years with client-server systems but the cloud infrastructure has expanded the design of client systems such as with a hybrid cloud.

THE HEALTHCARE INDUSTRY AND THE CLOUD

Healthcare providers around the world are facing rising costs while they attempt to maintain or improve care quality. At the same time, governments are implementing new laws or methods to leverage health expenditures downward and to increase efficiency. Therefore, hospitals and other healthcare providers are seeking out new ways to streamline their services, reduce costs, improve patient care, and meet new healthcare mandates.

Healthcare information technology (HIT) is a key component of streamlining healthcare in a way that can provide benefits to those involved. One of the key challenges involves implementing the best technologies to truly improve care and save money.

The benefits of cloud computing in healthcare involves the ability for health providers to reduce costs, adapt more quickly, improve hospital resource usage, automate tasks, improve security, increase data usage efficiency, and stay abreast of standards such as patient records and security.

Cloud Services

Cloud computing can generally be divided into three main service segments:

Infrastructure as a Service (IaaS) - IaaS is a cloud service that is offered to clients that generally controls the lowest amount of what the client uses or sees. The client maintains the operating system, the data, and the applications. The providers controls and offers hardware, virtualization, networking, and storage. This system is more flexible but requires more work on the part of the client.

Platform as a Service (PaaS) - PaaS is the next higher level of service provider involvement. In this service format the provider takes over the operating system from the client and retains the hardware, network, storage and virtualization as with the IaaS system.

Software as a Service (SaaS) - SaaS is the most completely provider-controlled application. The provider might offer access to a user though a web-based portal but the user relies heavily on the provider to store, control, secure, and display data. A web-based patient electronic medical record (EMR) application is an example of a SaaS system. The application provider takes the data from the client and manages the workflow behind the scenes.

Each system provides benefits at different levels. For many clients in the health industry the SaaS option has become one of the more popular choices. The growing demands of EMRs have sparked added interest in cloud services over the past couple years and it is expected this will

continue to be a driving factor for this segment. However, as storage concerns increase, the IaaS option will also become more appealing to gain additional storage capacity.

For 2012, the healthcare cloud market, valued at $3.2 billion, was dominated by SaaS sales with 78%, followed by 13% for IaaS and the smallest segment PaaS with 6%.

Figure 2-2

Distribution of Spending for Healthcare Cloud Services by Type, 2012
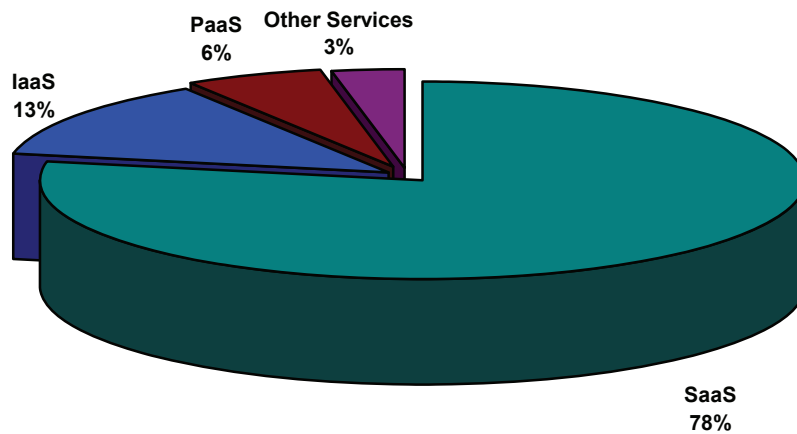
Source: Kalorama Information

MARKET DYNAMICS OF THE HEALTHCARE CLOUD

Spending on healthcare cloud services and product are expected to increase at a rate of 21% through 2020, increasing to $15.3 billion in value. This represents an increase of almost 21% from the $2.2 billion value in 2010. This is compared to global healthcare IT spending which will increase at a rate of 10.5% through 2020.

Figure 2-3

Global Healthcare IT and Cloud Spending, 2010-2020

(in billions)
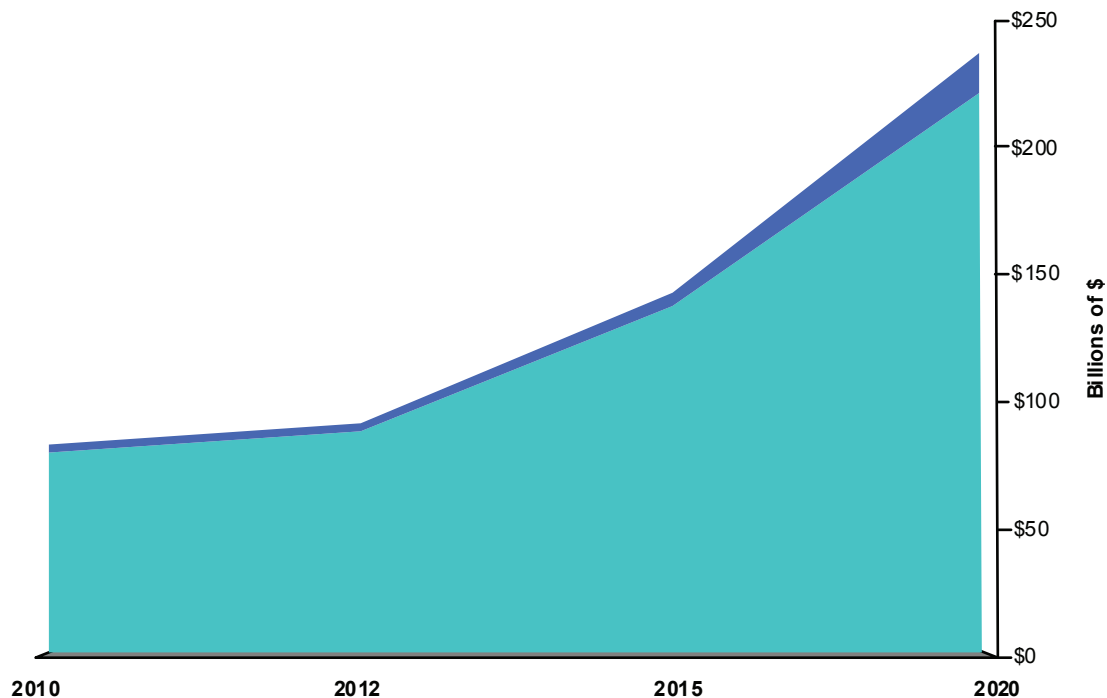
Source: Kalorama Information

Figure 2-4

Global Healthcare IT Spending, Healthcare Cloud Spending by Year
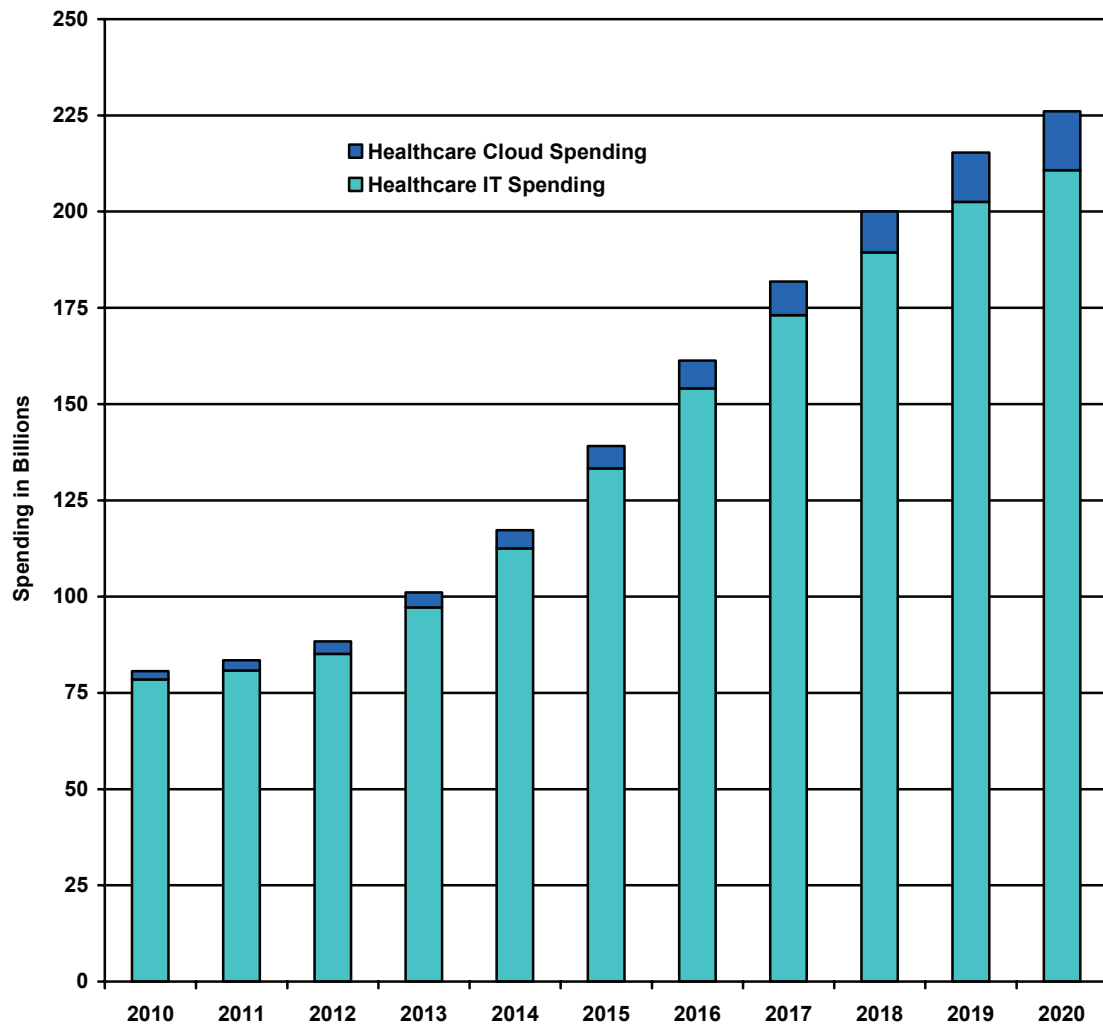
Source: Kalorama Information

Figure 2-5

Growth in Global Healthcare IT Spending and Healthcare Cloud Spending
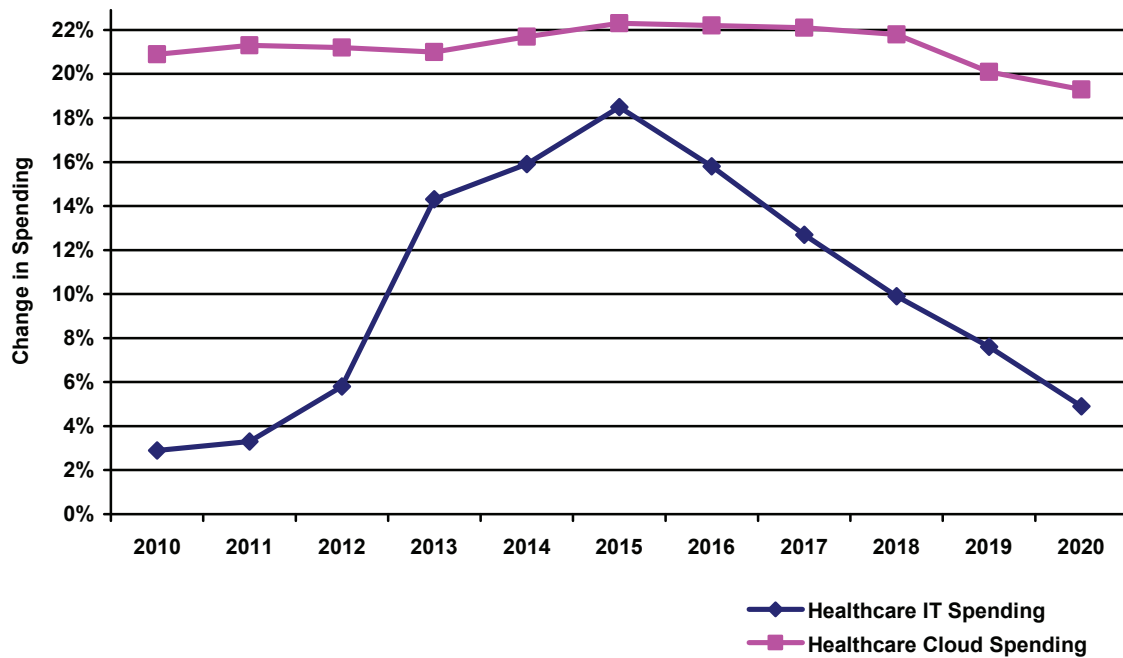
Source: Kalorama Information

Trends

Some of the trends in the area of implementing cloud computing in healthcare are as follows:

- **Increasing Customer Demand –** Customers around the world are increasingly expecting more value for money from the healthcare service providers.

- **Technological Evolution –** Healthcare providers are moving from GSM to more advanced technologies such as 4G.

- **Internet Revolution –** New tools supported by the global information infrastructure, such as the Internet, are transforming trade, messaging, medical care, information research, entertainment, etc. Easier access to online data exists owing to the Internet.

- **Expanding Relationships** – Greater mobility and access to information is changing the relationship structure of organizations. Organizations that used to operate independently have begun opening up and partnering with similar organizations for mutual benefit.

- **Wireline Substitution –** More and more customers prefer narrowband wireless to wireline communication, as the prices of the former continue to decline.

- **Broadband Revolution –** The remarkable increase in the Internet bandwidth enables instant access and the integration of services in new and better ways.

Challenges

Likewise, there are also challenges to implement cloud technologies, including:

- **Data security –** There is a possibility that medical information may be used consciously by hackers to the detriment of patients in searching for new employment or insurer. Possibilities of malicious or accidental data corruption through database intrusion also exist. About 15% of major hospital chains report at least one annual incident of breach in security, ranging from minor to threatening.

  Wireless communication involves data transmission through electromagnetic signals in air, which puts users at risk as simple scanning devices can highjack financial or patient information. However, data is at risk at rest and in transit. With public cloud computing the general efficiency of the system is based on multiple users on one system or data center. The users of the system rely on the providers to control security of sensitive data when it is on the cloud.

- **Data breach —** As more consumer and institutions rely on the access and transfer of electronic data the concern for a data breach is growing as well. A breach of that data can also be more costly to the organizations that hold the data in terms of public relations scandals and government penalties. There are new mandatory penalties under HITECH that include lawsuits from state attorney general, and reporting of violations to consumers. Attackers of online data are increasingly more resourceful and able to hide their identity. These attackers are also more focused, they often have large-scale objectives to attack platforms and access large amounts of sensitive information.

- **Government Mandates —** Healthcare reform and increasingly demanding mandates have put intense pressure on healthcare facilities to comply. This creates both a challenge and is expected to drive the market in the near term.

- **Staffing Issues —** A growing problem in implementing and continuing to expand IT in the healthcare environment is the lack of staffing resources. The demand for staff to support IT changes is expected to outpace the supply.

- **Budget limitations —** The cost of advanced IT infrastructures and compatible devices is still high. About a quarter of healthcare facilities identify lack of adequate financial support for IT as the most significant barrier to a successful implementation of IT at their organizations. Additionally, the problem with proving ROI is a concern for implementing and expanding IT options in facilities.

- **Data storage issues —** The use of digital storage technologies is adding additional pressures to storage requirements. Larger files, such as images, are now stored, full patient medical records are going digital, and archiving/recovery is becoming an essential to safeguard information in the event of disasters, etc. The requirements for space are now reaching into several hundred petabytes—where a petabyte equals 1 million gigabytes.

- **Continued access to platform and data —** If a vendor chooses at some point to change directions, possibly several years into a platform, some clients are worried about the ability to maintain a longstanding model. Clients of a specific platform or cloud service are hoping to have the provider maintain services for the long-term or at least have the option of sticking to one system that works for them for many years. The issue with data access is similar, a client may be worried about a vendor's ability to maintain business for the life of a hospital if necessary. If a vendor and client develop proprietary models this may be a costly and time-consuming process.

- **HIPAA Compliance —** One of the most significant concerns for healthcare providers involves the breach of private medical information. In the U.S., the Department of Health and Human Services (HHS) holds a healthcare organization liable for the sharing of health data inappropriately when it involves a health information exchange network. An entity that exchanges protected information is responsible for its own non-compliance including workforce violations. A covered entity is *not* directly liable for a violation of the HHS Privacy Rule by a health information organization acting as its business associate, if an appropriate business associate agreement is in place.

- **Implementation Failures** – Poor vendor support and training lead to a large number of implementation failures in the industry. This results in poor customer satisfaction, and as the industry works more on referrals, physicians are reluctant about using advancing technologies. Such failures can lead to low adoption rates of the technology. This is the third largest barrier to wireless technology adoption.

- **Resistance to Change –** A key market deterrent to the adoption of various IT technologies in healthcare is the medical staff's resistance to change. Many physicians and nurses still prefer face-to-face interactions instead of treating patients from a distant locations or accessing data in high-tech digital forms. Some people fear that they will be replaced by new technological devices. The technology is also considered to be complex; this leads to a greater reluctance to adopt it.

- **Differences in International Requirements —** International variations for security, privacy etc. provides challenges to implementing technology for some facilities. For example, in the U.S. HIPAA requirements must be addressed and in the E.U. the Data Protection Directive 95/46/EC is a key component to implementing a system.

HEALTHCARE CLOUD COMPUTING APPLICATIONS

Healthcare cloud applications consist of a variety of solutions for health providers including both front and back of the house systems. Examples include apps for patient/provider interaction, electronic patient records, physician support software, billing, and disaster recovery solutions.

Electronic Medical Records

Electronic medical records (EMRs) or electronic health records (EHRs) are essentially complete data records of a patient's health history. The development of cloud technologies has been instrumental in developing a more widely accessible EMR/EHR model with increased security measures, mobility, accessibility, ease-of-use, and digital backup. Many of the new records solutions utilize a SaaS model due to simplicity, quick launch times, and relatively low costs.

Many of the providers of EMR systems also develop complimentary apps for billing, prescription ordering, and practice management solutions in one compatible system. Platforms are often developed for multiple devices running Windows, Android, or Apple operating systems so users can bring their own devices or there is compatibility for other future systems.

A benefit of a cloud-based EMR system compared to a client-server system is that providers can focus on their workload and spend less time worrying about hardware and software maintenance. This solution is important especially for small providers such as rural physicians

seeking a solution for new government standards while delivering a robust, HIPAA-compliant security model to patients.

The use of a records system that meets the requirements for Meaningful Use criteria for Medicare payments is also vital for physicians to obtain government reimbursement.

Electronic records applications are available for small physician practices and up to much larger hospital groups that serve millions of patients. Further, patients who wish to handle some of the workload themselves can also compile their own medical records but these apps have not caught on as widely. In some scenarios, physicians have embraced the idea of allowing patients to access their own records to update some of the information.

Examples of medical record applications include the following:

- AdvancedMD EHR

- MediTouch EHR

- AthenaClinicals

- Practice Fusion EHR

- CureMD EMR

- GE Centricity EMR

Practice Management and Financial Systems

Practice management software can include systems for billing, revenue reporting, financial management, e-prescribing, drug interactions, and predictive modeling. Physicians and hospitals can utilize simple management solutions for one aspect of practice management (such as an e-prescribing app) or offer a diverse hybrid-cloud system for checking drug interactions and predicting future health problems based on a person's medical history.

A hybrid cloud system could be arranged for holding specific patient data on site while using the same nameless information in a public cloud system outside of a firewall for predicting health problems or utilizing evidence-based care applications. These systems may also offer the ability to connect a physician to a health information exchange.

Practice management software generally refers to solutions for the management of patients and tasks such as patient alerts, preventative care measures, patient check-in, and reporting.

Examples include CureMD practice management, GE Centricity practice management/EMR, and CareCloud Central.

Billing software, such as Athena Collector, is based on cloud architecture to allow physicians to conduct better reporting, tracking, payment collection, and benchmarking while receiving more money, more quickly, from payers. Athena Health reports that its users gain 8% in collections and 29% less days in accounts receivable using their billing solution. Other billing software is available from the following vendors:

- HealthFusion

- AdvancedMD

- CareCloud medical billing

- CureMD

Interpreting

On-Demand Interpreting (ODI) from Stratus Video is a cloud-based video interpreting solution for health providers that is compatible with iPad, PC, Android, iPhone, or any other video-capable phone. This interpreting software is offered for the translation of 170 different languages and is available 24/7. Using the system, a medical provider in need of translation services is connected via video feed to a translator in 30 seconds or less. It is designed to improve care, reduce wasted time, and lower costs. The pay structure is based on minutes of translation time.

Medical Imaging Systems

Medical imaging management and specifically the secure transfer of medical images is a component of Stage 2 Meaningful Use criteria. One provider, Practice Fusion, announced the launch of its Medical Imaging API in 2013, a system used to digitally connect imaging centers to physicians.

Carestream offers the Vue system for medical imaging system is developed for vendor neutral archiving, enterprise workflow, and cloud-based services. The cloud services are offered as SaaS on a pay-as-you-go basis.

Patient Portals and Interaction Systems

Patient portals and interaction programs are often available from companies with EMR/EHR and other related medical applications. Patient portals are electronic methods of interacting with their providers such as with electronic scheduling, digital messaging, registration, appointments, refills, medical alerts, statements, and lab results. Benefits of a patient access system based on a digital cloud platform include:

- improving patient experience/engagement

- reducing administrative tasks

- increasing access to physicians or support staff

- eliminating paper waste

- automating tasks

- reducing errors

Some of the patient portal or interaction systems are offered by CureMD, eClinicalWorks, and CareCloud.

Archiving and Backup/Disaster Relief (Recovery)

If a healthcare provider is faced with data loss due to a disaster or other catastrophic event a cloud system often provides the user with the ability to reacquire the data after the disaster. For example, if a physician's office computer server is damaged during a hurricane, lost data may be provisioned when the physician's office is rebuilt.

Asset Tracking

The Bring Your Own Device (BYOD) work model has flourished in some areas of business. Some health providers have reported supplying mobile devices for employees who are frequently traveling or visiting numerous patients every day under home care. Hospitals may also allow some access on mobile devices at work or physician access to patient records while at home for emergency calls.

Employees often have numerous devices available for work which has the potential to reduce costs for employers. If the software used by the business is available on multiple platforms, the employer can quickly allow access to employees on multiple mobile devices which speeds mobile access on their familiar devices. However, the possibility of security breaches, non-work device use, monitoring, reporting and management of data on lost devices are all problems with BYOD.

One solution available from Xerox, the Mobile Device Management (MDM) system is used for providing security and device management on a cloud platform. If a device is lost, the provider can wipe a device remotely, or lock it out completely. Because it is a cloud-based solution, devices are granted access remotely, configured over-the-air, and monitored centrally. Administration of the process is handled by Xerox or can be taught to a company's IT team. Services are billed per activated device.

INDUSTRY ADOPTION OF CLOUD COMPUTING

Information technologies in healthcare do not represent any single application but rather can be utilized across many facets of healthcare. Therefore, their role in healthcare can best be understood by grouping them into application segments.

These technologies serve to the three main segments of the healthcare industry, comprising:

- healthcare providers that includes hospitals, physicians' offices, nursing homes, laboratories and home care providers

- payers, which include insurance carriers, insurance agents and health maintenance organizations

- pharmaceutical and medical device companies that includes drug manufacturers, biological products manufacturers and medical device manufacturers.

Figure 2-6

Healthcare Industry
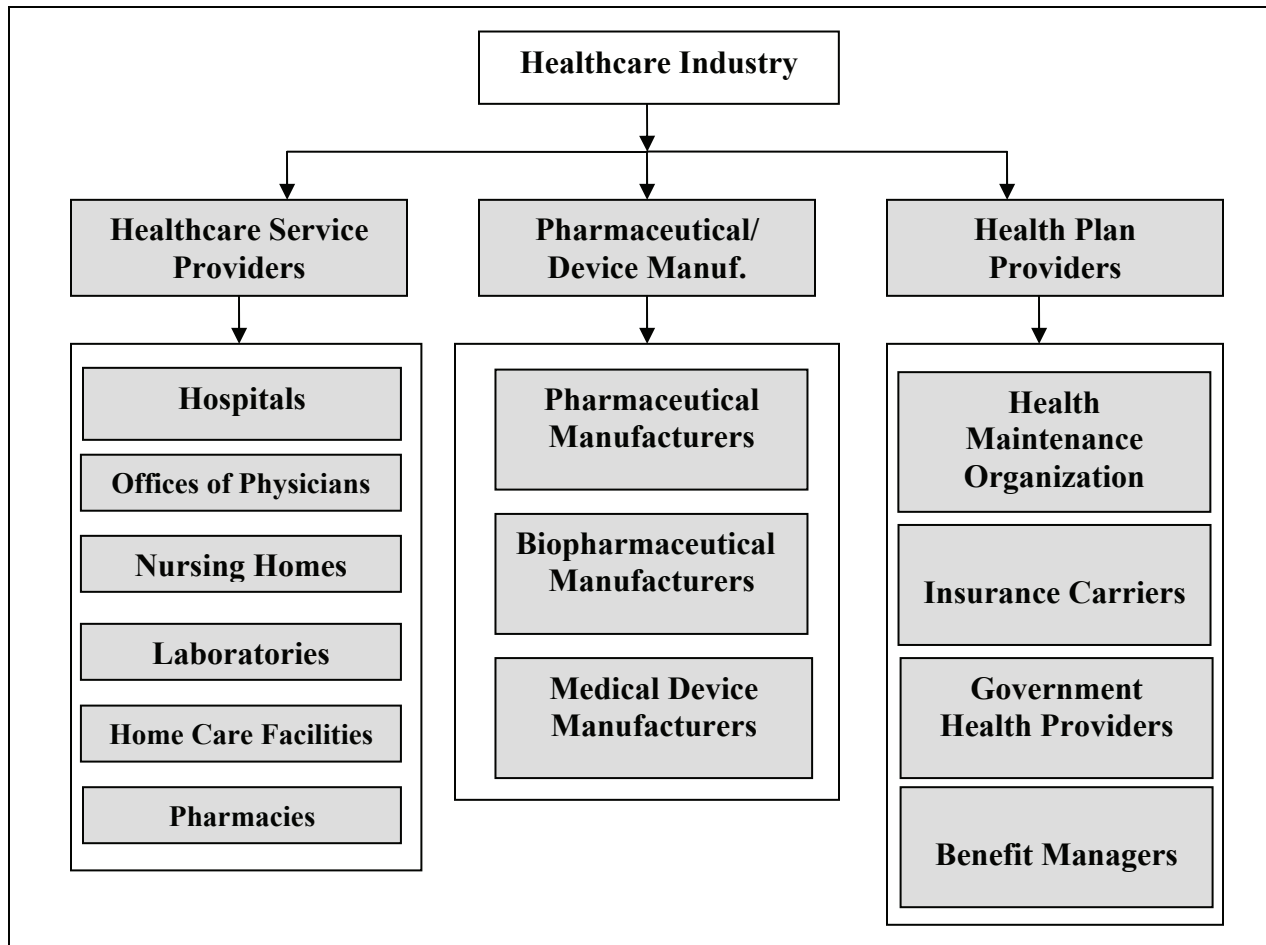
Source: Kalorama Information

Providers

The healthcare industry includes establishments ranging from small private practices of physicians with only one medical assistant to large city hospitals that employ thousands of professionals. Healthcare establishments include the following segments:

- **Hospitals** – Hospitals are responsible for providing medical care, which includes functions such as diagnostics, surgical activities and nursing services. There are some

specialized hospitals which perform specific functions and cater to specific ailments. Examples include mental hospitals, cancer hospitals, cardiac hospitals, etc.

- **Outpatient Care Centers –** The establishments in this category include kidney dialysis centers, outpatient mental health and substance abuse centers, health maintenance organization medical centers, ambulatory surgical centers, and emergency centers.

- **Ambulatory Care Services –** These include small physicians' offices, large group practices, and hospital outpatient departments.

- **Acute Care Services** – These include inpatient medical/surgery units and critical care units.

- **Physician Offices** – Physician offices comprise approximately 40 percent of the total healthcare establishments in the US. Physicians practice privately as well as in groups performing specific as well as general roles.

- **Nursing and Residential Homes** – The role of nursing care facilities is to provide rehabilitation and other health-related personal care to needy patients. Another type is a residential care facility, which provides 24-hour care to children and elderly patients, etc., alike.

- **Home Care** – Treatment of chronic diseases remotely from the patient's home can lead to fewer hospital visits as well as flexibility for the aged people who require treatment.

- **Pharmacies** – Dispensing of pharmaceuticals as prescribed by physicians and other qualified health providers. Pharmacists perform consultations and administer vaccines and other approved therapies.

- **Medical and Diagnostic Laboratories** – Laboratories are responsible for providing analytical and diagnostic services the healthcare organizations as well as the patients. Some of the activities carried out by laboratories are blood testing, cytology, imaging, etc.

Hospitals

Hospitals are responsible for providing medical care, which includes functions like diagnostics, surgical activities and nursing services. There are some specialized hospitals that

perform specific functions and cater to specific ailments such as mental hospitals, cancer hospitals, cardiac hospitals, etc.

<u>Number of Hospitals</u>

Worldwide, more than 80,000 hospitals and acute care centers are registered and the number continues to grow in many regions, especially in areas such as China.

The aging population, increasing incidence of diseases requiring hospitalization, and increased interest in government funding for healthcare has fueled growth of these facilities. See the following table for an estimated number of registered hospitals/acute care centers for countries around the world.

Table 2-1

Registered Hospitals and Acute Care Centers by Country

Country	Number
Australia	1,300
Canada	2,200
China	12,000+
France	1,100
Germany	1,500
Japan	9,000
United Kingdom	1,100
United States	5,800

Source: Kalorama Information

Figure 2-7

Registered Hospitals and Acute Care Centers by Country
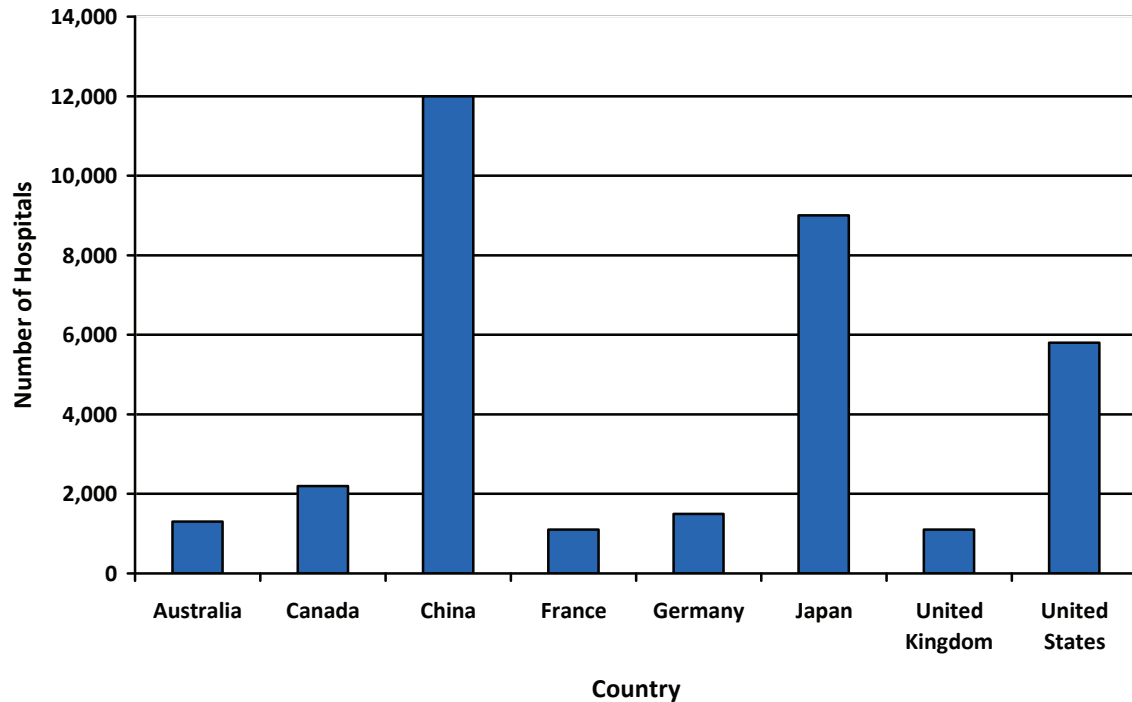
Source: Kalorama Information

Adoption of Advanced Information Technology

Overall, in developed regions the adoption of information technology (IT) in the health sector is reaching 95%. The U.S. is a major driver for this segment with nearly 100% of hospitals implementing some degree of advanced information technology. The hospital segment represents the most advanced care provider type adopting information technologies and EMRs.

A growing attention to lower healthcare spending and increasing federal requirements are responsible for the majority of growth. The looming financial penalties for failing to achieve

government requirements leave a considerable number of U.S. hospitals in jeopardy of government penalties, including loss or reduction of Medicare payment eligibility. Rural hospitals are expected to be the most at risk for not meeting requirements and reduced payments due to lower financial resources.

Physician Offices

There are two major types of physicians:

- **Integrated Practice Physicians** – Those who work in large groups or hospitals

- **Independent Practice Physicians** – Those who run their own clinics

Integrated group doctors in large practices and hospital-based doctors are more likely to implement advanced HIT systems than those in solo and small practices. There is a lot of competition in this group, and hence, they are ready to invest in new technologies to be ahead of the competition.

Independent physicians, who practice in groups of five or less, form a majority of the practicing physicians in the U.S. region. They do not have well-established infrastructure and have significantly less capital to invest in new technologies; hence, they are not very willing to experiment. They want to be sure of the benefits of a technology before actually making any investments. They are considered to be late adopters.

The decision to buy or invest in any technology or application is usually a group decision made after all the members of the group are convinced of the benefits of the technology.

Number of Physician Offices

Around the globe, the number of physicians per 1,000 people in the population is between about one and four. According to the American Medical Association, the U.S. had over 900,000 physicians in 2008, of which around 60 percent were involved in office-based patient care. The remaining 40 percent were either attached with hospitals or involved in some other activities.[1] Although, the number of physicians has more than doubled in the last 35 years, a shortage of around 84,000 physicians is expected by 2020.[2]

---

[1] Source: http://www.ama-assn.org/ama/pub/category/12930.html

[2] Source: http://www.aha.org/aha/content/2006/pdf/PreparedToCareFinal.pdf

Table 2-2

Medical Doctors per 1,000 Population by Country

Country	Physicians/1000
Afghanistan	.21
Australia	2.9
Belgium	2.9
Brazil	1.7
Canada	1.9
Czech Republic	3.6
France	3.5
Germany	3.5
Italy	4.2
Japan	2.1
Mexico	2.9
Spain	3.7
Sweden	3.6
Switzerland	4.1
Turkey	1.5
United Kingdom	2.7
United States	2.7

*most current data available from source. Data reported by country, approximately 2005 through 2009.

Source: WHO Global Health Observatory Data Repository

Figure 2-8

Medical Doctors per 1,000 Population by Country
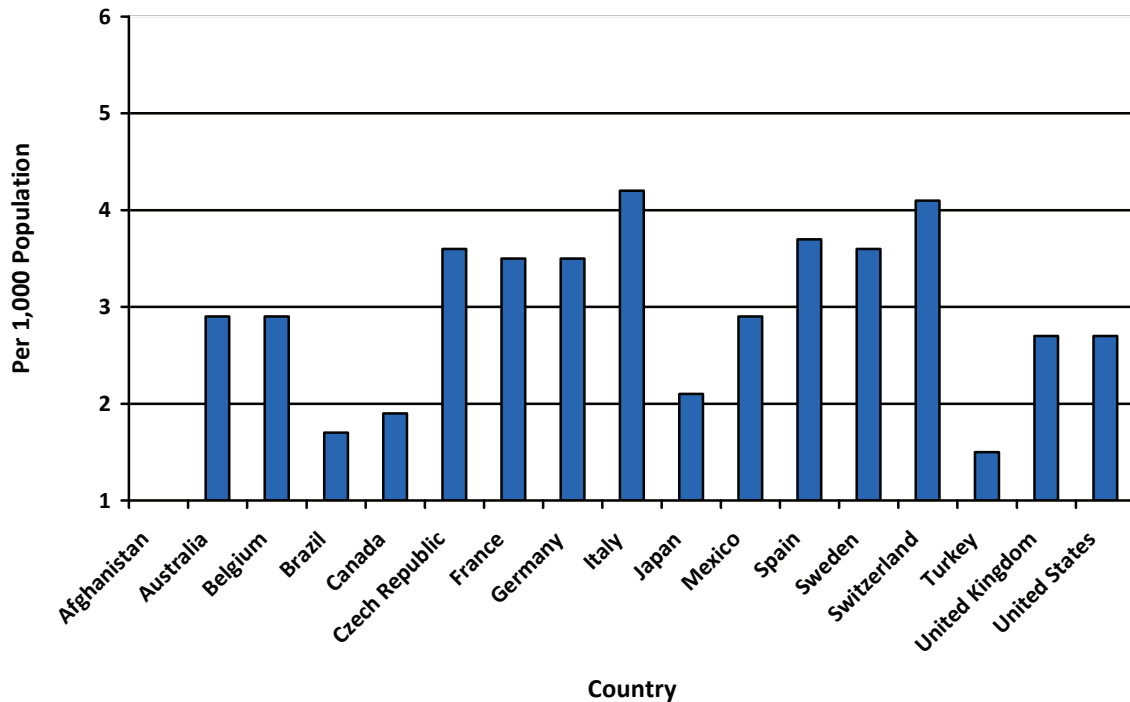
*most current data available from source. Data reported by country, approximately 2005 through 2009.

Source: WHO Global Health Observatory Data Repository

Adoption of Advanced Information Technology

Although some physician practices are slow to adopt these technologies, to remain competitive and maintain the highest percentage of patient base and payments, using these technologies is becoming necessary. The awareness of these benefits is evident in the growing trend to implement IT in recent years. In 2004 the use of PDA's and smartphones by physicians

for patient care was estimated at 25%; by 2008, this had increased to 40% and in 2010 the adoption of this technology in the practice was more than 50%.

Similarly, the use of e-prescribing technologies has jumped from less than 10% in 2004 to about 35% in 2010. The use of e-prescription by physicians is expected to experience a significant amount over the next few years with the growing regulatory requirements.

Nursing Homes and Home Care

A nursing home is a place where patients who require constant nursing care can reside. It is generally a smaller version of hospitals with some specialized facilities. Patients receive physical, occupational, and other rehabilitative therapies in case of illnesses or accidents in nursing homes.

Number of Establishments

The U.S. has an established nursing home structure and a growing home health program. In 2010, there were 15,690 nursing home establishments in the United States with approximately 1.4 million residents. In additional to nursing homes. There are about 3 million Americans registered under full-time home health care, and an additional 9 million requiring part-time or alternative home care.

The demand for non-hospital care centers is growing internationally, and particularly throughout Europe and in Japan and China. The aging populations in these areas are driving growth for this sector of the health industry. In past decades, elderly populations lived with family members who assisted with care and responsibilities. However, as society changes the trend for elderly populations and their family members to be independent have increased. In many developed European countries, for example, the majority of elderly care facilities are between 5 and 10 years post construction and most are independently owned.

Table 2-3

Estimated Nursing Service Establishments and Care Centers by Country

Country	Number
Canada	1,500
China	40,000
France	8,000
Germany	10,000
Japan	15,000
United Kingdom	4,500
United States	15,700

Source: Kalorama Information

Figure 2-9

Estimated Nursing Service Establishments and Care Centers by Country
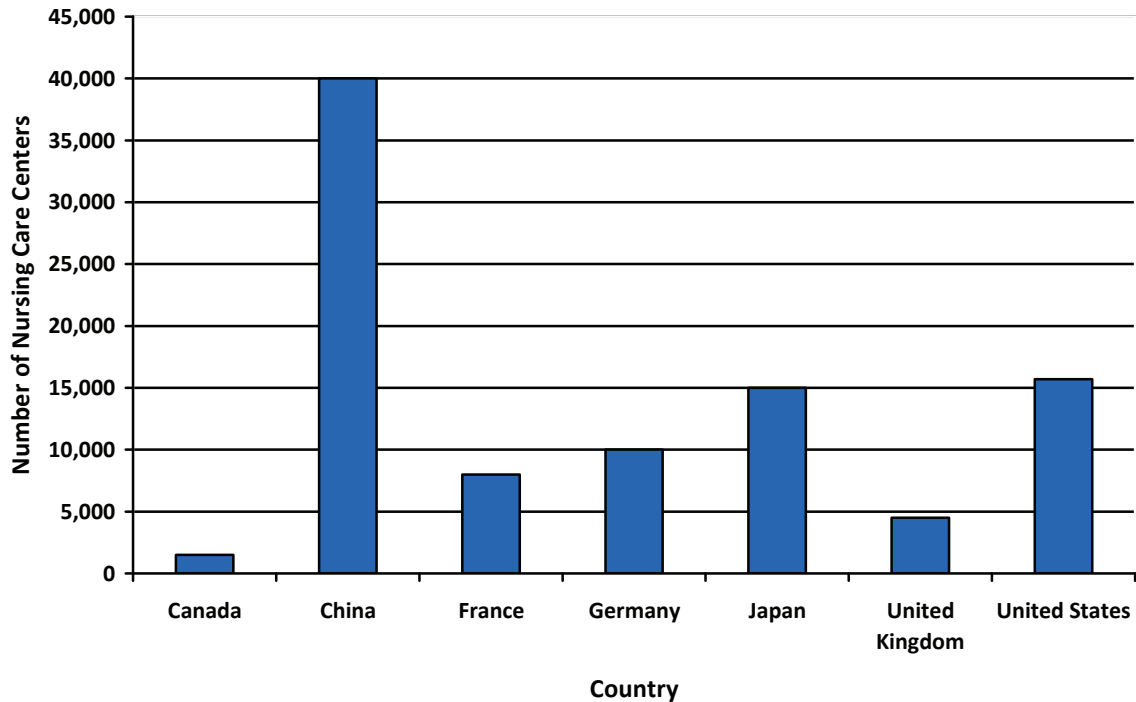
Source: Kalorama Information

Adoption of Advanced Information Technology

Nursing homes have been slower to adopt new or advanced technologies, including IT technologies; however the forecast years will likely show an increase in adoption due to the use of EMRs in the health industry, government incentives and standards, and an increase in the number of residents requiring improved streamlining and efficiency in facilities.

The growing implementation of wireless networks in nursing homes, and improved IT infrastructure is a driver of technology sales in this sector; currently only about 10 percent of

nursing homes have advanced wireless systems. However, more than 80 percent of the physicians of nursing homes carry wireless communication devices, such as PDAs and laptops.[3] Reducing costs in nursing homes will likely contribute to the growth of advanced IT technologies in this type of facility in the future.

Pharmacies

A pharmacy is the primary place of preparing and dispensing prescription drugs. The main job of a pharmacist is to distribute medications that are prescribed by a physician; however some pharmacists advise physicians concerning drug selection, dosing, interaction, and side effects of medication.

There are two primary types of pharmacies:

- Hospital/healthcare pharmacy

- Retail/community pharmacy

The hospital or health center pharmacy services hospitals, mental health institutions, general health centers, and nursing homes.

The retail or community pharmacy dispenses medications in retail stores.

Number of Pharmacies

The number of pharmacies worldwide is a difficult number to obtain. There are a number of non-regulated establishments in developing regions and even some in more developed countries. In the U.S. there are more than 60,000 pharmacies (including those in drug stores).

Adoption of Advanced Information Technology

In the United States, the adoption of IT by pharmacies is about 95% for making claims. About half of the pharmacies in the country now use IT for patient doctor communication. The growing adoption of electronic prescribing is fueling growth for technology adoption by pharmacies.

---

[3] Source: Primary Research

Medical and Diagnostic Laboratories

These facilities are responsible for providing analytical and diagnostic services to healthcare organizations as well as the patients. Some of the activities carried out by laboratories are blood testing, cytology, imaging, etc.

Number of Medical/Diagnostic Laboratories

In the United States, there are a number of laboratory types, including hospital (in-house) laboratories, stand-alone labs, satellite locations, mail order only, and mobile options. The number of all these types of locations is difficult to obtain, however the U.S. Census Bureau reports more than 15,000 establishments--defined primarily as stand-alone establishments.

Adoption of Advanced Information Technology

The adoption of advanced IT by the laboratory sector varies considerably by region. In the United States, the adoption of IT by laboratories is about 90% for making claims and viewing results. In less developed regions, the percentage drops to between 0 and 30%. This provides a substantial opportunity for expansion.

Payers

These are the organizations/individuals to which products and services are sold by healthcare providers and fiscal intermediaries. Insurance carriers provide insurance to companies, individuals, physicians, etc. The role of insurance carriers is to provide protection against financial losses, which can occur due to a number of factors such as accidents.

Adoption of Information Technology

Increasingly, health plan providers are using IT to streamline the payment side of healthcare to both patients and providers. IT in this area is effective in the following applications:

- **Information Access** – Information access through the use of the Internet is one of the enable users to access any information and make use of the same for an effective business transaction.

- **Field Applications –** The use of information technologies in field activities, such as claims and data capture, ensures accuracy and efficiency.

- **Alerts/Notifications –** Insurance agents can receive alerts, notifications, messages, etc., through these technologies, which can help them to respond to situations in an efficient manner.

- **Remote Hardware and Software Management –** With the help of wireless technologies, hardware and software systems can be remotely monitored and tracked, which is useful in keeping control or being informed even while mobile.

Pharmaceutical Companies

Pharmaceutical manufacturers refer to pharmaceutical drug manufacturers. They are responsible for the entire process of drug making, i.e., from research and development to final production of the drug. All the processes, such as clinical drug trials and the sales of the drugs, are carried out by pharmaceutical manufacturers.

The area of biopharmaceuticals refers to the practice of producing medical drugs using biotechnologies. The term biotechnology refers to a technological application that uses biological systems, living organisms, etc., to execute processes. A vast majority of the products produced under the purview of biopharmaceuticals is derived from life forms.

Adoption of Advanced Information Technology

The two main challenges that pharmaceutical and biopharmaceutical companies face with regard to drug development are involved in clinical drug trials.

- **Cost of Clinical Drug Trials –** This cost refers to the cost of clinical trial participation, which includes data collection, management and analysis of results and tests performed for research purposes. This cost has been rising over the years and pharmaceutical companies are seeking alternatives to reduce it**.**

- **Time Taken –** On average, the time taken for the completion of a typical clinical drug trial is 6 years. This leads to a huge loss in revenues for pharmaceutical companies, as well as a loss for patients who get the drug after a long wait. Thus the industry is looking for alternative means that can help reduce the overall time taken for the clinical drug trial.

The following benefits can be found with IT in this sector:

- **Reduction in Time Taken for the Trial –** The use of IT in clinical drug trials can reduce the time taken to run trials by approximately six months. With the help of advanced technologies, such as wireless communications, paperwork can be minimized, information can be better understood, and the analysis can be carried out in a relatively shorter period of time.

- **Cost Savings –** Reduction in the time taken to conduct trials will lead to cost savings. The drug, after it is launched, will earn additional revenue for the time that has been saved by the use of a technology solution.

- **Reduction of Work Load –** The use of technologies in clinical drug trials will reduce the burden on research staff, doctors, and patients.

- **Accurate Tracking of Responses –** Patient responses can be stored more accurately, as paperwork is minimized in the process.

Interaction/Communication between Health Customers

There are various types of interoperations or communications that take place among the various customers of the healthcare industry.

Table 2-4

Primary Interactions between Health Customers

	Direct Healthcare Providers	Individuals	Insurers/ Reimbursers
Direct Healthcare Providers	Clinical information Patient referral/ transfer Opinion/support Prescriptions Education and training	Consultation Treatment Health information	Billing Payments
Individuals		Peer support	Claims Payments Reimbursements
Insurers/ Reimbursers			Inter-agency reimbursement

Source: Kalorama Information

- **Direct Service Providers to Direct Service Providers** – Service providers exchange a variety of information among each other. This can range from simple messages to high-resolution video images. Some of these exchanges were earlier supported through post, courier, etc., but now, they increasingly use the electronic media.

- **Direct Service Providers to Individuals** – This refers to the communication taking place between service providers and their patients. The main type of communication pertains to

consultation and treatment. In this segment, on-line access to professional advice, prescriptions, etc., is increasing.

- **Direct Service Providers to Purchasers/Reimbursers** – This aspect involves transactions such as submitting claims, receiving payments from insurers, etc. The volume of transactions is usually high; therefore, electronic communication is becoming almost necessary to be up-to-date.

- **Individual to Individual** – This interaction is important from the aspect of exchange of information. With the advent of electronic media such as the Internet, this interaction has expanded manifold.

- **Individuals to Purchasers/Reimbursers** – Consumers can communicate using advanced technology to submit claims and get reimbursements without even being present at the office physically.

- **Purchasers/Reimbursers to Purchasers/Reimbursers –** Communication between these parties are mainly related with inter-agency interactions especially for reimbursement cases, where a client of one reimburser is treated by healthcare providers in a different jurisdiction. This exchange becomes particularly important for patients who travel for treatments.

Healthcare Cloud Computing: Trends Shaping the Market

THE GLOBAL HEALTHCARE MARKET

The healthcare industry is considered to be among the largest markets worldwide. It is estimated that in the developed nations, healthcare represents 8-10% of Gross Domestic Product (GDP). Healthcare costs have also been increasing annually. The global spending on healthcare is now estimated to be between $6.5 and $7 trillion annually.

The health industry is now focusing more on personalized medicine, evidence-based healthcare, and electronic health records. At the same time, hospital throughput and efficiency has to meet the demands of an aging population, high costs and in some areas, a shortage of workers. Some of the most advanced uses of technology in the health industry are focused on addressing the vital issues facing the health industry today.

The U.S. is one of the largest spenders on healthcare, ranking 2nd globally as compared to its GDP. Increases in spending have been seen in countries with growing economies such as Brazil and China. Some regional markets have experienced a slowing in the economic growth, but growth in healthcare spending is expected to continue due to increases in national coverage and health reform policies in areas like China.

The top fifteen countries for health expenditures compared to GDP are as follows:

1. Marshall Islands
2. United States

3. Tuvalu

4. Niue

5. Micronesia, Federated States of

6. Sierra Leone

7. Netherlands

8. France

9. Liberia

10. Moldova

11. Germany

12. Burundi

13. Switzerland

14. Denmark

15. Canada

Table 3-1

Total Healthcare Expenditures as a Percent of GDP by Country 1990, 2000 and 2011 (Selected Countries)

Country	Total Health Expenditures as Percent of GDP by Country		
	1990	**2000**	**2011**
Australia	6.9	8.3	9.0
Austria	8.4	9.9	11.0
Canada	8.9	8.8	11.3
Czech Republic	4.7	6.5	7.9
Finland	7.7	7.0	8.9
France	8.4	10.1	11.9
Germany	8.3	10.3	11.6
Greece	6.6	7.8	10.2
Italy	7.7	8.1	9.5
Japan	6.0	7.7	9.5
Mexico	4.8	5.6	6.3
Switzerland	8.2	10.3	11.5
United Kingdom	6.0	7.2	9.6
United States	11.9	13.2	17.5

Source: Organization for Economic Cooperation and Development; U.S. Census Bureau; British Medical Journal; U.S. National Coalition on Healthcare; Canadian Institute for Health Information; Kalorama Information

Figure 3-1

Total Healthcare Expenditures as a Percent of GDP by Country 1990, 2000, and 2011 (Selected Countries)

Percent of GDP
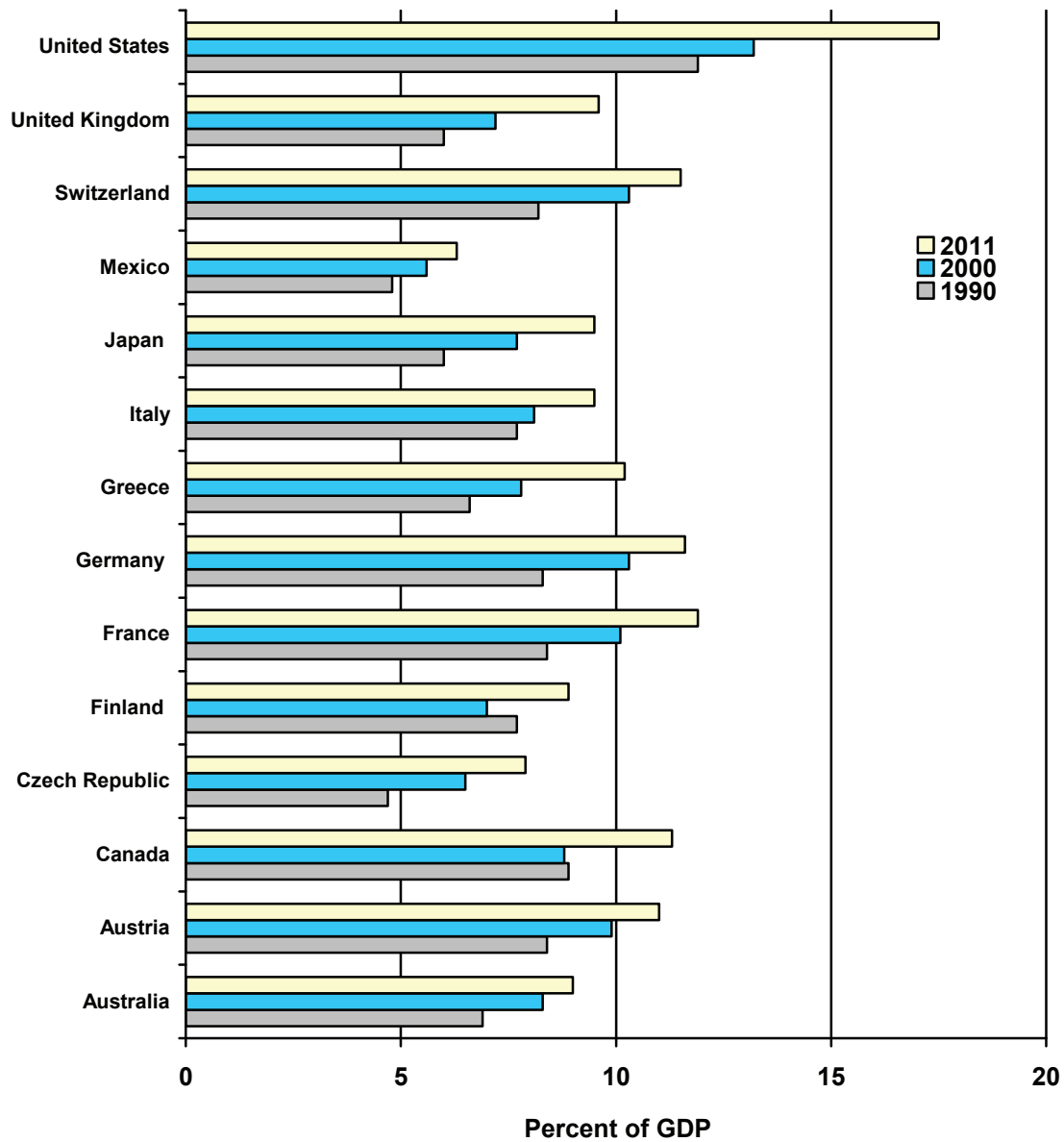
Source: Organization for Economic Cooperation and Development; U.S. Census Bureau; British Medical Journal; U.S. National Coalition on Healthcare; Canadian Institute for Health Information; Kalorama Information

Healthcare Efficiency

Wealthy countries tend to spend more on healthcare—and conversely the poorer countries spend less. The level of spending however doesn't always translate to efficiency and improved outcomes. In Japan, the rate of spending per capita on healthcare is $3,200 compared to $8,500 for people in the U.S. In Japan the life expectancy is one of the highest around the globe, at 83.9 years. The U.S. is 78.5 years.

The U.S. and a handful of other countries around the globe spend a disproportionately high amount of global domestic product (GDP) on healthcare products and services but the results often do not justify the high costs. This brings to question the efficiency of each dollar spent on healthcare.

Factors that influence outcomes of health spending:

- Preventative measures and diagnosis

- Lifestyle choices including diet and exercise

- Geography

- Disease

- Access to care

- Spending inefficiency (amount of each dollar spent compared to amount of care received)

- Adherence to care

- Quality of care (including hospital acquired infections or "never events")

Table 3-2

Healthcare Spending, Obesity and Life Expectancy, 2012

Country	Healthcare Spending Per Capita	Obesity Rate	Physicians per 1,000	Life Expectancy at Birth
Japan	$3,200	5%	2.1	84.0
United States	$8,500	33%	2.7	78.6
Mexico	$1,000	32%	2.9	76.7
Greece	$2,400	20%	6.0	80.1

Source: U.S. Census Bureau, World Health Organization, Kalorama Information, CIA World Factbook

Governments are seeking to increase their leverage on pricing while keeping quality of care up. Prevention is also an important tool for controlling costs. Countries such as the U.S. are seeking to reduce healthcare costs dramatically including passing laws like the Affordable Care Act (ACA) signed into law in 2010. Reports from a variety of global and U.S. health agencies indicate that the U.S. has below average health indicators, and an unreasonably high level of spending compared to other regions.

GLOBAL POPULATION

The significance of knowing the demographic trends for participants in the healthcare industry is how an increase in population will impact the healthcare system in general and how it will affect the increase in generation of advanced technology streamlining healthcare and reducing cost with the increasing population.

Additionally, because the population is aging, the demand for healthcare services will grow significantly as aging population seek services and life expectancy increases.

Global Population Trends

The total global population has increased at a faster rate than the United States, largely due to growth in India and China. In 1980, the global population stood at 4.5 billion and increased to 5.3 billion over a ten-year period, reflecting a 1.7% increase. By 2020, the population globally will likely increase to nearly 7.7 billion. This provides a significant need for streamlining workflow and reducing costs in all areas of healthcare.

Table 3-3

The Global Population, 1980-2050

Year	Population (millions)	% Growth (CAGR)
1980	4,453	-
1990	5,284	1.7%
2000	6,092	1.4%
2010	6,870	1.2%
2020	7,662	1.1%
2030	8,379	0.9%
2040	9,005	0.7%
2050	9,536	0.6%

Source: U.S. Census Bureau.

Figure 3-2

The Global Population, 1980-2050

(in millions)
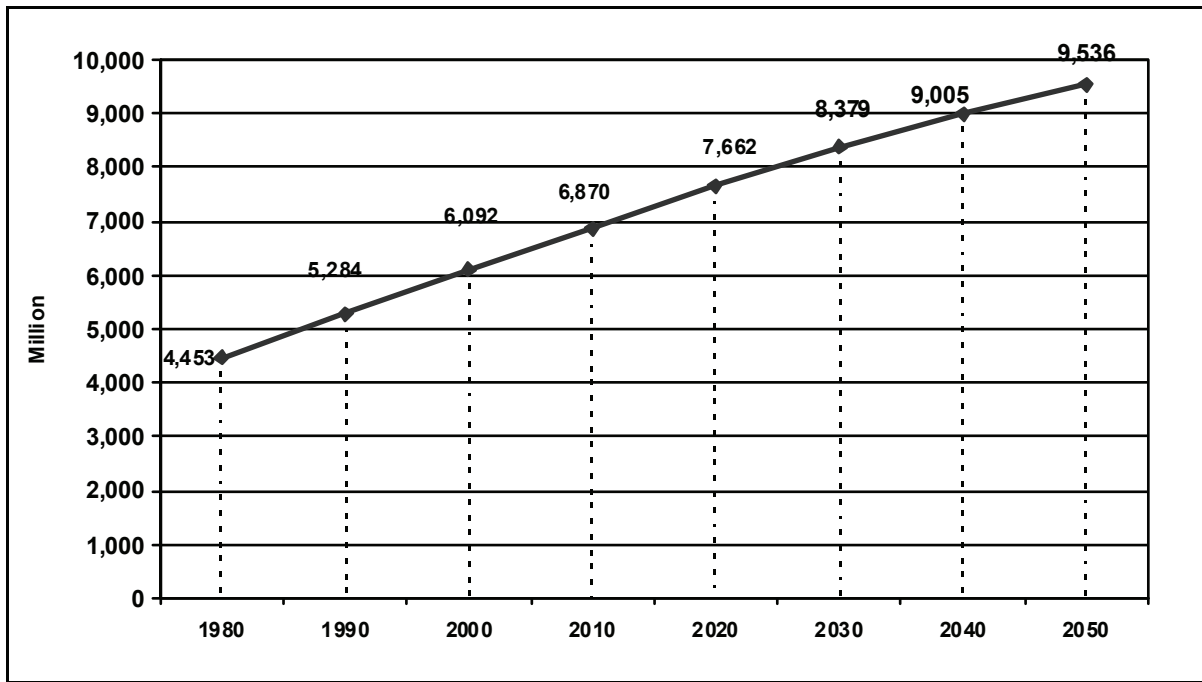
Source: US Census Bureau.

Global Population over 65

Around the globe, the aging population is expected to change the way the healthcare centers operate. As people age, they typically require more care and medicine. Essentially, the increasing number of individuals in higher age brackets is expected to increase the demand for healthcare.

The global population above age 65 is expected to grow by 279% between 2000 and 2050. The growth is showing the fastest increase from 2000 through 2020. The population in this age group continues to increase beyond 2020, but the growth *rate* is expected to decrease to a minor degree from 2020 to 2050.

In comparison, the total global population is expected to increase by 57% between 2000 and 2050 (6.1 billion to 9.5 billion).

Table 3-4

Global Population Trends Age 65+, 2000-2050

Year	Over 65 Population (millions)	% of Total World Population
2000	420	6.9%
2010	530	7.7%
2020	730	9.5%
2030	1,000	11.9%
2040	1,327	14.7%
2050	1,593	16.7%

Source: U.S. Census Bureau International Database

Figure 3-3

Global Population Trends Age 65+, 2000-2050

(Millions)
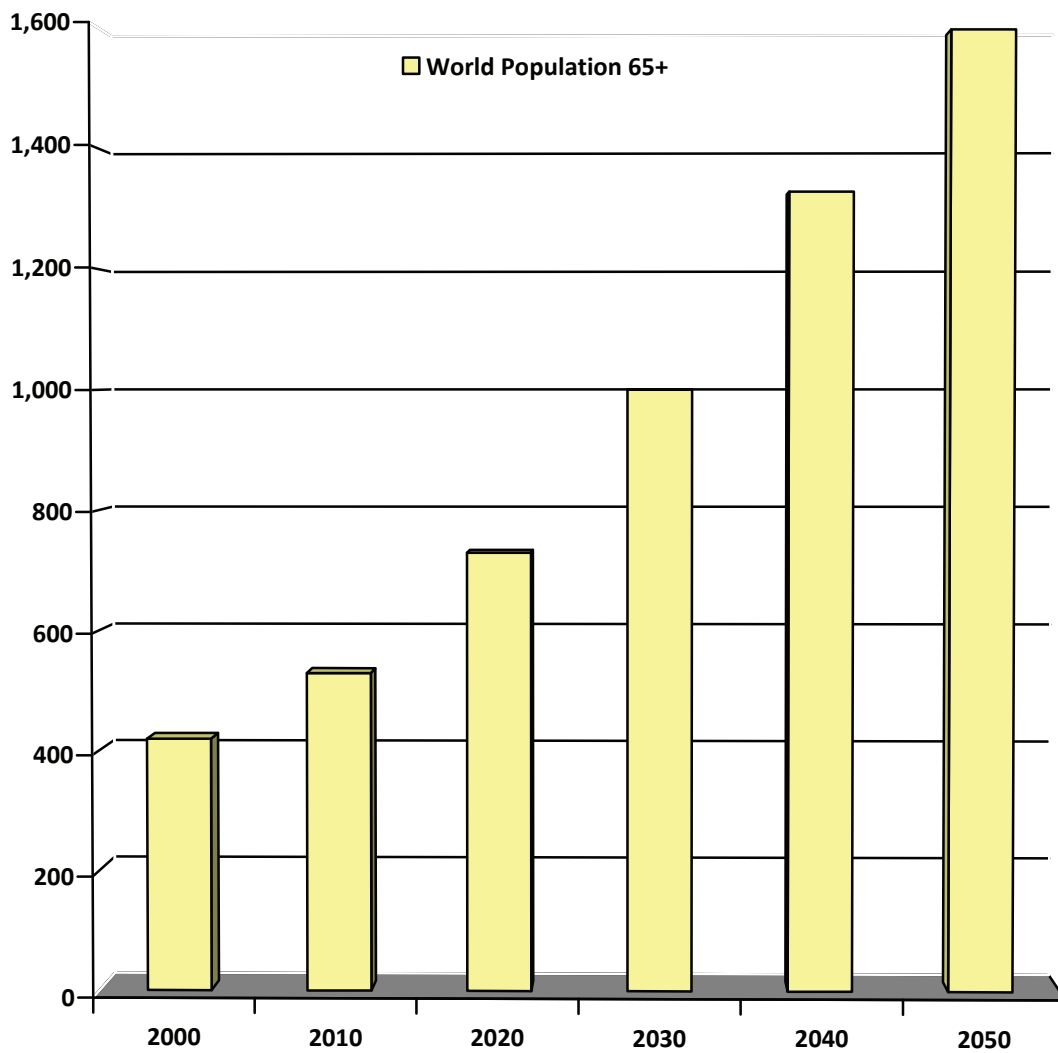
Source: U.S. Census Bureau International Database

Figure 3-4

Global Population: Age 65+ as a Percent of Population, 2000-2050
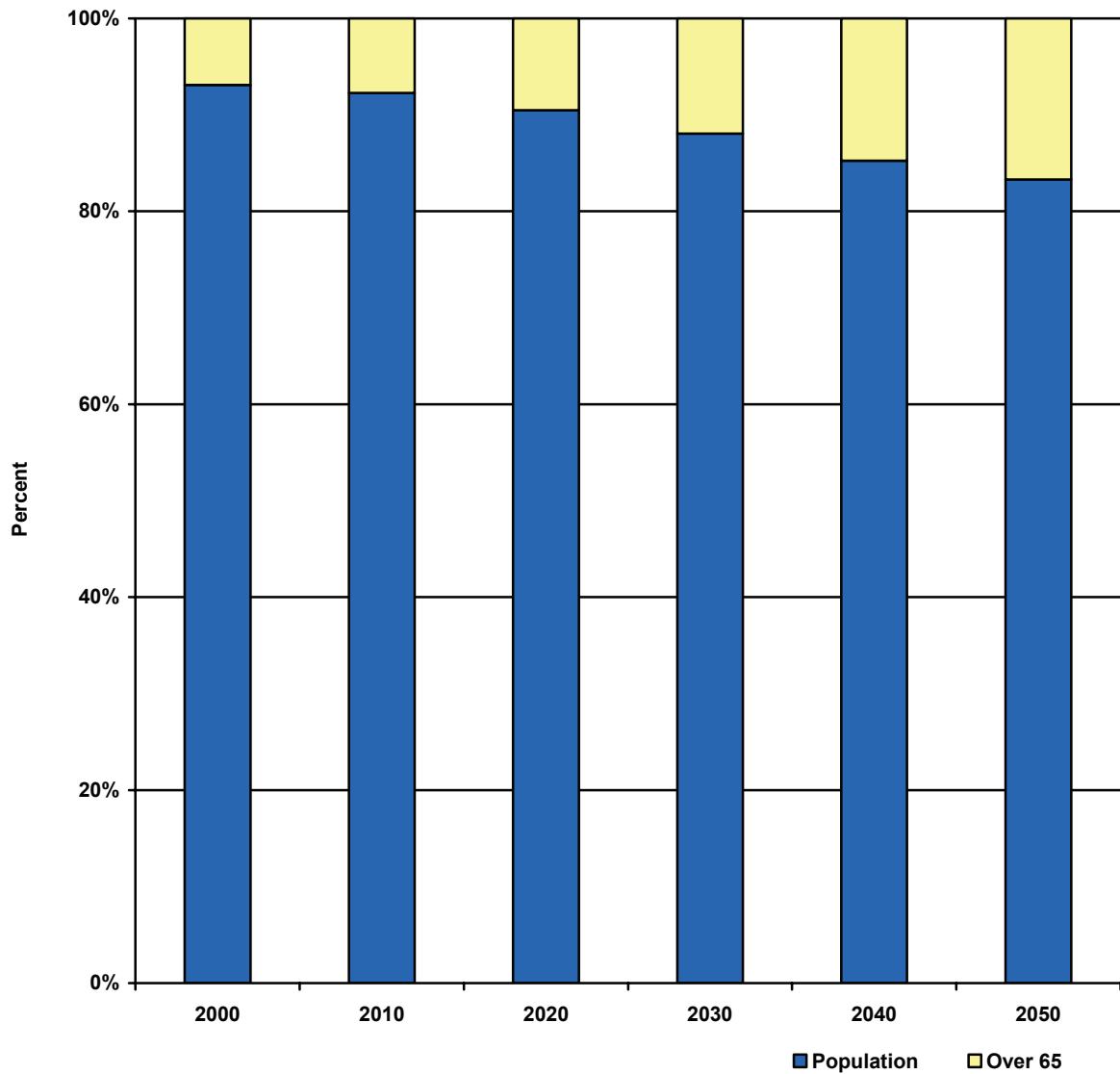
Source: Kalorama Information

Increasing Life Expectancy and Demands on the Health System

Life expectancy has been increasing around the world due to advances in healthcare, medical research, sanitation, and nutrition. Developed regions have seen relatively steady growth over the past 25 years. The increasing life expectancy is adding more pressure to the health system by demanding care for an increasing number of aging patients for longer. There is also a trend for patients to remain independent of full-service health services for longer. This shows a demand for advanced information technologies that can meet these needs.

Table 3-5

Average Life Expectancy in Years by Country 1980 and 2012

Country	1980		2012	
	Women	Men	Women	Men
Australia	78.1	71.0	84.5	79.5
Canada	78.9	71.7	84.2	78.9
China	67.2	63.4	77.1	72.8
France	78.4	70.2	84.7	78.4
Germany	76.1	69.6	82.6	77.9
Italy	77.4	70.6	84.6	79.2
Japan	78.8	73.4	87.4	80.6
Mexico	70.2	64.1	79.6	73.8
Spain	78.6	72.5	84.5	78.3
Sweden	78.8	72.8	83.6	78.9
Turkey	60.3	55.8	74.8	70.9
United Kingdom	76.2	70.2	82.4	78.1
United States	77.4	70.0	81.1	76.1
World Average	61.0		67.6	

Source: Organization for Economic Cooperation and Development (OECD); U.S. National Center for Health Statistics, Vital Statistics of the United States; CIA World Fact Book; Kalorama Information

Figure 3-5

Average Life Expectancy in Years by Country 1980 and 2012
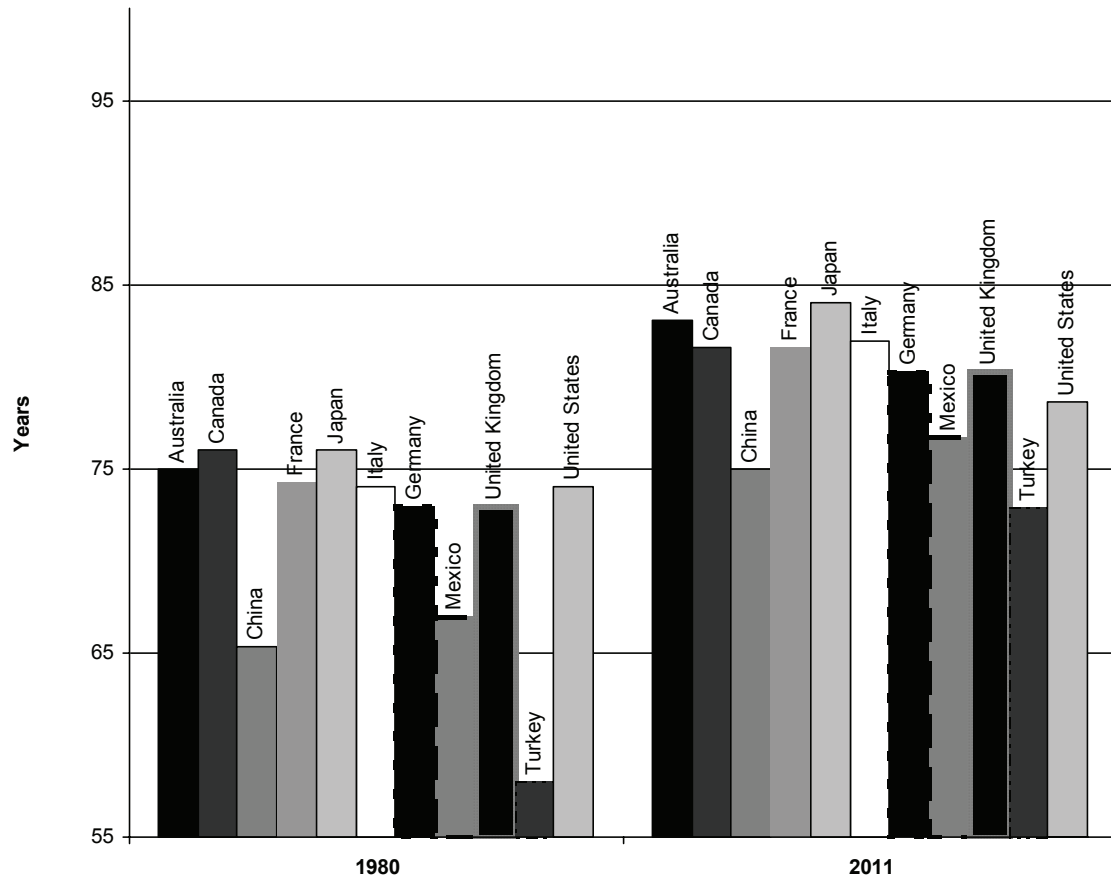
Source: Organization for Economic Cooperation and Development (OECD); U.S. National Center for Health Statistics, Vital Statistics of the United States; CIA World Fact Book; Kalorama Information

INFORMATION TECHNOLOGY (IT) IN HEALTHCARE

Globally, nearly $90 billion was spent on healthcare IT in 2012, growing at a rate of 5% annually. However, healthcare IT spending varies dramatically from one country or region to another and is not consistent in percent compared to total health spending or in growth. For example, healthcare IT accounts for roughly 1.3% of all healthcare spending in the U.S., while in Brazil accounts for less than 1%.

Figure 3-6

Healthcare IT Spending by Country
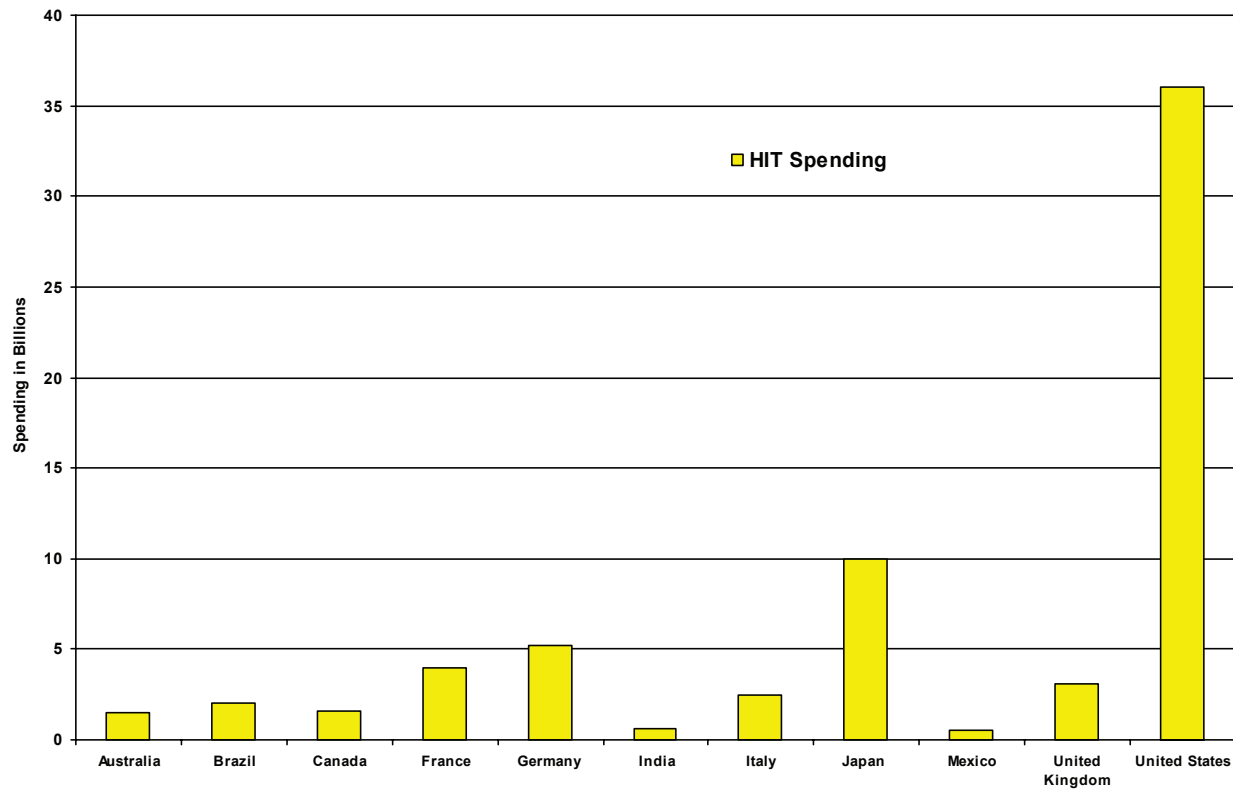
Source: Kalorama Information

Figure 3-7

Healthcare IT Spending by Country
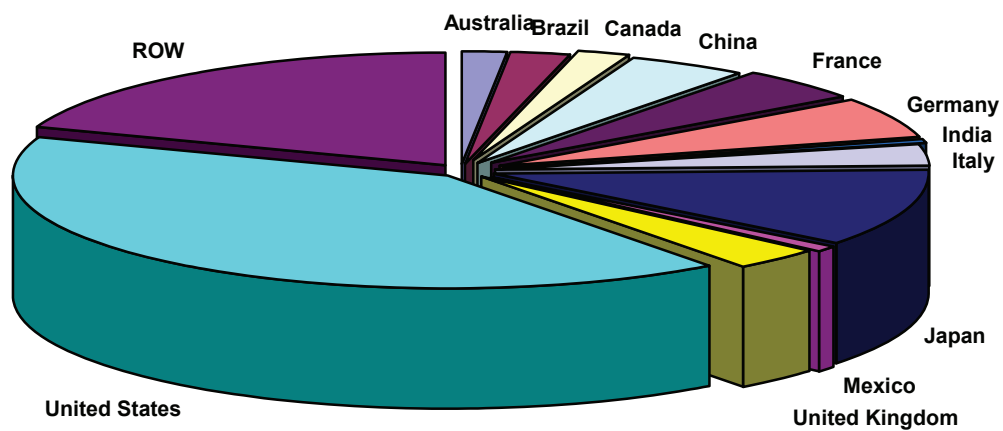
Source: Kalorama Information

HIT Trends

Some of the trends in the healthcare industry are as follows:

- Technology is giving rise to new clinical therapies, which, in turn, are addressing a number of medical ailments and aiding in early diagnosis.

- Physicians and healthcare facilities are investing increasingly in paperless systems to improve their efficiency and reduce the operating cost. This has sparked a need for focusing on infrastructure and developing plans to operate in a more efficient, streamlined system.

- Healthcare reform and policy mandates are expected to drive the market. The most recent HIMSS survey reported that about 25 percent of health establishments were focused on achieving meaningful use in 2011 and in 2012 it was still the primary objective with 24% focused on this goal.

- Consumers' expectations for improved healthcare are increasing in both developed and developing countries.

Figure 3-8

Primary IT Infrastructure Focus, 2011-2012
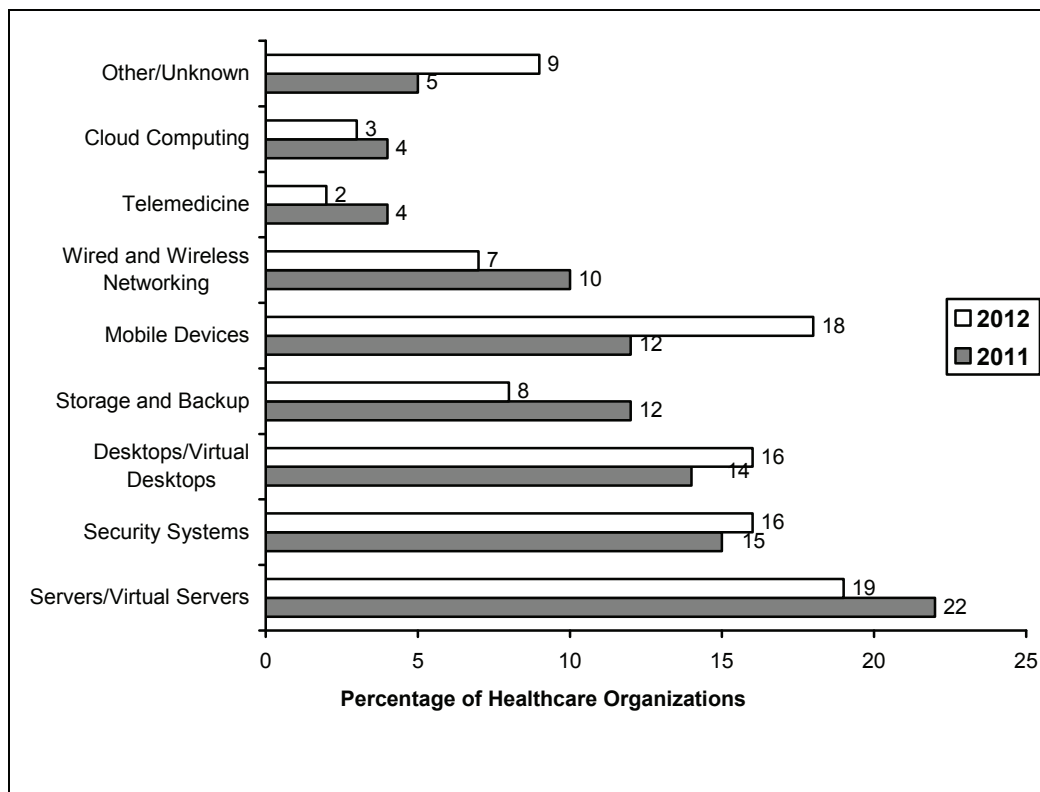
Source: 23nd Annual HIMSS Leadership Survey

Challenges

The healthcare industry is facing the following challenges:

- **Increasing Cost** – Healthcare costs are rising at a high rate and it can only be curtailed by implementing the latest technologies. Most researchers agree that the cost for outpatient care has increased because the cost of setting up the medical units and facilities is as expensive as doing procedures during hospital admissions. Inpatient hospital costs have been increasing due to increased use of more expensive technology, higher labor costs, growing shortage of nurses, hospital consolidation, and increased costs for hospital admissions.

- **Increasingly Stringent Government Regulations** – Healthcare providers are facing challenges in providing services due to an increasing number of government regulations and policies that regulate the healthcare industry. Governments expect more transparency and reporting in the healthcare system. These policies may have consequences, such as increased cost and pressure for healthcare providers.

- **Increasing Population –** The global population has shown steady growth and is expected to continue its growth at a steady rate of one percent through the year 2020. The global population in the year 1980 was estimated to be 4.5 billion; this is expected to reach 7.7 billion by the year 2020.

- **Aging Populations** – Life expectancy is increasing and the major proportion of population in the world is consolidated in the middle-age group. In the United States the trend is apparent. The growth in the 65+ age group is increasing between 2005 and 2020. However, there is a larger increase between 2010 and 2015. The growth *rate* increases between 2005 and 2020, but decreases after 2020. The number of people continues to increase over the period. Similar trends are reported in other countries.

- **Shortage of Qualified Medical Personnel –** There continues to be a concern over the available staff to treat the growing and aging population. The difference between the number of nurses and physicians available and the required number has been increasing over the years, and the demand and supply gap is expected to grow even wider over the next few years. This demand-supply gap creates a pressure on hospitals to utilize staff more productively.

- **Medical Errors** – Medical errors can be defined as the failure of a planned action. Medical errors can be involved in medicine administration, surgeries, diagnoses, equipment, and laboratory reports, and can occur in hospitals, clinics, nursing homes, pharmacies, etc. About 20-30 percent of the healthcare providers believe that the use of technology to reduce

medical errors and promote patient safety is the top priority. In the HIMSS survey, most respondents reported that improving quality outcomes was the largest area where IT implementation could impact patient care.

Healthcare Information Exchange (HIE)

Healthcare information exchange is the process of sharing health information in a private and secure manner across organizations within a region. The industry continues to stress the importance of health information sharing in a central location for the benefit of both provider and patient. The primary goal is to achieve full access to patient medical data to provide care effectively and more efficiently. In addition to benefits in the delivery of care, there are cost saving benefits to reducing time spent with exchanging paper records and freeing up staff to do direct care rather than office work.

Figure 3-9

Health Information Exchange
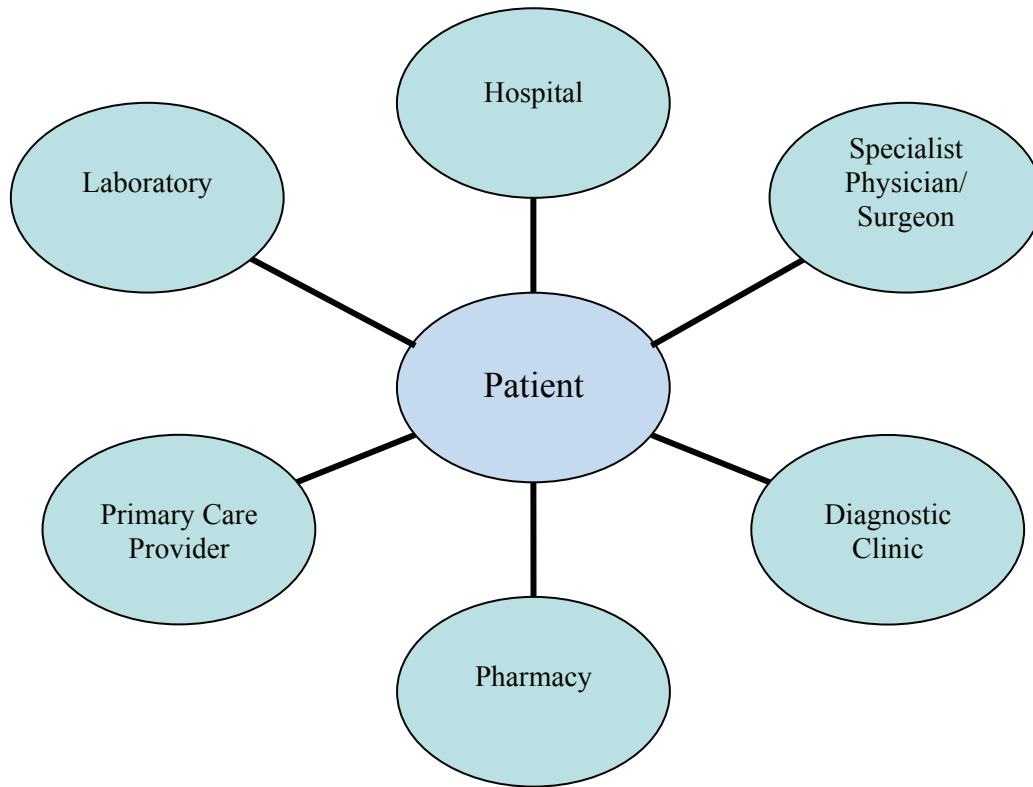
Source: HHS.GOV

A driving force in the market is the demand and initiatives implemented with the American Reinvestment and Recovery Act in 2009. Meaningful use requirements and funding provided by programs as part of the American Recovery and Reinvestment Act of 2009, such as the HITECH Act, are fueling the adoption of information technology in patient care, including healthcare information exchange.

A growing number of facilities are participating in HIE programs. In 2010, the Healthcare Information and Management Systems Society reported results from a survey showing 37% of respondents participated, by 2011 the survey reported 44% and for 2012 49% now participate.

Figure 3-10

Health Information Exchange (HIE) Adoption, 2010-2012

(in percent)
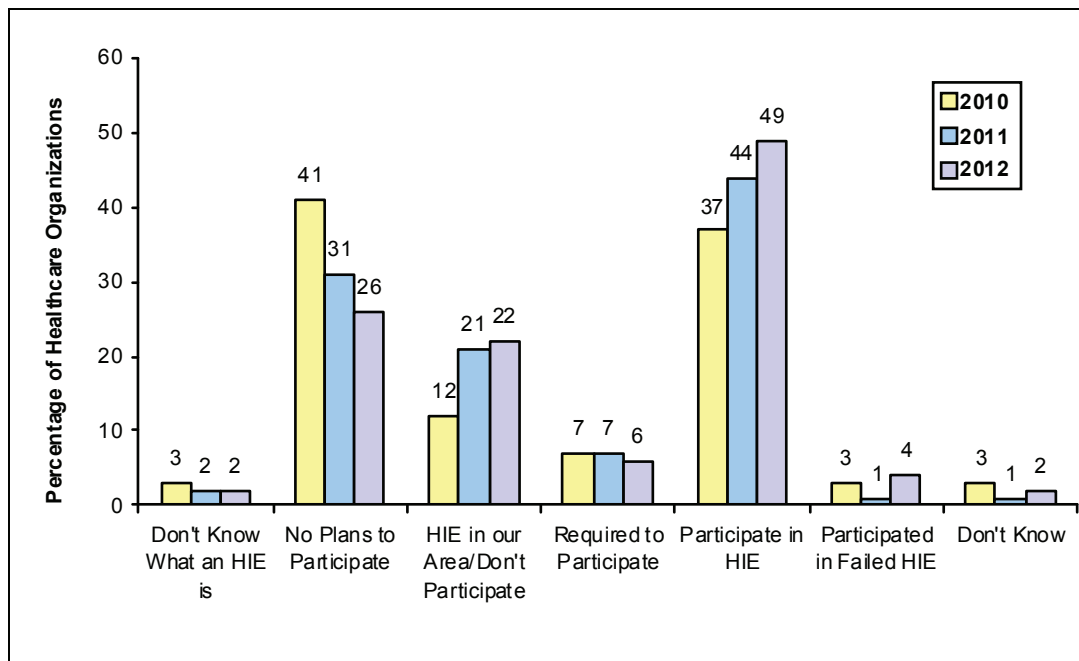
Source: 23nd Annual HIMSS Leadership Survey

Staffing Healthcare IT

A growing problem in implementing and continuing to expand IT in the healthcare environment is the lack of staffing resources. The demand for staff to support IT changes is expected to outpace the supply. In the recent HIMSS survey, 60% of health facilities were preparing to change the staff requirements for IT in the next 12 months. (HIMSS 2012 Data)

THE HEALTHCARE IT BUDGET

Although, information technology spending in the healthcare industry averages just 1-2 percent of the overall healthcare spending annually, this translates to billions of dollars considering that almost $2.8 trillion is spent on healthcare in the U.S. alone. With the increase in investment in IT healthcare, the spending on this sector is expected to grow at a faster pace than healthcare spending, as a whole, in the near future.

The overall market for healthcare IT in the U.S. is estimated at $36 billion for 2012 and is increasing at a rate of 6% annually and was estimated at $32 billion in 2010. Driving this growth is the overall growth in IT systems in healthcare environments and the demand for more wireless technologies. This has forced many facilities to adjust their IT budgets accordingly.

REGULATORY STRUCTURE AND ISSUES

Need for Regulation

With the growing use of advanced information technology—wireless technologies, remote operations, and a wider range of access—many organizations are exploring ways through which information technologies can improve efficiency, reduce costs, and improve overall patient outcomes. However, with the multiple advantages of using advanced information technologies in healthcare, a series of risks are also involved regarding data confidentiality and reliability. The growing use of these technologies also demands the need for an evolving regulatory environment.

Health Information Technology and American Investment and Recovery Act of 2009 (ARRA)

In February 2009, President Obama signed into law the ARRA. This $787 Act (stimulus package) is designed to provide funding in areas of the U.S. economy that need reform, reconstruction, financial aid, and increases in consumer/patient care. The Act promises a boost of $19 billion in funding over the following 5 years for healthcare information technology (HIT), Medicare, and Medicaid. Funding will be provided to physicians that achieve "meaningful use" of health technologies. This law also penalizes physicians who do not implement a health information system by reducing Medicare payouts starting in 2015.

The Act is expected to provide funding for the healthcare system both directly and indirectly over the next 5-10 years as health providers have the potential to redirect funding or receive loans to invest in more efficient healthcare systems including (hospital acquired infection (HAI) screening, electronic medical records (EMRs), and others.

REGULATORY BODIES AND SOCIETIES

United States Department of Health and Human Services

This department is the principal agency of the U.S. government and is established with a mission of protecting the health of all U.S. citizens and providing essential human services.[4]

Health Insurance Portability and Accountability Act (HIPAA)[5]

The health insurance portability and accountability act was enacted by the U.S. government in 1996. It is concerned with patient privacy and confidentiality. HIPAA requires healthcare institutions to take precautions in order to safeguard patient information from unauthorized access.

HIPAA is responsible for defining the offenses pertaining to the healthcare industry and defines penalties for violation of the same. The act is also responsible for creating numerous programs to curb fraud and wrong usage within the healthcare system. The most significant provisions of the act are pertaining to rules which lead to the simplification of the administration. Department of Health and Human Services (HHS) draft rules which can lead to the efficiency enhancement of the healthcare system through standards regulating the use and dissemination of healthcare information. These rules apply to a number of segments such as health plans, billing services and community health information systems, and healthcare providers that transmit healthcare data in a way that is regulated by HIPAA.

The HHS has formulated five rules regarding administrative simplification**,** such as the privacy rule, the transactions and code sets rule, the security rule, the unique identifiers rule, and the enforcement rule.

---

[4] Source: http://www.hhs.gov/about/whatwedo.html

[5] Source: http://en.wikipedia.org/wiki/HIPAA

- **The Privacy Rule –** It lays down standards and regulations for the use and disclosure of Protected Health Information (PHI). PHI is information on the health status etc., of an individual.

- **The Transactions and Code Sets Rule –** This rule define guidelines for all the transactions that take place in the industry especially electronically.

- **The Security Rule –** The rule identifies security standards for compliance in administrative, physical, and technical fields.

- **The Enforcement Rule –** This rule sets penalties for any violation of the rules and guidelines laid down by HIPAA.

The complexity of HIPAA has affected clinical care negatively. The staunch penalties for violators might lead to unnecessary information withholding by physicians and medical centers.

Health Level Seven

HL7 is an international community of the healthcare industry experts, which contact each other to create standards for the exchange, management, and integration of electronic healthcare information. HL7 includes members in over 55 countries worldwide.

The role of HL7 can be summarized as follows:[6]

- To develop coherent and extendible standards, which define healthcare information exchange

- To develop a robust methodology to support the creation of HL7 standards from the existing models

- To educate the healthcare industry, policy makers, and general public about the benefits and guidelines, etc., of healthcare information standards in general and HL7 standards

- To promote the adoption of HL7 standards by organizations worldwide through the formation of affiliate organizations

- To collaborate with other standards developing organizations in the healthcare and information infrastructure domains to promote the use of standards

---

[6] Source: http://www.hl7.org/

Federal Communication Commission

The Federal Communications Commission (FCC) is an independent government agency in the U.S. The FCC was established by the Communications Act of 1934, whose role is to regulate the communications happening via radio, television, satellite or cable. Some of the functions carried out by the commissions bureaus are the processing of license applications, complaint analysis and developing and implementing regulatory programs. The board related with wireless communications is Wireless Telecommunication Bureau.

Wireless Telecommunications Bureau

The Wireless Telecommunication Bureau (WTB) was formed to cater to the domestic wireless telecommunications programs and policies initiated by FCC. The policies do not include satellite communications. The wireless communications services taken care of by WTB include cellular telephone, paging services, personal communications services, and services related to public safety, etc.

WTB has specified eight goals, which are as follows:

- Develop a framework for analyzing market conditions for wireless services

- Foster competition among different services

- Promote universal service, public safety, and service to individuals with disabilities.

- Maximize efficient use of spectrum

- Minimize regulation where appropriate

- Facilitate innovative service and product offerings, particularly by small businesses and new entrants

- Enhance consumer outreach and protection; improve enforcement process

Healthcare Information and Management Systems Society[7]

The Healthcare Information and Management Systems Society (HIMSS) has a role in healthcare of managing technology and information, education and networking opportunities as well as publications. The society's members are kept abreast of the latest industry information and news, as well as legislative and policy issues. HIMSS has 570 corporate members and more

---

[7] Source: http://www.himss.org

than 50,000 individual members working in healthcare organizations worldwide. Members include healthcare professionals, HIT supplier organizations, healthcare consulting firms, and government institutions.

Health Industry Business Communications Council

The Health Industry Business Communications Council (HIBCC) is sponsored by the industry and is a fully supported non-profit organization. The council's primary function is to develop standards for information exchange between healthcare organizations in order to enable electronic communications. The council devises standards for a number of important areas such as, electronic data exchange, barcode labeling, numbering systems, and various databases.

Health Resources and Services Administration

The Health Resources and Services Administration (HRSA) is an agency of the U.S. Department of Health and Human Services (HHS). This administration is described by the HHS site as the primary Federal agency for improving access to health care services for people who are uninsured, isolated or medically vulnerable. The HRSA was created in 1982 to provide leadership and financial support to health care providers in every state and U.S. territory. HRSA focuses on the uninsured, people living with HIV/AIDS, pregnant women, mothers and children.

INDUSTRY INITIATIVES

There are industry initiatives within the U.S. healthcare industry and the various governing bodies related to information security standards and practices. This sector is complex and regulated with a number of competing and interested parties, thus, some initiatives may overlap. Furthermore, there are standards related to wireless technologies that may conflict in relation to geographic borders.

- **The Workgroup for Electronic Data Interchange (WEDI) –** It focuses on improving healthcare through electronic commerce. WEDI has published best practices documents for healthcare security issues, most specifically related to general security policies and electronic data interchange.

- **The American Society for Testing and Materials Committee on Healthcare Informatics** – It develops standards related to the architecture, content, storage, security, confidentiality, functionality, and communication of healthcare information, including proposed standards for certificate profiles specific to healthcare.

- **The Internet Engineering Task Force –** It is concerned with the evolution of Internet architecture, and has developed several security standards, including the X.509v3 standard for digital certificates and several other base technology standards for the Public Key Infrastructure (PKI) and information security industry.

- **Common Criteria Community –** Appreciable work has been done with regard to healthcare standards and practices, especially by the Forum for Privacy and Security in Healthcare, which is a part of the Common Criteria Community.

NEW STORAGE REQUIREMENTS

Storage components, servers and the other infrastructure of a typical data center can be costly to launch and maintain. They can require significant power and cause pollution which is an issue presented by the growth of the internet and other data center use.

The increasing use of EMRs and other digital health data requires a digital storage capacity increase. The size requirements of higher resolution images, for example, is increasing the need for extra hard drive capacity, and backup storage. Some IT systems make use of faster disk drive technologies like solid state drive (SSD) which are more expensive than traditional hard disk drives (HDDs) but have better access times, durability and usually, read/write speeds. The average SSD requires less power to operate as well. Server-based HDDs typically feature faster read/write times than home HDD systems and are more cost-effective than a SSD system.

By consolidating client-based data centers to shared cloud-based centers with newer, more efficient computer technologies, companies hope to reduce the power draw and pollution from data centers. However the need for data storage still remains.

The average home user in 2013 will buy personal computers with around one to two terabytes of HDD storage capacity and may purchase external drives for backup storage or extra boot speed. The typical business user will require a significantly larger amount of storage capacity. Leading companies that make hard disk drives include Seagate, Western Digital and Toshiba.

One terabyte or TB of information is around 1,000 gigabytes or one trillion bytes. A byte is often used to describe the smallest unit of memory or about one character of computer text.

A large resolution image, if not compressed or resized, can require several megabytes of storage space. When adding hundreds or thousands of high-definition images and complimentary text, the storage requirements increase significantly.

Technology hardware providers and hosted cloud systems often refer to storage capacities in petabytes, one measurement step higher than terabytes. One step up in computer data storage terminology is generally a very large increase of about 1,000 times the previous step.

Table 3-6

Digital Storage Capacity Comparison

Unit	Capacity (bytes)
Megabyte MB	1,000,000
Gigabyte GB	1,000,000,000
Terabyte TB	1,000,000,000,000
Petabyte PB	1,000,000,000,000,000

Source: Kalorama Information

Figure 3-11

Digital Storage Capacity Comparison (in Gigabytes)
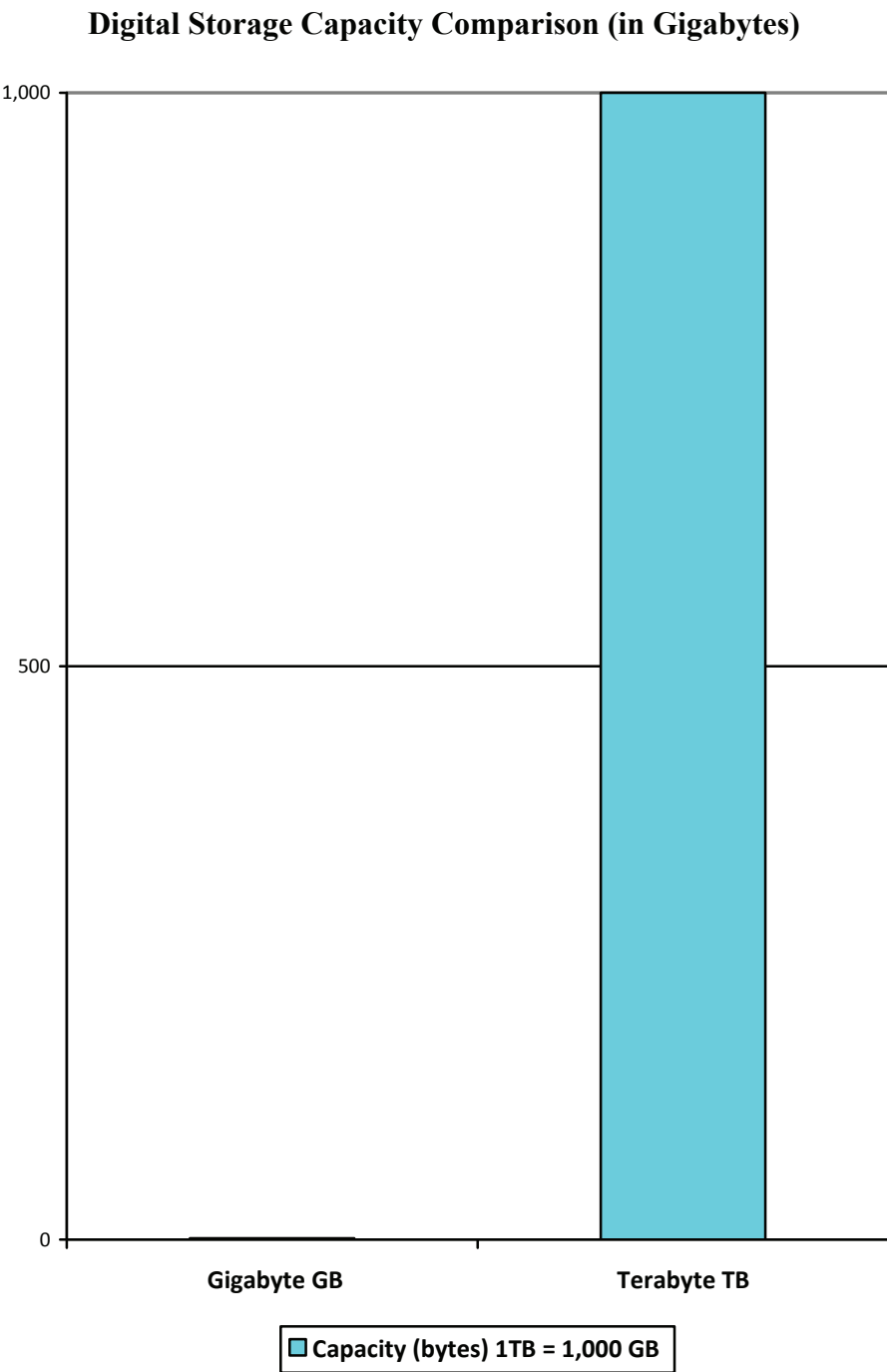
Source: Kalorama Information

GLOBAL TRENDS IN TECHNOLOGY ADOPTION

On a global scale, the adoption of mobile technologies and the Internet have increased immensely. This can provide an indication of the growing trend in technology for healthcare in the coming years. Cellular telephone subscribers have more than doubled since 2005 with 2.2 billion reportedly under a mobile cellular subscription, growing to more than 5.3 billion in 2010.[8] Additionally, the number of Internet users has also doubled between 2005 and 2010 with up to 65% of inhabitants in the developed world now using the Internet. Advancing technologies, becoming more tech savvy and greater adoption of wireless personal use devices will likely contribute to the adoption and acceptance of mobile technologies in the future, likely fueling the growing of these technologies in the health field.

United States

The United States represents one of the highest proportions of population to cellular phone and Internet users worldwide with roughly 95% and 80%, respectively. In many survey's and reports data reveals that the number of phones in use outnumber the population—citing that many people in the U.S. own two or more phones (one for personal, one for business).

Developed Europe

The European cellular device market is mature in relation to many other regions. The growth in phone subscribers to population has increased at a steady pace, in contrast to the higher growth in developing regions. We can anticipate the market to remain steady in Europe with growth in new technologies fueling the market. The use of mobile devices in everyday activities—from personal to business—will be significant drivers. Many consumers and business professionals have begun to expect the on-the-go services these technologies can provide and expanding the capabilities of products and services will be key to expanding the market in Europe.

---

[8] U.S. Census Bureau, Statistical Abstract of the United States: 2012 International Statistics

Similar to the United States, the number of cellular phones in use in many countries outnumber the population, suggesting multiple phones for one user—personal and business usage.

Brazil

Brazil has recently grabbed the attention of many cellular and mobile device suppliers, displaying rapid increases in cellular subscriptions. Users in South American countries have adopted cellular phones to do daily activities such as shopping, social networking, and information searches. The increasing number of users in Brazil and other South American countries provides a growing opportunity for using mobile devices to manage and record health events.

China and India

The vast population of China and India allow for an increasing opportunity in the mobile device and Internet markets. The Asia-Pacific region as a whole is showing increasing growth of mobile devices, with high rates experienced in select countries. China has seen the one of the highest increases in cellular subscribers over the past 10 years. In 2000 there were approximately 67/1,000 subscribers to population in 2010 this reached 700/1,000. Likewise, in India, there were 4/1,000 subscribers in 2000, growing to 440/1,000 by 2010. There are also large increases in Singapore, Taiwan, South Korea, and Australia.

Japan

Japan is an established market for cellular phone services and Internet. In 2000, the rate of cellular phone users was reported at 526/1,000 population, growing to 915/1,000 by 2010. Usage is similar to that of the United States and other developed markets.

Figure 3-12

Technology Adoption by Country
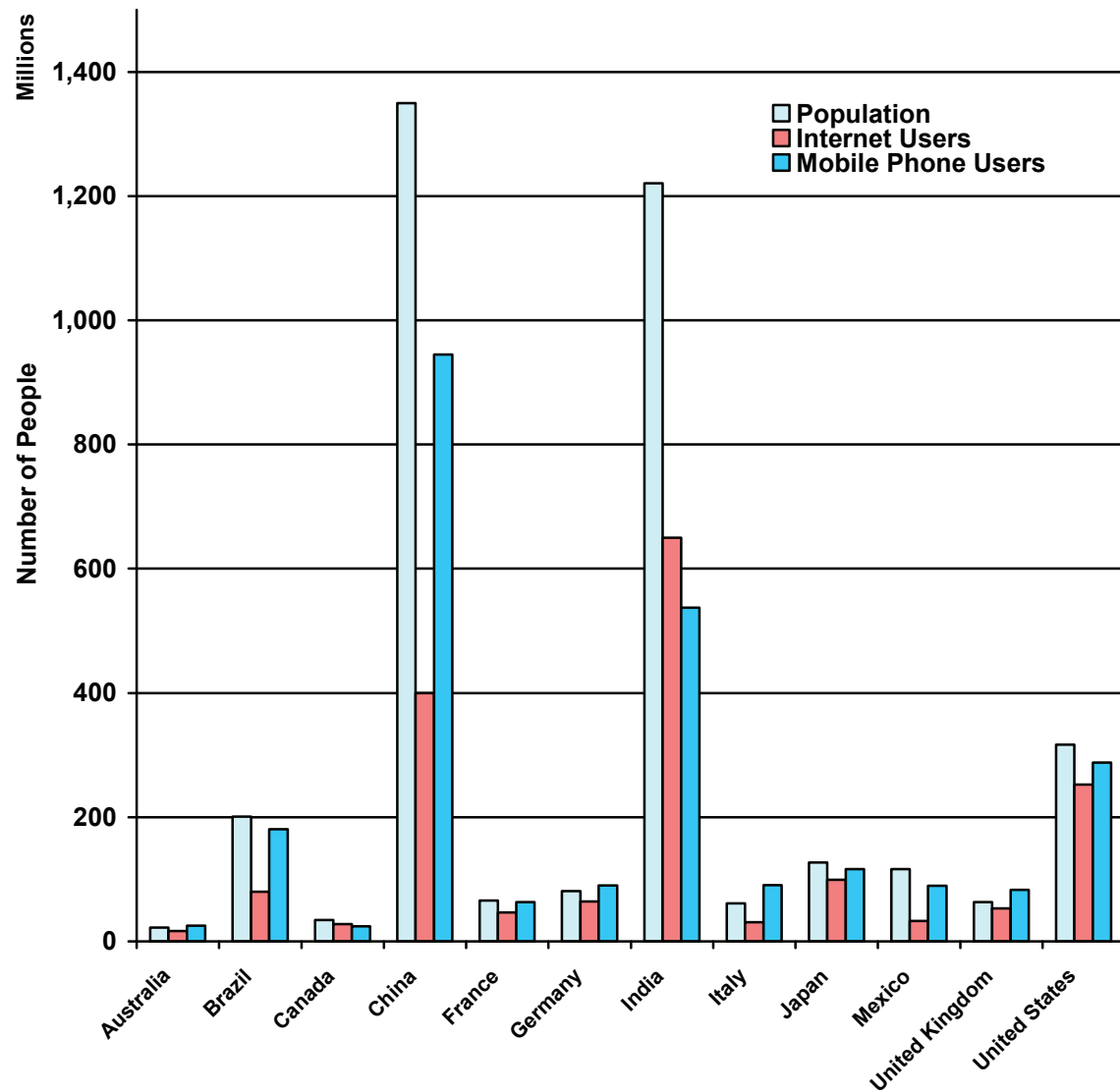
Source: Organization for Economic Cooperation and Development; CIA; Kalorama Information

Case Studies

OVERVIEW

Case studies, are frequently reported by the companies that deliver products in HIT. These are generally short descriptions of a specific product deployment and the benefits of the technology as described by the product manufacturer and the healthcare providers.

Allscripts Professional EHR Healthcare Provider Solutions

Allscripts is a leading healthcare information technology provider that has delivered services to more than 180,000 physicians, 1,500 hospitals and 10,000 post-acute care organizations. It offers both on-site and SaaS models for health providers.

A family healthcare practice, Oliver Family Healthcare, located in Indianapolis, IN has chosen to use several Allscripts solutions including their proprietary Professional EHR system and reported some of the benefits through an Allscripts case study.

The Professional EHR system from Allscripts is an upgraded model from the Allscripts MyWay system. There are various practice management, billing, and patient records systems offered by Allscripts and users may implement one or more of these solutions like Oliver Family Healthcare.

Oliver Family Healthcare chose to implement Allscripts Practice management (PM) and Professional EHR. It also chose the Assure Disaster Recovery system for online offsite backup which is a HIPAA-compliant recovery model. Oliver Healthcare reported savings of up to

$158,000 per year based on cutting two positions, eliminating records systems and transcriptions costs.

The family practice wanted to launch the system after 10 days, and they met that goal. Staff fully learned the system after 30 days including working with Allscripts on customization of the software.

Table 4-1

Oliver Family Healthcare's Savings with Allscripts Systems

Technology	Savings with Digital System
Electronic records system	Reduction in staffing of 2 positions for savings of $60,000 per year.
Reduction in supplies	Previously spent around $3 per medical record. The new system saves approximately $27,000 per year.
Using pre-defined templates for medical visit information	Estimated annual savings by not using a transcriptionist - $39,000
ePrescribing	Prescriptions are sent to pharmacies electronically instead of by fax. Re-fill requests are sent to health provider electronically from the pharmacy resulting in faster prescription management.
Billing through EHR system	The medical provider has reported a 25% growth in profits for four years after implementing a system based in part on the improved billing of patient care visits.
Data management	Physicians reported a benefit in compiling records, a process that used to take hours and several personnel. The process now takes the office a few seconds.
Assure disaster recovery	Off-site backup of information
Patient marketing	Marketing efforts are targeted by using compiled data reports of patient zip codes

Source: Allscripts

Oliver Family Health also reported intangible benefits in improved care and better employee retention. They had one employee leave in 4.5 years due in part to increased employee benefits such as 100% 401(k) matching, dental, vision, and 80% employee medical coverage.

Bambino Gesù Pediatric Hospital and Microsoft Cloud Services

Bambino Gesù Hospital, located in Italy, was founded in 1869. It is one of the largest pediatric research and treatment centers with 880 beds, 1 million outpatients, 37,000 inpatients and 55,000 emergency cases annually.

The hospital chose to implement a new improved IT system due in part to limitations in previous technology such as with file size limitations for e-mail attachments. It chose to deliver communication and collaboration services to employees with a third-party hosted data center and internet based cloud access tools. They chose the Microsoft Business Productivity Online Standard Suite which is purchased on a per-user scale. The hospital IT department reported a savings of 60% compared to the previous solution. The benefits of the system included:

- improved patient care, and better patient/doctor communication
- a savings of 100 hours a month of work on e-mail maintenance

Cloud Services for an E-Health Provider

An e-health provider, Stat Health Services, chose to move its online services from a physical program to the cloud using Microsoft Windows Azure. Stat Health was launched in 2009, started the development of a cloud system in August 2011 and went live seeing new patients with the cloud system in March 2012. The physical server system didn't offer the scalability and cost-effectiveness of the cloud system.

Stat Health is a web-based health network that connects patients with physicians remotely. It has 800 networked board certified emergency doctors and 12 employees. The company is based in Scottsdale, Arizona, but it serves patients 24/7 and in all areas of the U.S. The physicians 'see' patients for minor medical conditions through video and audio teleconferencing technology. The patients receive prescriptions through an e-prescribing system and have an electronic health record.

Stat Health is focusing on delivering health services for both individual accounts and employers. Employers can offer competitive packages for minor care but patients are referred to a local facility for treatment when necessary. The system can connect rural patients with physicians without asking them to drive to a facility, and connect traveling or vacationing patients while they are away from home.

The Windows Azure system offers a HIPAA Business Associate Agreement (BAA) to help its users comply with both HIPAA and HITECH.

Through the cloud-based system Stat Health saved a $170,000 investment in physical networking expenditures, and $3,000 per month in video conferencing charges. One of the business customers of Stat Health reported a savings of $115,000 per year in reduced healthcare costs.

The benefits of scalability were important as well. The company reported that it added 4,000 new companies to its system in two days without the demands of adding or upgrading the physical sever or server environment.

CareCloud Corporation

CareCloud Corporation offers a variety of solutions to healthcare practices and medical billing companies. Company products include a cloud-based EMR system, a complete medical practice management system, revenue management, and a social network solution for connecting caregivers with patients.

One of the health practices that chose CareCloud's electronic records solution reported that the practice experienced an increase in revenues of 11% in billings and 6% in cash flow after six months of use. It also received its first meaningful use payment.

Another healthcare practice, South Florida Medicine, chose a web-based practice management and revenue cycle solution from CareCloud. The practice was expanding into new specialties and was operating out of several locations which was creating added complexity. The group has 7 locations, 30 physicians, 50 staff and 139,000 patients.

The manager of the transition to a cloud system reported that a significant benefit for them was the reduced cost and challenges with a client-based server solution. The group was able to concentrate on training staff to use the new system instead of focus or wait on the IT process. Training time was estimated at about one week.

Administrators also reported how pleased they were to easily produce complex practice reports based on the analytics features of the new system.

St. Francis Health-Moorseville Surgery

St. Francis Health–Mooresville Surgery Center wanted to find a solution to an expensive billing system that they didn't have the room or the IT manpower to support. The estimated costs

of launching an in-house billing system totaled over $100,000 for the first three years. The center specializes in general surgery, gynecology, urology, orthopedic surgery, ophthalmology, podiatry, otolaryngology, plastic and reconstructive surgery, colorectal care, and pain management.

After finding the billing software, AdvantX, the surgery center chose to partner with a company called Solutions Healthcare Management. The advice of Solutions Healthcare led the two groups to use an offsite private cloud architecture operating on VMware's vSphere solution with processing hardware from IBM and SuperMicro. Storage was handled by Dell Compellent storage systems.

After the companies selected the options they wanted, the process took Solutions Healthcare a few days to setup. This was another advantage over traditional in-house servers. The new system was offered by Solutions Healthcare at a flat rate, another benefit from the surgery center's viewpoint. This allows the center to know exactly what it needs to budget for its billing resource.

Because security is a concern for healthcare institutions, the Mooresville Surgery Center chose a provider that supported HIPAA requirements. Additionally, the virtualization solutions integrated with the vSphere platform allow the system to allocate additional computing resources to intensive security applications that may not be possible with a traditional system.

As a result of the move to a virtual cloud platform, the surgery center reported a reduction in its administrative costs from 5% of collected dollars to 3%. The infrastructure costs are 35% less than with an in-house installed server. The center's revenues are approximately $4.6 million annually.

EHR Pathway and Connectria

A healthcare consulting company, EHR Pathway, is also a provider of healthcare related software systems delivered under a SaaS model. The company is serving office-based physicians who are often in rural areas or find it difficult to make the transition to a digital system like electronic records. The company was started in 2010 and launched its first software, BizMed Toolbox in 2012.

EHR Pathway is collaborating with another provider, Connectria, for the hosting of its software. The BizMed Toolbox is being updated consistently as the company develops new

software. Its offering the software applications for free, but it does not house patient data in the application and is not HIPAA compliant but has its sights set on this for the future.

Beth Israel Deaconess Medical Center

Beth Israel Deaconess Physician Organization (BIDPO), and Beth Israel Deaconess Medical Center (BIDMC) entered an agreement to provide a cost-effective, secure, and robust electronic health record (EHR) system to its independent physicians in order to more accurately measure and report its healthcare services. By doing this the groups are able to increase their rates from medical insurers.

The medical center has 450 primary care physicians, 1,300 specialists, and support staff. Its member practices are scattered across 248 locations however and this was part of the difficulty in implementing a solution. The technical director of the project wanted to provide a centrally-located system that served all the members instead of using client servers. The solution was to use a SaaS system provided from a central server allowing access via the internet. This meant the IT support could also be centralized and security could be managed like a private server.

VMware's software was chosen for the virtualization aspect of the solution and was launched with VMware Infrastructure 3 Enterprise, vSphere, VMware ESX, vSphere Distributed Resource Scheduler, vSphere High Availability, vMotion, and VirtualCenter.

TrendMicro was chosen as a security system for the new solution which provided security on both endpoints and the virtualized servers. The technology platform is based on Hewlett Packard servers, Cisco and Array Networks, and EMC storage systems.

Another partner, Acadia Technology, was chosen to provide an off-site scalable IT infrastructure to connect the entire health community. Acadia manages the IT environment and provides a help desk for physicians. Data recovery is provided via two geographic locations that collect synchronized data.

After the initial setup of services for 300 physicians, BIDPO reported that it has implemented solutions for approximately 2,000 members. The cloud/virtualization model allows the group to expand the system without some of the difficulties of a client-server system.

System Providers

OVERVIEW

The companies in the market for cloud computing in healthcare can offer several types of solutions, or a combination of solutions. Most of the bigger players have a wide geographical presence and have offices located around the world. The companies enter into contractual relationships and strategic alliances with resellers and distributors through which they broaden their distribution network as well as cater to industries which are not served by the direct sales force.

Large providers like Cisco Systems, provide solutions for a range of customers with a product line to suit numerous industries. For example, in wireless networking, companies may serve the healthcare markets but will also have solutions for energy, aviation, education, energy, media, home entertainment, and more.

Company profiles include companies with a primary focus on cloud services directed at the healthcare industry and/or are a major technology provider and collaborate with smaller healthcare focused companies to provide a complete solution. These include:
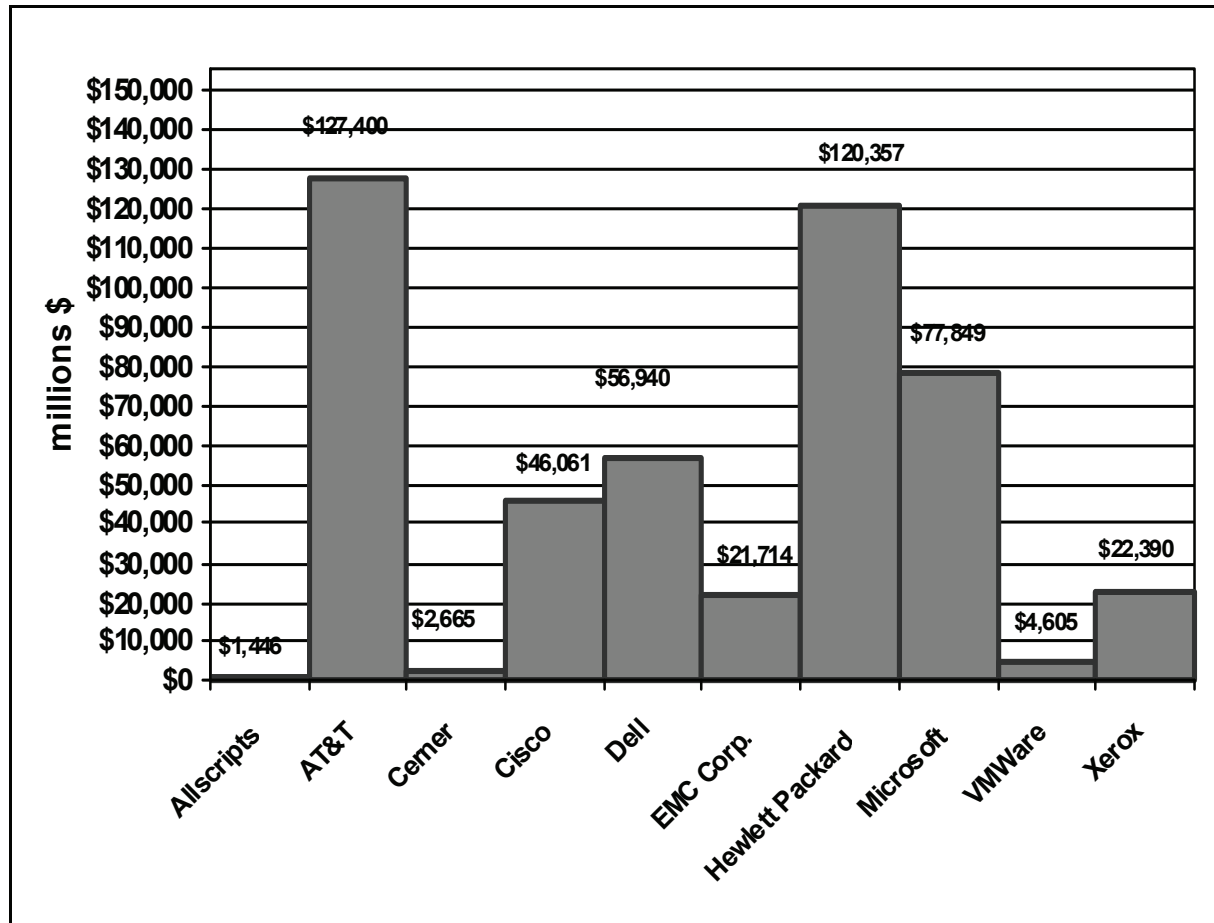
- Allscripts
- AT&T
- Cerner
- Cisco Systems

- Dell, Inc.

- EMC Corporation

- Hewlett Packard

- Microsoft

- VMware

- Xerox

A comparison of total sales is provided in the following figure.

Figure 5-1

Company Comparison, 2012 Revenues*

($millions)

*Fiscal year end may vary by company.

Source: Company Websites

MERGERS, ACQUISITIONS AND ALLIANCES IN THE TECHNOLOGY SECTOR

Some of the largest mergers and acquisitions in recent years have involved technology and telecommunications companies. As an example, a deal worth more than $202 billion the acquisition of German telephone and internet company Mannesmann Arcor was completed in 1999 by Vodafone Group, a British-based telecommunications company offering services worldwide.

The mergers and acquisitions landscape in the technology sector has continued to produce some of the largest deals in history.

- Vodafone Group purchased Mannesmann Arcor in 1999 (valued at $202 billion)

- Sprint Corp. and MCI WorldCom merged in 1999 (valued at $129 billion)

- AT&T purchased BellSouth Corporation in 2006 (valued at $86 billion)

- SBC Communications purchased Ameritech Corp. in 1999 (valued at $63 billion)

- Vodafone Group purchased AirTouch Communications in 1999 (valued at $60 billion)

- Bell Atlantic purchased GTE in 2000 (valued at $53 billion) forming Verizon Wireless

- Qwest Communications purchased US West in 1999 (valued at $48 billion)

- WorldCom merged with MCI Communications in 1997 (valued at $37 billion)

- Deutsche Telekom purchased VoiceStream Wireless in 2001 (valued at $35 billion)

- Deutsche Telekom purchased Powertel, Inc. in 2001 (valued at $24 billion)

- MetroPCS Communications merged with T-Mobile USA in 2012 (valued at $24 billion)

- SBC Communications purchased AT&T in 2005 (valued at $16 billion) operating now under the AT&T name.

- Google purchased Motorola Mobility in 2011 (valued at $13 billion)

- Microsoft Corp. purchased Skype Communications in 2011 (valued at $9 billion)

SIGNIFICANT ACTIVITIES IN HEALTHCARE IT/CLOUD BY COMPANY

Allscripts

Allscripts has maintained its focus on providing high quality, technologically advanced solutions through both internal development and strategic acquisitions. The company recently acquired the company Jardogs, a leading provider of patient engagement and healthcare management solutions, including cloud-based technologies.

In 2010, Allscripts merged with another healthcare technology company, Eclipsys. The merging of complimentary products in healthcare IT was completed to provide more complete solutions for healthcare providers looking to meet new government mandates, improve care, and reduce costs.

Allscripts-Misys Healthcare Solutions business is selling its Medication Services to A-S Medication Solutions. Allscripts had completed the acquisition of Misys plc several years prior (2008).

AT&T

AT&T hit the health segment running with its alliance with Acuo Technologies in February 2009. Acuo Technologies is an established provider of archiving and data migration solutions for the health industry. The joint offering of Acuo and AT&T provides a solution of cloud-based and telehealth products and services for the health industry, focusing

Quest Diagnostics and AT&T Healthcare are working together to provide the Quest Care360 platform including the Care360 EHR using AT&T's cloud-based Healthcare Community Online. The AT&T community combines tools for health information exchange between payers, providers, patients, and physicians. The Quest Care360 platform was being used by around 310,000 physicians as of June 2013.

Dell

Dell has been focusing on end-to-end technology solutions including enterprise cloud solutions and has lost some ground in the consumer computer technology department. In 2013,

Dell announced the acquisition of Enstratius, an enterprise cloud-management software and services provider. Dell has also acquired Wyse Technology, Quest Software, and SonicWALL.

In 2013, Dell announced its own merger agreement by Denali Holding Inc., a corporation owned by Michael Dell, Chairman, CEO and founder of Dell.

EMC Corp.

In 2012, EMC acquired Syncplicity, a private company focused on a cloud-based file sync and share which was completed to improve EMC's vertical-specific content management solutions. Syncplicitiy's solutions are enterprise-based.

IBM

To enhance IBM's position in the cloud segment, the company has completed a number of acquisitions in the area. The most recent activity includes the acquisition of SoftLayer Technologies, Inc., a dedicated server, managed hosting and cloud computing provider.

Another recent example is the acquisition of Kenexa Corporation in December 2012 for $1.4 million. Kenexa is a provider of cloud-based technology consulting and solutions to critical business segments.

Examples of various relevant acquisitions by year include:

2012

- Kenexa Corporation — a leading provider of recruiting and talent management solutions, brings a unique combination of cloud-based technology and consulting services

- Emptoris, Inc. — a developer and provider of strategic supply and contract management software

2011

- Q1 Labs — a provider of security intelligence software and accelerates efforts to help clients more intelligently secure their enterprises by applying analytics to correlate

information from key security domains and creating security dashboards for their organizations.

2010

- Initiate Systems, Inc. — a market leader in data integrity software for information sharing among healthcare and government organizations.

- Cast Iron Systems — a leading Software as a Service (SaaS) and cloud application integration provider, enhances the WebSphere business integration portfolio.

- BigFix, Inc. — a leading provider of high-performance enterprise systems and security management solutions that revolutionizes the way IT organizations manage and secure their computing infrastructure.

- Coremetrics — a leader in Web analytics software, expanded the company's business analytics capabilities by enabling organizations to use cloud computing services to develop faster, more targeted marketing campaigns.

- Datacap strengthens the company's ability to help organizations digitize, manage and automate their information asset

VCE Corp.

VCE Company is a joint venture company formed in 2010 under an agreement with EMC Corporation, VMware, Inc., and Intel Corporation. The focus of VCE is in cloud technologies utilizing platforms from Cisco, EMC and VMware.

VMware

Outside of its VCE joint venture, VMware acquired Nicira, a network virtualization company that focuses on heterogeneous environments.

WebPT

WebPT is a provider of cloud-based EMR and practice management solutions for physical therapists. In 2012 the company acquired Health Data Solutions, Inc., a company that specializes in related billing and revenue cycle management solutions for physical therapists and chiropractors. WebPT was also listed as one of the fastest-growing companies and has earned several awards including:

- Innovator of the Year – Start-Up Company Award from the Arizona Technology Council in 2010

- Silver Stevie Award Winner – Most Innovative Tech Company of the Year in 2012

- EHR Game Changer title from HealthData Management in 2012 for President Brad Jannenga

Xerox

In 2012, Xerox acquired Wireless Data Services a technical support and consultancy firm that uses a proprietary cloud-based platform called GlobalMine. Xerox also recently acquired The Breakaway Group which is an EMR solutions company and a cloud-based service provider.

ALLSCRIPTS HEALTHCARE SOLUTIONS, INC.

Company Overview

Allscripts provides clinical software, services, connectivity solutions and information for physicians and other healthcare providers. It has two major business segments, clinical solutions and health solutions. The main focus of Allscripts involves information technology and the more efficient practice of delivering care through the use of these technologies.

The company's clinical solutions business offers patient records solutions using tablet PCs, wireless handheld devices or desktop workstations. These systems are used to benefit physician workflow, and can automate typical daily tasks such as prescribing, ordering lab tests, viewing results, and dictating.

Allscripts completed the merger with Eclipsys Corporation in August 2010 and changed its fiscal year end from May 31 to December. Eclipsys provided integrated clinical, revenue cycle and performance management software, and other services for healthcare.

Table 5-1

Corporate Details of Allscripts

Company Details	Description
Company Type	Public
Company Address	222 Merchandise Mart Plaza
	Suite 2024
	Chicago, IL 60654
Phone	312-506-1200
URL	www.allscripts.com
Employees	5,500
Fiscal Year End	December

Source: Company Website

Performance Review

Allscripts reported sales of approximately $1.4 billion in 2011 and 2012. Company sales increased in 2009 and quickly grew again in 2010 and 2011. Allscripts completed two significant mergers/acquisitions leading to business changes in those periods. The Eclipsys acquisition was completed in 2010 and the Misys plc merger in 2008.

Figure 5-2

Allscripts' Sales, 2009-2012

($millions)
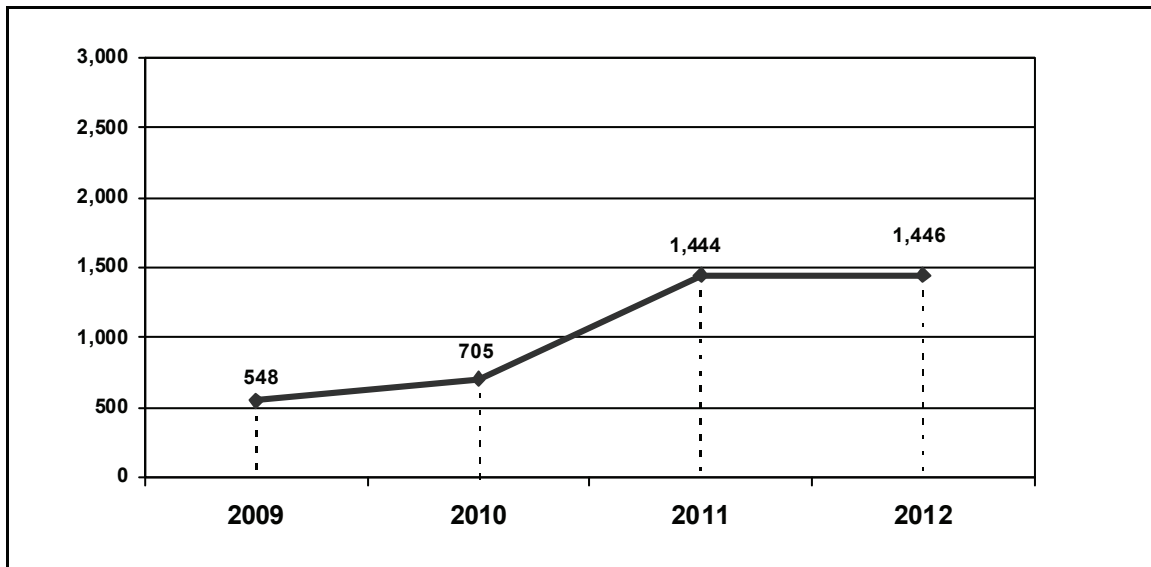
Source: Company Website

Figure 5-3

Break-up of Sales by Region, 2012

(in percent)

Source: Company Website

Product Portfolio

Allscripts offers integrated EMR and practice management solutions to physicians via traditional on-premise delivery or through SaaS. Hospitals and health system have Allscripts Sunrise Enterprise solutions available to them with a full acute care EMR system that the company has integrated with administrative solutions and revenue management. The SaaS delivery model is designed to allow healthcare providers to focus more on healthcare and less on the management of IT systems.

Mobile solutions take advantage of a wide range of mobile devices including iPad, iPhone, BlackBerry, Android and Windows Mobile. Leading company products include:

- Professional EHR - Electronic records solutions for both enterprise and private practice physicians

- Practice management (PM) - Allscripts PM is a full practice management solution for front and back office, collections, and reporting.

- Revenue cycle management (RCM) - RCM is a medical practice solution for driving better business including increasing income and improving solutions.

- ePrescribing - The Allscripts ePrescribing system allows care providers to manage the writing of prescriptions electronically. It features web-based access, the option to ePrescribe via smartphone or mobile device, import information from Allscripts PM, drug reference library, and prescription printing.

- Patient Portal and Patient Kiosk, patient access technologies - Allscripts Patient Portal and Patient Kiosk are two options for improving the system of patient/provider interaction. The kiosk system offers providers a freestanding appointment check-in, patient information update center, and self-service payment processing. Patient Portal is a method for patients to interact with physicians or staff through a web-based portal.

- Allscripts Document Management - The Document Management solution features the ability to manage patient documents such as patient records and charts. Approximately 18,000 health professionals use this service in the U.S.

- Medication Services Business - Allscripts-Misys Healthcare Solutions is in the process of selling its Medication Services segment to A-S Medication Solutions but Allscripts will continue to sell the solutions through a co-marketing agreement.

AT&T, Inc.

Company Overview

AT&T is a technology company with a leading focus on mobile communications, devices, and global networks It is a dominant player in the global telecommunications industry with a mobile wireless system that allows customers to make calls in 225 countries. It also operates 32,000 AT&T Wi-Fi Hot Spots which are located in public areas like hotels and retail outlets.

AT&T delivers services to enterprise customers, government organizations, and is expanding to small- and medium-sized businesses. It sells wired and wireless communication services including voice, voice over internet protocol (VoIP) and data. The company launched a new program called Project VIP in November 2012. Part of this plan involves increasing the capabilities of AT&T's communications platforms for future revenues in cloud computing, strategic network services, security, and wireless systems.

Table 5-2

Corporate Details of AT&T

| Company Details	Description
Company Type	Public
Company Address	AT&T, Inc.
	208 South Akard St.
	Dallas, TX 75202
Phone	210-821-4105
URL	www.att.com
Employees	242,000
Fiscal Year End	September

Source: Company Website

Performance Review

AT&T reported sales revenues of over $127 billion in 2012 an increase of less than 1% over 2011 sales. Between 2009 and 2012, company sales have exceeded $122 billion per year.

Figure 5-4

AT&T's Sales, 2009-2012
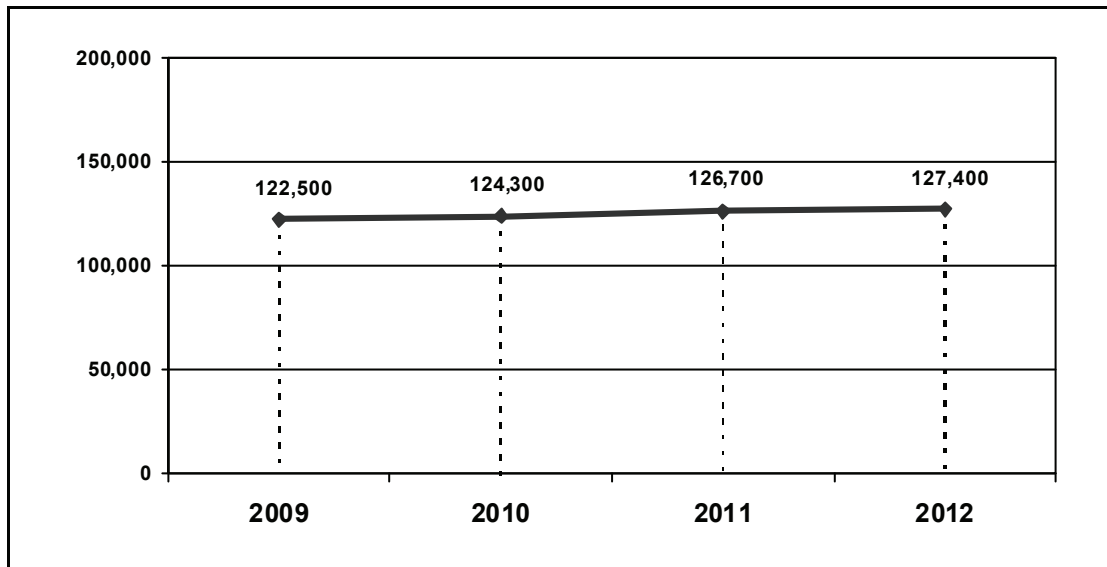
($millions)

Source: Company Website

AT&T is focused on expanding its service reach and the speed of its networks including a push to 4G LTE services. It expects to offer the wireless 4G long-term evolution (LTE) services to 250 million people by the end of 2013 and 300 million by 2014. The wireless connection methods such as 4G and 4G LTE are faster ways of connecting mobile devices to cloud-based systems such as SaaS. AT&T also offers up to 99.99% network availability, enterprise security at centers, and advanced data-in-transit security.

Figure 5-5

Break-up of Sales by Segment, 2012

(in percent)
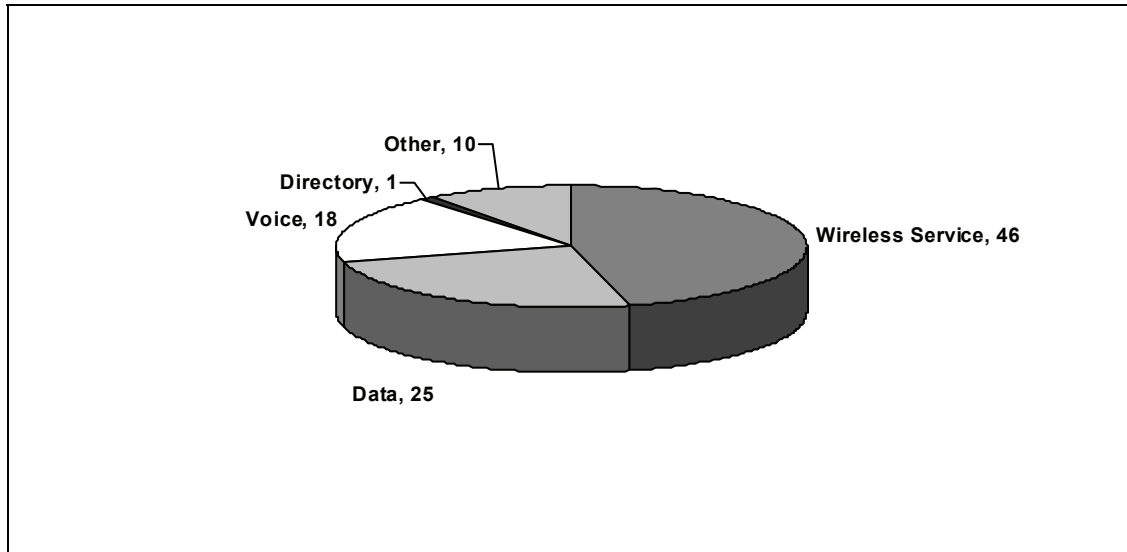
Source: Company Website

Product Portfolio

- Wireless - wireless connectivity solutions are available for consumers and business. Service plans are available on a post-paid or pre-paid schedule.

    o Equipment - includes products for mobile communication including handsets, tablet, notebooks, and PC data cards.

- Wireline - wired data and voice connectivity services for retail and wholesale communications contracts. Accounted for 47% of 2012 operating revenues.

    o Data - a sub segment of the wireline business segment of AT&T. This includes on demand data storage and computing capabilities available from different devices (cloud solutions). Cloud-based solutions include cloud

computing, storage, PaaS, virtual desktop services, network enablement, and SaaS enablement for software vendors.

- Other - revenues in the Other business segment include corporate and other operations and impacts from corporate-wide decisions.

CERNER CORPORATION

Company Overview

The company was originally known as PGI. PGI signed its first venture capital deal with First Chicago Capital in 1983, which was followed by a change in its name to Cerner Corporation in 1984.

Cerner is a leading healthcare IT solution provider and it specializes in clinical and management information solutions. The company is involved with designing, developing, installing, and supporting patient-focused clinical and management information systems, and services, such as EMRs. The solutions offered by the company enable healthcare providers to improve their operating effectiveness and the overall quality of care as well as reduce costs, medical errors, and variances as measured by clinical outcomes.

The company also sells device integration solutions for asset tracking, medication dispensing, mobile vitals collection, smart pump infusion, patient interaction, facility design services.

There are approximately 11,900 employees with Cerner, an increase of 45% over the past 3 years.

Table 5-3

Corporate Details of Cerner Corporation

Company Details	Description
Company Type	Public
Company Address	2800 Rockcreek Parkway, North Kansas City, MO 64117
Phone	816-221-1024
URL	www.cerner.com
Employees	11,900
Fiscal Year End	December

Source: Company Website

Performance Review

Company sales are segmented into international and domestic, and by business category:

- Services (41%)

- Systems sales (34%)

- Support and maintenance (23%)

- Reimbursement for travel (2%)

In 2012, revenues exceeding $2.6 billion, with an increase of 21% over 2011. Products and services are offered globally, however, approximately 88% of sales are from domestic buyers. The 2012 increase in revenue was attributed to improved economic conditions, ongoing demand related to the HITECH Act, Cerner ITWorks and Cerner RevWorks. Non-domestic global revenues increase by 5% in 2012 due largely to technology resale, managed services and support.

Figure 5-6

Cerner's Sales, 2009-2012

($millions)
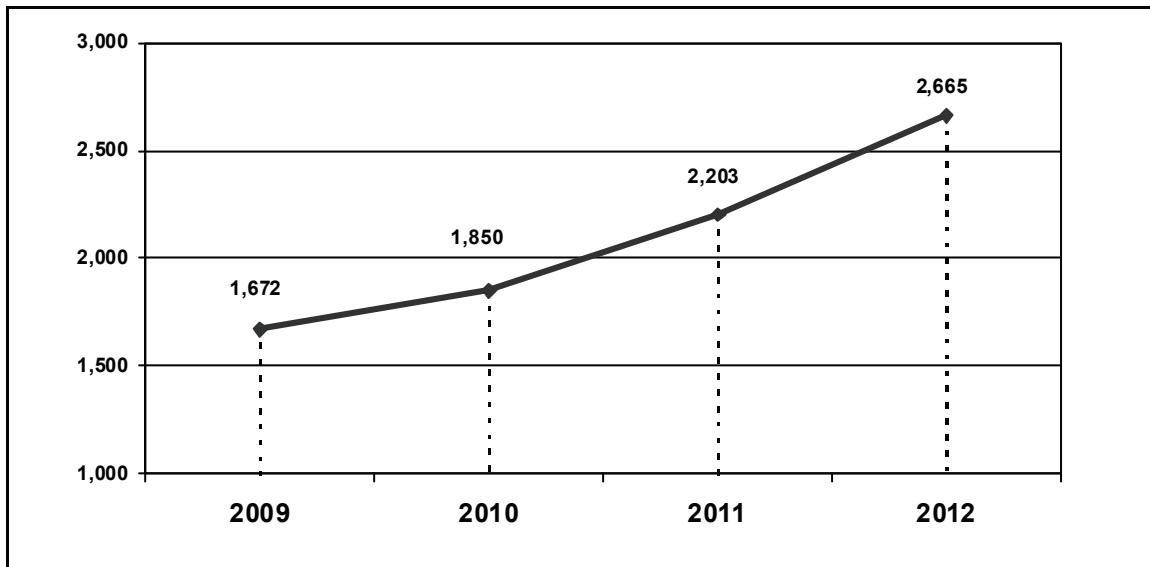
Source: Company Website

The ongoing strategy of Cerner is to reach new buyers that are seeking to modernize their facilities in response to new healthcare industry mandates, and an outcomes-based reimbursement model. It believes that the proper implementation of quality HIT products and services will improve the level of care and provide better revenues for healthcare institutions.

Figure 5-7

Break-up of Sales by Type, 2012

(in percent)
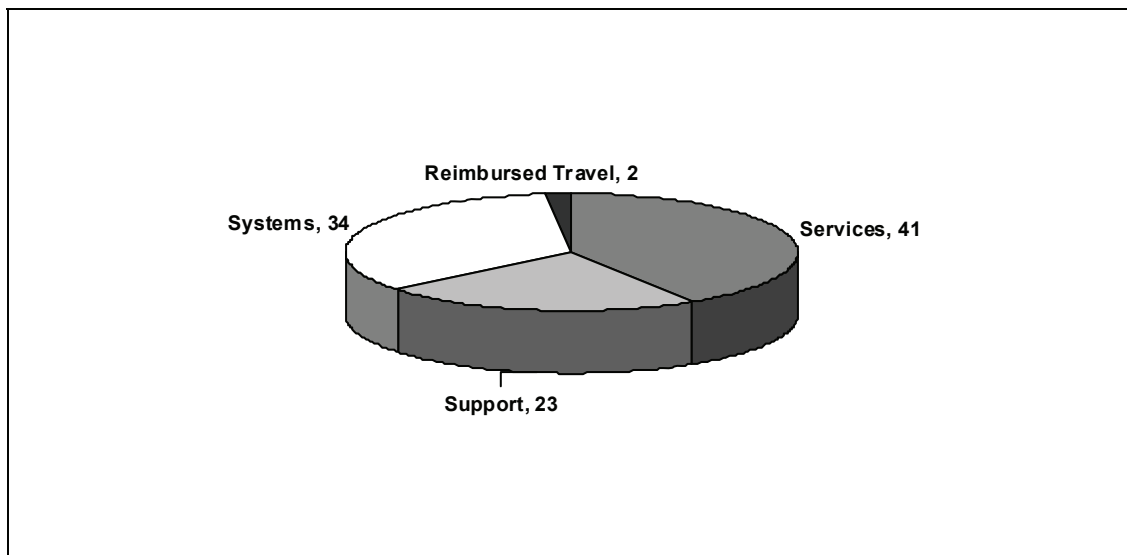
Source: Company Website

Product Portfolio

Cerner has developed a diverse portfolio of solutions for both providers and caregivers. Some of the solutions in cloud related technology include the following:

- Cerner Millennium solutions platform - this platform includes the Millennium and Millennium+ systems. Millennium+ is designed to take advantage of cloud technologies including improved mobility.

- Population health management - the population health technologies from Cerner are created to help apply prevention principles to healthcare rather than treat illnesses after they become more costly to treat. Cerner Healthe Intent Bundle is a cloud-based set of solutions for population health. One of the solutions is called Chart Search, a patient chart search system that allows physicians to rank find and rank important health information contextually. The Chart Search tool is used by more than 50% of the U.S. Cerner client base. The Healthe

Intent platform also has the capability to apply algorithms to health data to predict potential problems and has been used for conditions like predicting sepsis.

- EMR - The Cerner EMR system is designed for both the acute and ambulatory care settings. One of the clients of the Cerner EMR solution, the U.S. National Basketball Association (NBA), chose to implement a centralized medical record for all its athletes using a cloud architecture. The solution is also available for mobile device users.

- Cerner Member Portal - the Cerner Member Portal solution is an electronic method of connecting patients with their providers. Using the system member can message their providers securely, fill prescriptions, update their information, manage appointments, make payments online, view medical fees, download a Continuity of Care Document and view clinical information and educational material.

- Skybox - Center's Skybox system is an enterprise health cloud solution that features secure messaging, data protection and backup, storage, virtual desktop, and HIPAA compliance. This is offered through collaborations with Nirvanix, HP, Oracle, Citrix, VMware, and Symantec.

CISCO SYSTEMS, INC.

Company Overview

Cisco was founded in 1984 by a group of Stanford computer scientists. The company owns several hundred offices and is operational across the globe. It is headquartered at San Jose, California and has 67,000 employees. Approximately 54% of employees are located in the U.S. and the remainder work internationally.

Cisco is a leading company with a variety of technology solutions in the area of internet protocol (IP) networking and other telecommunications solutions. It also offers related services. In general, Cisco specializes in moving data, voice, and video in businesses and up to international communications. It has segmented its products into the following:

- Switching

- Next-Generation Network ("NGN")

- Routing

- Collaboration

- Service Provider Video

- Wireless

- Security

- Data Center

- Other Products

Table 5-4

Corporate Details of Cisco Systems, Inc

Company Details	Description
Company Type	Public
Company Address	170 West Tasman Drive
	San Jose, CA 95134
Phone	408-526-4000
URL	www.cisco.com
Employees	66,639
Fiscal Year End	July

Source: Company Website

Performance Review

Net sales increased 7% to $46,061 million in 2012, product sales increased 5%, and service revenue increased 12%. The company's total gross margin decreased by .2% due to higher sales discounts, product pricing, and unfavorable product mix shifts. Strong sales were reported in the U.S. and emerging markets such as Mexico, Brazil, Russia, and China.

The company launched a new strategic initiative in 2011 concerning five key areas of focus including core technologies (routing switching and associated services), collaboration, data center virtualization and cloud technologies, video, and architecture for business transformation.
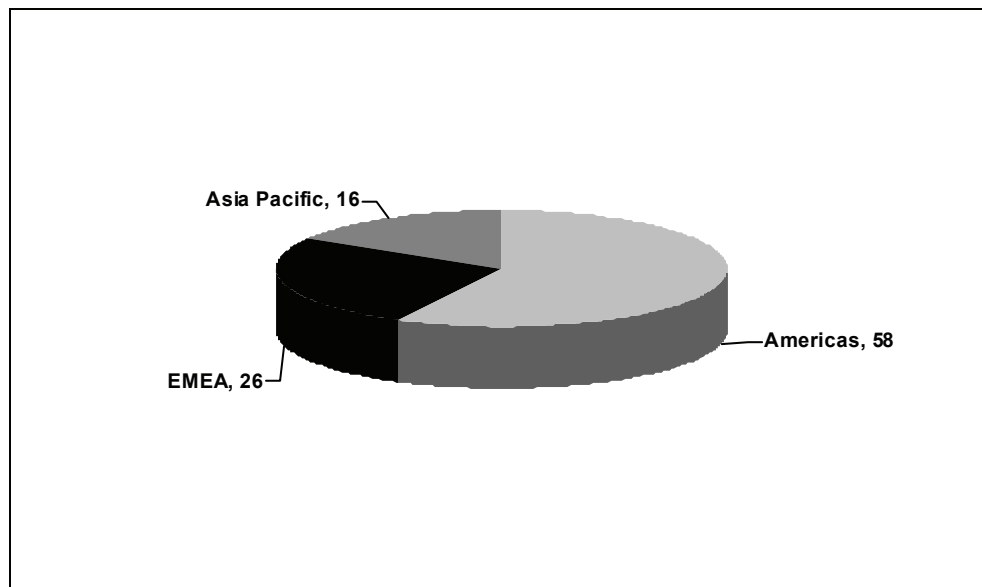
Figure 5-8

Cisco's Revenues, 2009-2012

($ million)
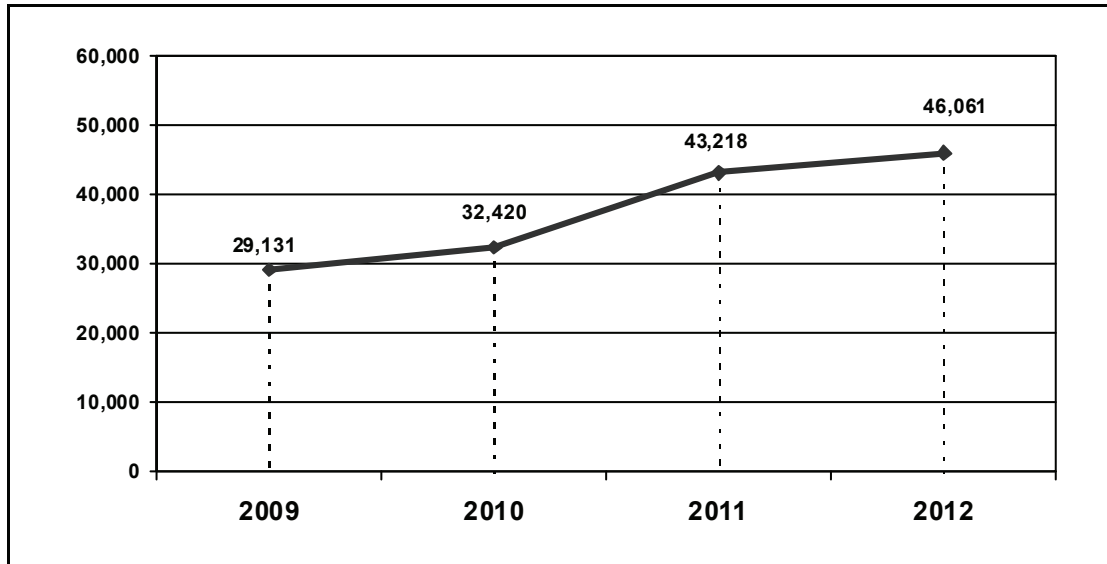
Figure 5-9

Break-up of Net Sales by Region, 2012

(in percent)

Source: Company Website

Product Portfolio

Cisco works with other leading providers of technology and services to offers a variety of solutions. Some of the companies that are in collaboration with Cisco include Microsoft, AT&T, Nokia, Nokia Siemens Networks, VMware, Oracle, Xerox, VCE Company, and others. VCE Company is a joint venture company formed in 2010 under an agreement with EMC Corporation, VMware, Inc., and Intel Corporation. VCE helps companies to transition to cloud technologies using systems from Cisco, EMC and VMware.

Cisco is focusing its priorities in several new, emerging areas of technology including the cloud and virtualization. Enterprise cloud technologies are based on networking, computing, storage, and software technologies which are served by the Cisco Unified Computing System platform and Nexus product families. Cisco is working to develop new cloud-based offerings to enable its customers to launch their own cloud-based solutions including SaaS and others.

Cisco's wide area application services (WAAS) include software deployment on Cisco Service Ready Engines modules. The company offers businesses the ability to build a private cloud, buy public cloud services from a provider, and sell cloud services (for providers). Cisco Powered cloud services are offered by third party developers to deliver public cloud systems. For users that wish to outsource infrastructure, Cisco Powered providers offer IaaS services.

In cloud technologies and systems management Cisco offers:

- network management for IT organization

- cloud automation

- data center management and automation

- network management for small businesses

DELL, INC.

Company Overview

Dell is a leading computer technology company with a variety of products in software, hardware and services for both household users and businesses. It has been transitioning over the past several years into an end-to-end solutions provider. In fiscal 2012 it acquired more than 12 businesses to compliment its new strategy. Part of this includes expanding into new enterprise technologies in addition to providing financing options for its customers. Another strategy has been to acquire cloud-related technologies.

In fiscal 2013 Dell completed nine acquisitions including the acquisitions of Wyse Technology, Quest Software, and SonicWALL. SonicWALL systems provide security for wired or wireless systems including those installed in healthcare settings. Wyse Technology is a cloud-computing solutions company. Quest Software is designed for IT management. To date, Quest has 100,000 customers around the globe.

In 2013, Dell announced a definitive merger agreement concerning the acquisition of Dell by Denali Holding Inc., a corporation owned by Michael Dell, Chairman, CEO and founder of Dell. Following the merger, Michael Dell is to remain the Chairman and CEO of Dell, Inc.

Table 5-5

Corporate Details of Dell, Inc.

Company Details	Description
Company Type	Public
Company Address	One Dell Way
	Round Rock, TX 78682
Phone	800-289-3355
URL	www.dell.com
Employees	111,300
Fiscal Year End	February

Source: Company Website
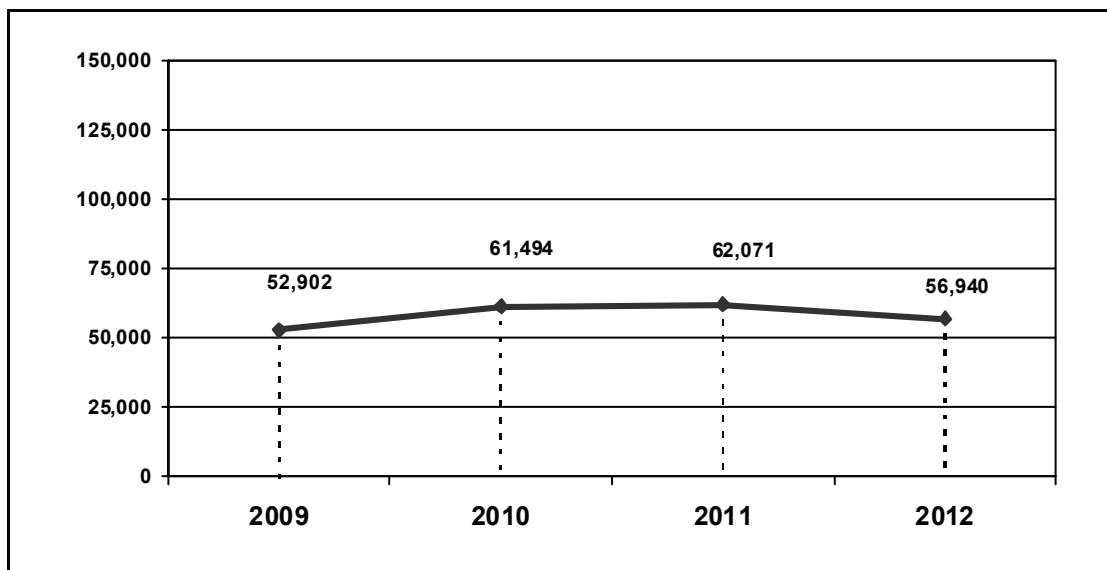
Performance Review

Dell reported total sales of $57 billion in 2012. This represents a decrease of 8% from 2011. Consumer sales were the primary cause of the sales decline but sales decreased in all segments. Consumer sales decreased by 20% and commercial client sales declined by 5% in 2012.
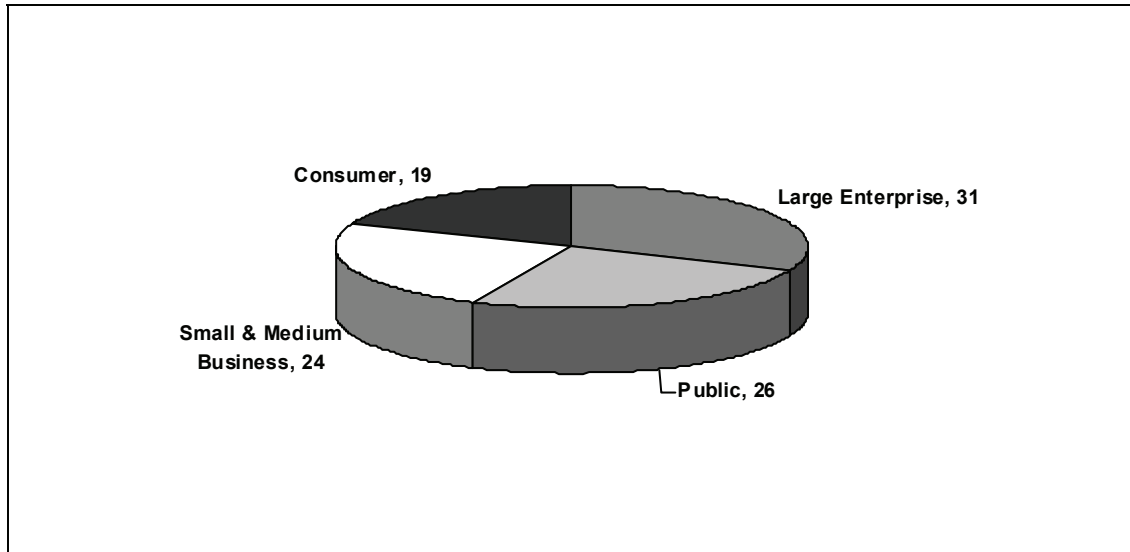
Figure 5-10

Dell's Sales, 2009-2012

($millions)

Source: Company Website

Figure 5-11

Break-up of Sales by Segment, 2012

(in percent)

Source: Company Website

Product Portfolio

Dell has reported a strong emphasis on cloud solutions including the acquisition of multiple companies specializing in cloud solutions. Dell cloud services include:

- Dell cloud on demand - A public cloud for IaaS.

    o Joynet - IaaS cloud for real time web and mobile apps

    o PEER 1 hosting - uses Dell PowerEdge servers, public and private cloud; powered by VMware

    o ScaleMatrix - cloud hosting platform

    o Zerolag - an on-demand cloud infrastructure powered by VMware

- Dell cloud dedicated IaaS services - This system is used for more secure operations for HIPAA and HITECH clients. Also features billing on a demand level, managed server services, various infrastructure options, and VMware tools.

- Desktop as a service - A virtual desktop system delivered without the infrastructure costs.

- Software cloud solutions - Business apps hosted in the cloud and made available to business clients.

- E-mail - An e-mail solutions offered as a SaaS enterprise solution.

- Electronic medical records (EMRs)

In 2013, Dell announced the acquisition of Enstratius, an enterprise cloud-management software and services provider. Enstratius specializes in the management of cloud applications, automated application provisioning, scaling, application configuration management, usage governance, and cloud utilization monitoring. It delivers solutions in private, public and hybrid clouds.

In Fiscal 2013, Dell announced new thin client systems through technologies acquired with the purchase of Wyse Technologies. It also launched new tablet computers and convertible devices specifically for commercial customers and clients bringing their own devices to the workplace. This ties into the cloud-based business strategy. The new tablets and convertible devices are Microsoft Windows based.

Dell designs, develops, manufactures, and sells a variety of technologies such as desktops, laptops, thin clients, tablets, large enterprise and small business servers, networking solutions, storage devices, software, peripherals, application services, and cloud services.

Cloud computing services are often performed under multi-year outsourcing arrangements, subscription services, or short-term consulting contracts. The acquired company offers clients the ability to choose from public and private cloud providers including Dell and non-Dell clouds.

For clients seeking an EMR solution, Dell offers cloud-based or on-premise solutions with hardware, software, upfront support, installation, setup, and training. Hardware is Intel based. The company also has a 24/7 EMR support desk.

EMC CORPORATION

Company Overview

EMC Corporation is focused on helping its clients transition to hybrid cloud computing. The company was incorporated in Massachusetts in 1979. It is a relatively large IT company with 60,000 employees however 13,800 of the company's employees are with VMware, Inc., a company majority-owned by EMC. VMware is a leading provider of virtualization solutions, a significant component of the cloud infrastructure.

EMC's business strategy for the future is based primarily on increasing data usage efficiency, and to leverage the power of virtualization and software-defined data centers. It believes that many companies will start with private cloud computing but move to a hybrid model more as time continues.

In 2012, EMC acquired Syncplicity, a company focused on a cloud-based file sync and share which was completed to improve EMC's vertical-specific content management solutions.

Table 5-6

Corporate Details of EMC Corporation

| Company Details	Description
Company Type	Public
Company Address	176 South Street
	Hopkinton, MA 01748
Phone	508-435-1000
URL	www.emc.com
Employees	60,000
Fiscal Year End	December

Source: Company Website

Performance Review

Company product revenues increased by approximately 4% in 2012 compared to 2011. Product revenues were strongest in storage and VMware Virtual Infrastructure products.

Consolidated services revenues increased 16.7% in 2012. Strong service revenues were due to sales of storage systems, and VMware's Virtual Infrastructure revenues. The increase in services revenues was due to significantly higher demand for maintenance-related services. The company noted an increase in demand for professional services for cloud architectures and other related IT solutions.
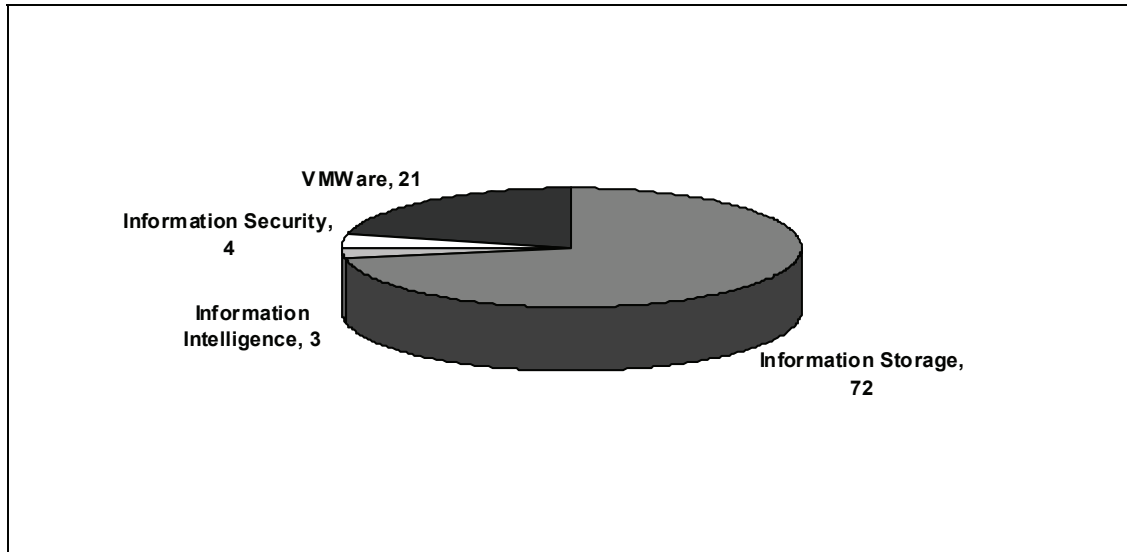
Figure 5-12

EMC's Sales, 2009-2012

($millions)
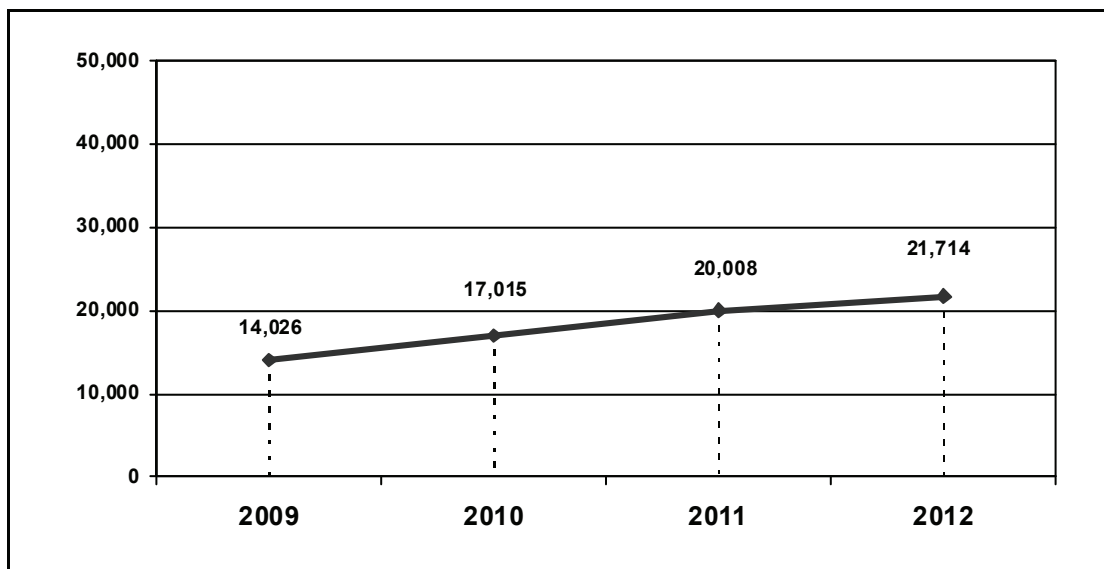
Source: Company Website

Figure 5-13

Break-up of Sales by Segment, 2012

(in percent)

Source: Company Website

Product Portfolio

EMC Corporation has two major business segments: EMC Information Infrastructure and VMware Virtual Infrastructure.

Part of EMC's information business is its storage solutions business unit which provides enterprise storage systems and software portfolios including product families VMAX, VNX, Isilon, and Atmos. The company also offers backup products. Storage systems are integral to IT solutions including cloud systems. EMC's devices can be deployed in networked, object storage and/or direct attached storage environments.

In information intelligence EMC provides cloud computing, software, and services to improve workflow, mobility, cloud technologies, governance solutions, and related services. Product groups in information intelligence include:

- EMC Documentation xCP

- EMC Captiva

- EMC Document Sciences

- EMC SourceOne kazeon

- EMC OnDemand

The OnDemand solution is a private cloud deployment model for enterprise-class applications. In July 2013, the company announced the new hardware and software products for data protection. These solutions include the product lines Data Domain, Avamar, NetWorker, and Mozy. The key components of these security offerings are based on disaster recovery, archive, backup, data source integration, analytics and other data management options.

HEALTHFUSION, INC.

Company Overview

HealthFusion is a provider of healthcare applications for the cloud including its electronic medical record and patient portal solution MediTouch EHR. HealthFusion also offers practice management, and claims processing solutions. Physicians founded the company and continue to run it.

The company's systems are used by private practices, hospitals, and medical billing services. It is a private company based out of California.

Table 5-7

Corporate Details of HealthFusion, Inc.

Company Details	Description
Company Type	Private
Company Address	100 North Rios Avenue
	Solana Beach, CA 92075
Phone	877-523-2120
URL	www.healthfusion.com

Source: Company Website

Product Portfolio

HealthFusion's products are electronic health software solutions for medical records, practice management, and claims clearinghouse. Its platform is compatible with Microsoft Windows or Apple OS desktops, laptops, and tablet computers.

The MediTouch EHR software version 4.0 gained meaningful use approval from the Drummond Group, as part of the Office of the National Coordinator - Authorized Certification Body (ONC-ACB) program. The software supports Stage 1 and Stage 2 of the meaningful use criteria for 2014.

MediTouch is a web-based system based on the HealthFusion Pure Cloud technology. It is a customizable solution that allows caregivers to adjust the software to their liking. Clients connect

via the internet and the data is protected by HIPAA-compliant measures. The system backs up practice and patient data at 15-minute intervals.

HealthFusion's practice management software is a complete revenue cycle management systems including:

- pre-visit patient registration and scheduling

- visit check-in and co-pay

- pre-fill options for patients and providers

- code validation

- payer edits

- HIPAA edits

- fee schedules

- reports

- statements

- post-visit management

The claims system, Health Fusion Clearinghouse is used to transmit and manage electronic health claims to payers including the production of graphical and customizable reports. It is an accredited and HIPAA-compliant system designed to:

- reduce claims processing time

- provide complete and current patient and payer information

- provide patients with their responsibilities at the point-of-care

- connect to hundreds of payers

HEWLETT PACKARD CORPORATION

Company Overview

Hewlett Packard is an household name in personal computers and other related technologies. It is a U.S.-based provider of products for the global market. This device and service provider employs around 332,000 individuals and offers solutions to consumers, small businesses, large enterprises, governments, education centers, and healthcare facilities.

Hewlett Packard devices primarily use Microsoft Windows operating systems and processors from either Intel Corporation or Advanced Micro Devices (AMD). The company's Infrastructure Technology Outsourcing division is responsible for infrastructure services including IT security, and cloud-based computing.

Table 5-8

Corporate Details of Hewlett Packard

| Company Details	Description
Company Type	Public
Company Address	3000 Hanover Street
	Palo Alto, CA 94304
Phone	650-857-1501
URL	www.hp.com
Employees	331,800
Fiscal Year End	October

Source: Company Website

Performance Review

Sales in 2012 of $120 billion decreased by 5.4% compared to 2011 sales. Revenues decreased due to weak demand in hardware and printing supplies. This was also combined with contractual rate declines in company service contracts.

Figure 5-14

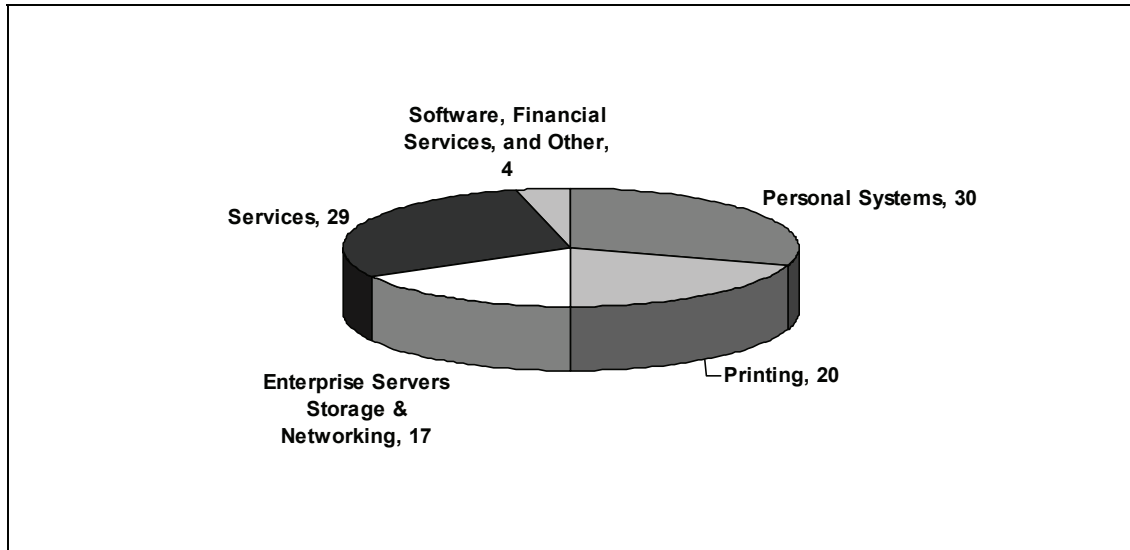**Hewlett Packard's Sales, 2009-2012**

($millions)
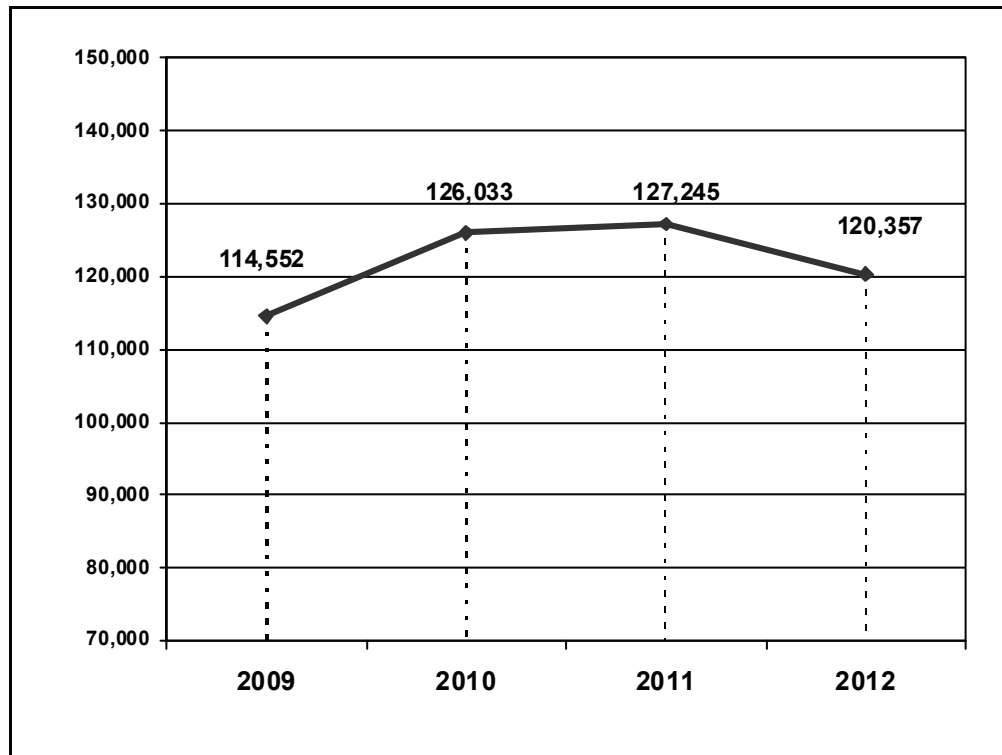
Source: Company Website

Hewlett Packard's future growth strategy is rooted in a changing industry. It aims to take advantage of increased development of the core technologies but also to increase its position in trends like data center consolidation and automation, cloud computing, IT security, digitization, mobility, and connectivity.

Figure 5-15

Break-up of Sales by Segment, 2012

(in percent)

Software, Financial Services, and Other, 4

Services, 29

Personal Systems, 30

Printing, 20

Enterprise Servers Storage & Networking, 17

Source: Company Website

Product Portfolio

- Servers

- Storage devices

- Consulting and other services

- Smartphones and pocket PC's

- Imaging devices

- HP Cloud (on- or off-site data storage/retrieval)

- Networking

- Personal computers

- Enterprise security

Hewlett Packard's Cloud Service Automation software suite is used to create the company's CloudSystem integrated solution. The system is designed for enterprise and service providers to deliver infrastructure, platform and SaaS. It is available for all cloud types: public, private, or hybrid systems. The flagship HP 3PAR StoreServe platform is a storage solution for virtualization, cloud environments, and IT-as-a-service.

The Hewlett Packard Health and Life Sciences portfolio of products are designed for healthcare providers, life sciences companies, healthcare plan providers, and government health systems. Its Digital Hospital solution is a full healthcare inpatient environment system that focuses on using digital technologies for secure, improved patient care. Part of this solution involves using cloud-based technologies to improve patient care.

MICROSOFT CORPORATION

Company Overview

Founded in 1975, Microsoft Corporation is a U.S.-based computer technology company with a leading portfolio of products including the Microsoft Windows operating system and related software. The company has solutions in software, services and hardware. It operates globally and has business offices in 100 countries.

There are 99,000 employees working for Microsoft, 59% of which are located in the U.S. Company headquarters are in Washington State. There are five major business units: Windows Division, Server and Tools, Online Services, Microsoft Business and Entertainment and Devices.

Table 5-9

Corporate Details of Microsoft Corporation

| Company Details	Description
Company Type	Public
Company Address	One Microsoft Way
	Redmond, WA 98052
Phone	425-882-8080
URL	www.microsoft.com
Employees	99,000
Fiscal Year End	June

Source: Company Website

Performance Review

Microsoft reported revenues for 2012 of $78 billion, an increase of 5.6% above 2011. Strong sales were reported in the business segment Server and Tools, and new products (e.g. Windows 8, Surface device, and the new Office). Weaker sales were reported for x86 PCs.

Figure 5-16

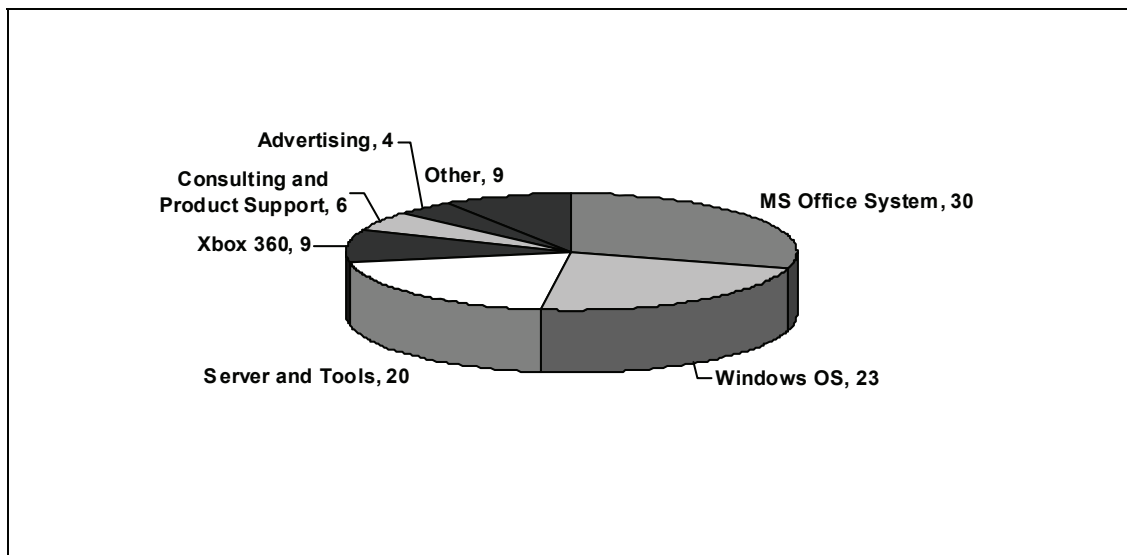**Microsoft's Sales, 2009-2012**

($millions)
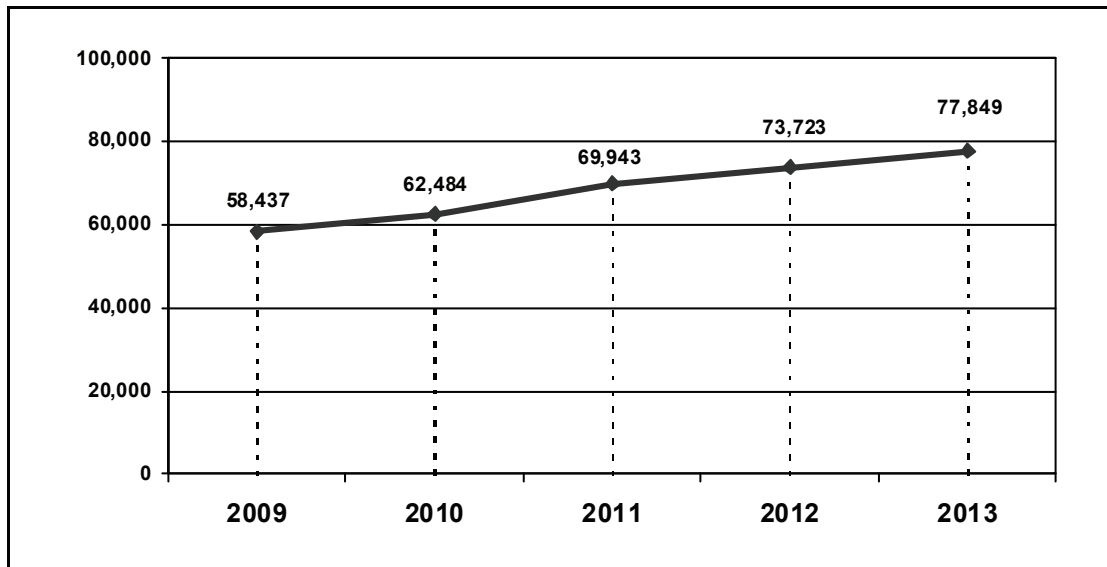
Source: Company Website

Figure 5-17

Break-up of Revenues by Business Segment, 2012

(in percent)

*Not equal 100% due to rounding

Source: Company Website

Product Portfolio

The product portfolio from Microsoft includes:

- operating systems such as Windows and Windows Mobile

- server applications

- applications

- business solution applications

- computer management tools

- software development tools

- online advertising

- video games and consoles

- cloud solutions

Microsoft's cloud solutions encompass software, services, and shared computer resources. Cloud solutions include Office 365, Microsoft Dynamics CRM Online, Windows Azure, Bing, Skype, X-Box Live and Yammer. Revenue from cloud systems are primarily derived from usage fees, advertising, and subscriptions.

Cloud services are offered to businesses to improve workflow by removing the workload of on-site server management. Cloud solutions are available as a scalable complete system for users to build, deploy, and manage both enterprise workloads and web apps. Business server solutions are available as on-premise or cloud based.

Microsoft announced that it expects to see 80% of its business applications to be based on cloud infrastructure by 2016.

VMWARE, INC.

Company Overview

VMware is a leader in virtualization, cloud technologies and other systems for enabling the separation of applications and hardware, and automation of server infrastructures. The company is based in California, and has 13,800 employees.

In 2012, VMware acquired Nicira, a network virtualization company that focuses on heterogeneous environments. One of the concerns expressed by healthcare organizations using a large range of software types from multiple vendors is that the overall computing solutions are often not very heterogeneous.

In December 2012, VMware launched an initiative with EMC Corporation to focus resources on big data and cloud application platforms. VMware has other agreements with IT providers—a total of approximately 1,900. It has shared its source code and technology with others to influence solution development from a wide network of other vendors.

Table 5-10

Corporate Details of VMware, Inc.

| Company Details	Description
Company Type	Public
Company Address	3401 Hillview Avenue
	Palo Alto, CA 94304
Phone	650-427-5000
URL	www.vmware.com
Employees	13,800
Fiscal Year End	September

Source: Company Website

Performance Review

VMware has reported significant growth over the past five years. It has increased revenues from $2 billion in 2009 to $4.6 billion in 2012. Sales growth in 2012 was 22% over 2011.

The majority of revenues are from licensing and support of VMware's solutions. Revenues are derived primarily of sales to customers in the U.S., and no other one country accounted for a significant portion of sales.
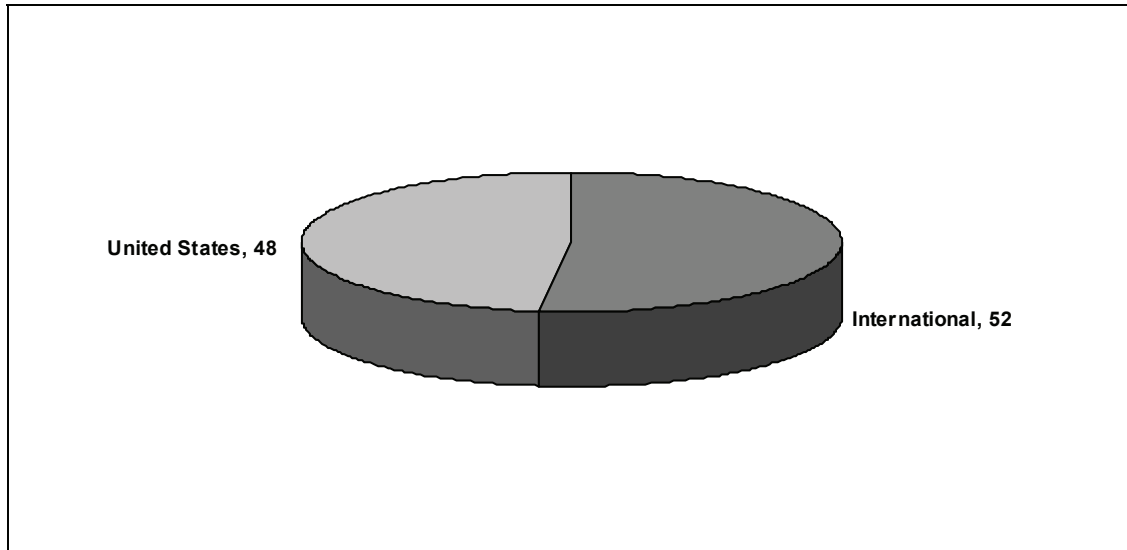
Figure 5-18

VMware's Sales, 2009-2012

($millions)
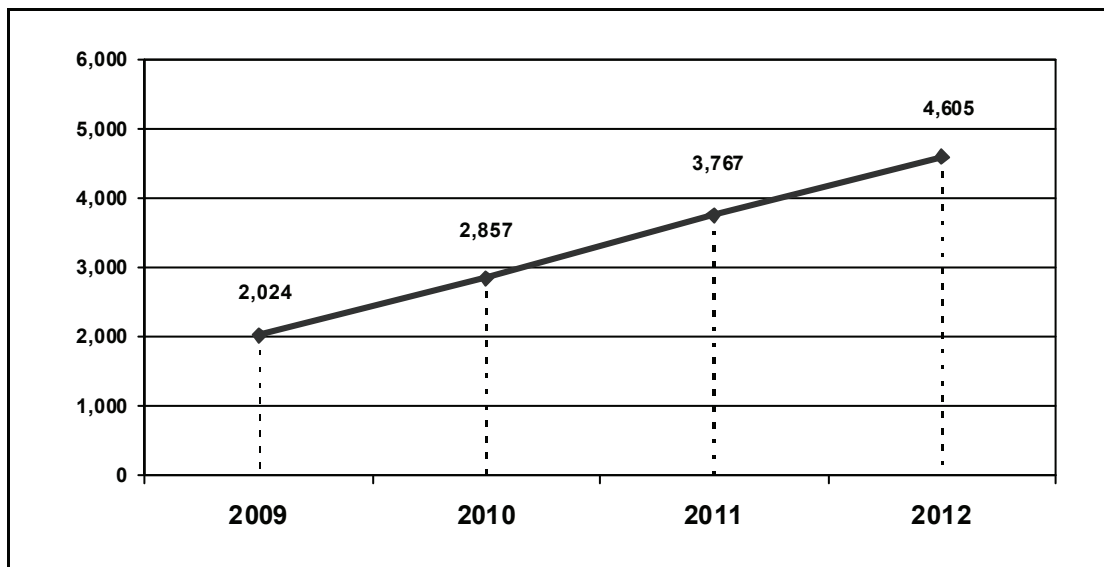
Source: Company Website

Figure 5-19

Break-up of Healthcare Systems Sales by Region, 2012

(in percent)

Source: Company Website

Product Portfolio

VMware's solutions are categorized into two main segments:

- cloud infrastructure and management

- end-user computing

VMware's vCloud Suite is the company's first integrated solution toward a software-defined data center (SDDC). This is a key focus for the company and a basis for cloud solutions. Another main solution from VMware is VSphere virtualization, a leading platform for virtualization. A key component of VMware's future strategy is based on hybrid cloud systems and it plans to expand its offerings in enterprise cloud services that are similar to private clouds.

The two VMware systems from transitioning from a traditional data center to a cloud environment are packaged software for on-site deployment and public IaaS services. The vCloud

software suite is for private cloud systems and the vCloud Hybrid Service is offered for a public or hybrid cloud solution. Benefits of these solutions include:

- quicker application deployment

- disaster recovery

- automated provisioning

- better control and focus IT expenses

- integrate third party solutions

XEROX CORPORATION

Company Overview

Xerox is a leader in office products for both small offices and large firms. It offers office printers, copiers, scanners, production printing equipment, workflow optimization software, IT, and management solutions. The company's IT services including cloud services in healthcare. Its outsourcing solutions include IT infrastructure services that utilizes the Xerox network of secure data centers, help desks, and data storage facilities.

Healthcare technology in general is a focus for Xerox; a company representative reported in late 2012 that healthcare technology systems "are making healthcare services the fastest growing segment of Xerox's business." To date, Xerox has delivered healthcare services through 31 U.S. state partnerships and has a total of 40 years of government health program experience. The company is involved with two out of three insured patient's care in the U.S. and it serves approximately 1,700 hospitals.

Table 5-11

Corporate Details of Xerox Corporation

| Company Details	Description
Company Type	Public
Company Address	45 Glover Avenue
	Norwalk, CT 06856
Phone	203-968-3000
URL	www.xerox.com
Employees	147,600
Fiscal Year End	December

Source: Company Website

Performance Review

For 2012, Xerox reported a decrease in revenues of 1% and a negative 1% impact from currency exchange rates. Total sales for fiscal 2012 were $22.4 billion, compared to $22.6 billion for the 2011 fiscal year.

Company sales are segmented into services, document technology and other. The services business grew to be the largest segment in terms of revenues in 2011 and 2012 but was less than document technology in 2010. Services are offered for IT outsourcing, document outsourcing, and business processes outsourcing. Revenues for IT outsourcing accounted for 12% of total services revenues.

Figure 5-20

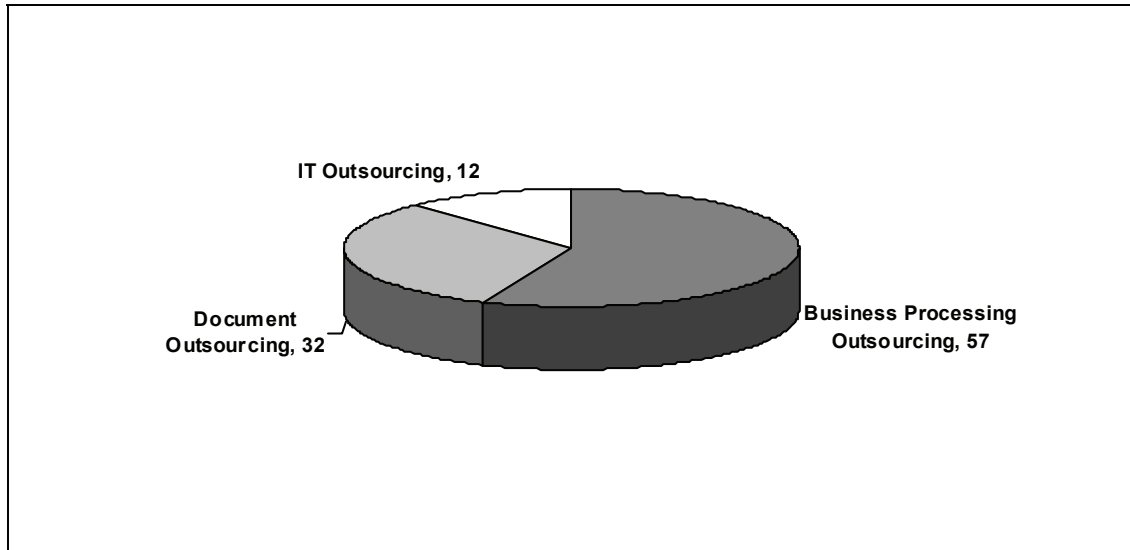**Xerox's Sales, 2009-2012**

($millions)
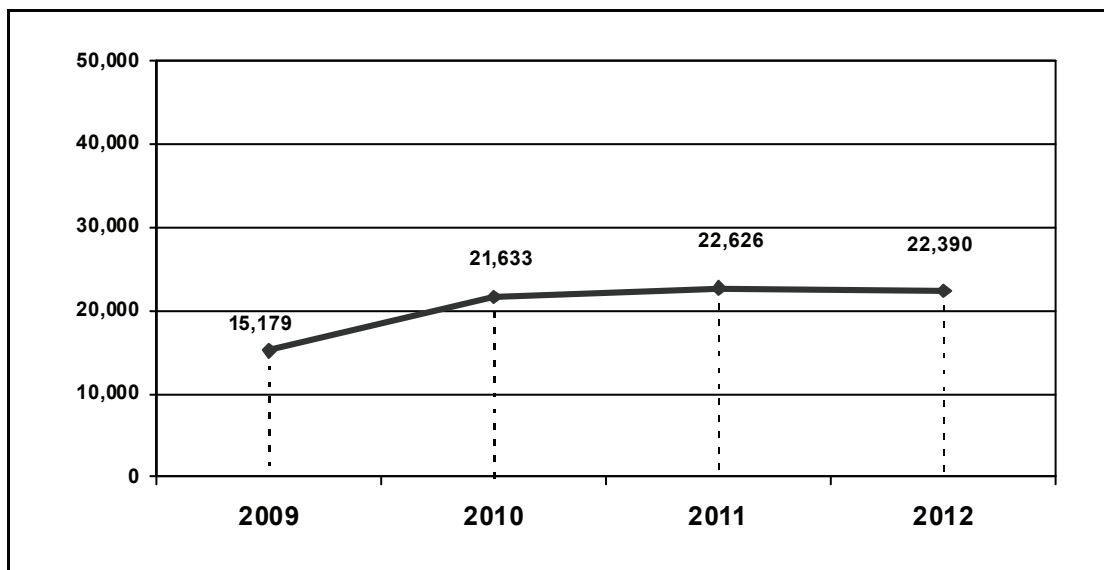
Source: Company Website

Figure 5-21

Break-up of Services Revenues by Segment, 2012

(in percent)

*Not equal 100% due to rounding

Source: Company Website

Product Portfolio

Xerox offers healthcare-related services in:

- ARRA/EHR advisory (Meaningful Use)

- EHR and ERP Applications Implementation and Project Support

- Revenue cycle management including ICD-10

- Simulation-based training to accelerate electronic health record (EHR) adoption

- Optimize technology and business process operations

- Technology and Infrastructure Services

- Extended Business Office and A/R Collections

- Applications Managed Solutions

- Regulatory Compliance

- Managed Print Services

- Enterprise Content Management

- Use analytics to manage, measure and monitor care metrics

- Real-Time Clinical Surveillance and Decision Support

- Care and Case Management

- Benchmarking and Comparative Analytics

In 2012, Xerox acquired Wireless Data Services a technical support and consultancy firm that uses a proprietary cloud-based platform called GlobalMine. This system is used to capture, analyze and manage millions of technical support interactions across a very wide range of mobile devices. In 2011, Xerox acquired The Breakaway Group which is a cloud-based service provider focused on helping healthcare providers improve their adoption of EMRs.

The Xerox portfolio of services in cloud computing technology includes infrastructure, mobility, collaboration, and platform solutions. It offers a cloud-based, multi-tenant infrastructure, remote infrastructure management, help desk services, managed storage, utility computing, disaster recovery, and security.

Market Opportunities in Cloud Computing

OVERVIEW

The global market for cloud computing in healthcare is estimated to reach $3.9 billion for 2013. This represents 21.1% growth over the 2012 year, for which cloud sales and service revenues for this sector were estimated at $3.2 billion. The push to adopt a higher level of IT in healthcare, growing government mandates, and limitations in digital storage have been primary drivers for the healthcare cloud market. Additionally, staffing shortages and a lack of internal IT infrastructures in many countries have provided a great opportunity for the cloud to be implemented.

The continued adoption of cloud services in the health industry is expected to drive the market to reach $15.3 billion by 2020. The growing availability of services and vendors will increase access to cloud systems and provide more options directly focused on meeting demands of the health industry. Growth is expected to remain steady, averaging more than 20% annually.

Table 6-1

Global Healthcare Cloud Market 2010-2020

(in millions of dollars)

Year	Revenues	Percent Change
2010	$2,200	—
2011	2,670	21.4%
2012	3,240	21.3%
2013	3,925	21.1%
2014	4,780	21.8%
2015	5,850	22.4%
2016	7,155	22.3%
2017	8,740	22.2%
2018	10,650	21.9%
2019	12,800	20.2%
2020	15,277	19.4%

Compound Annual Growth Rate
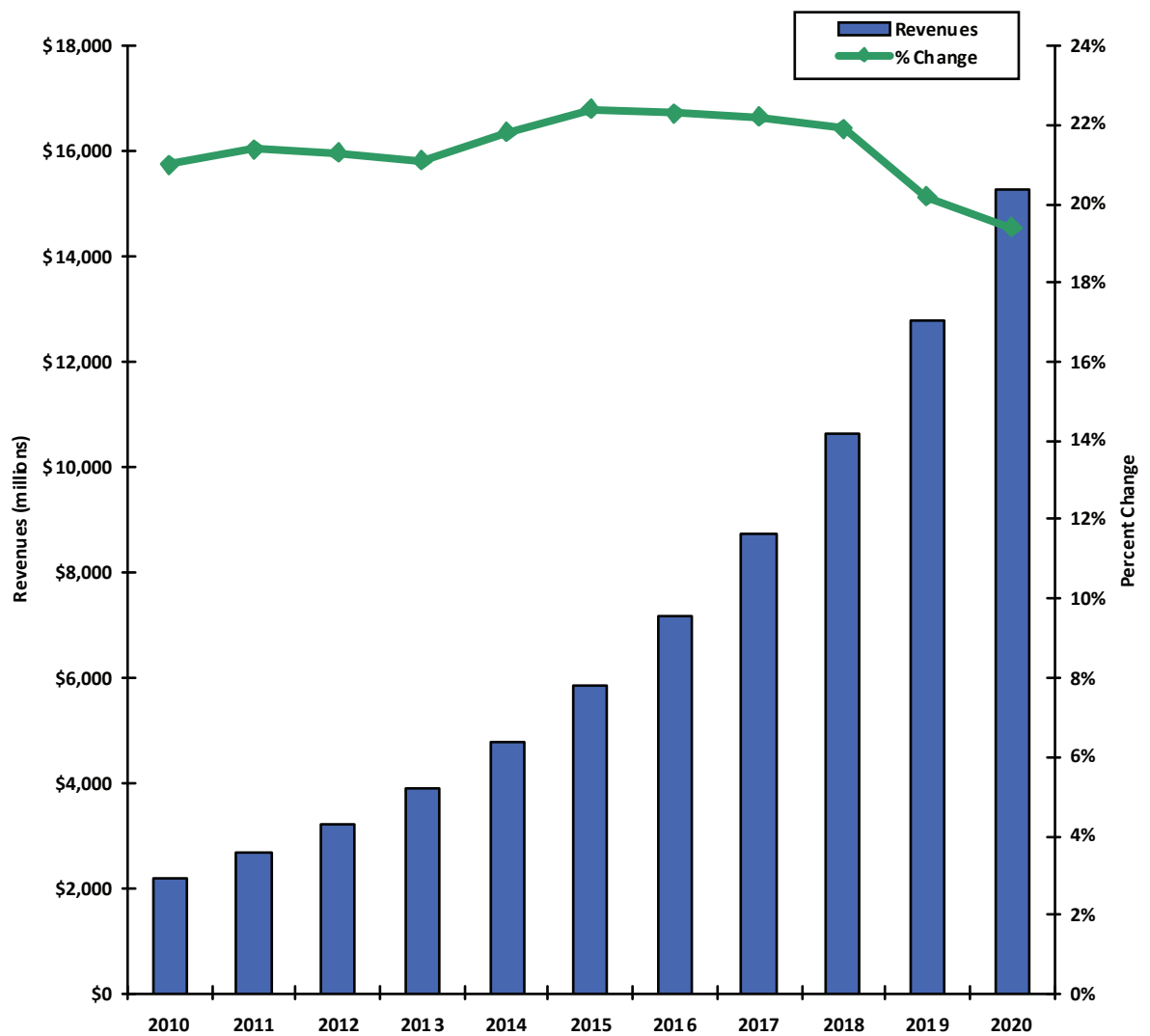
Period	CAGR
2010-2015	21.6%
2015-2020	21.2%
2010-2020	21.4%

Source: Kalorama Information

Figure 6-1

Global Healthcare Cloud Market 2010-2020

(in millions of dollars)

Source: Kalorama Information

The Cloud Industry: Where Does Healthcare Fit?

In the whole scheme of cloud computing, the healthcare segment represents about 8% of the entire market. The media, entertainment and telecommunications industry has been the largest adopter of cloud computing, holding about 23% of the total cloud market. This is followed by the financial sector with 21% and government and public services with 17%. See the figure below for estimated distribution of cloud computing revenues by industry sector.

Figure 6-2

Global Cloud Markets, Estimated Sales by Industry, 2012
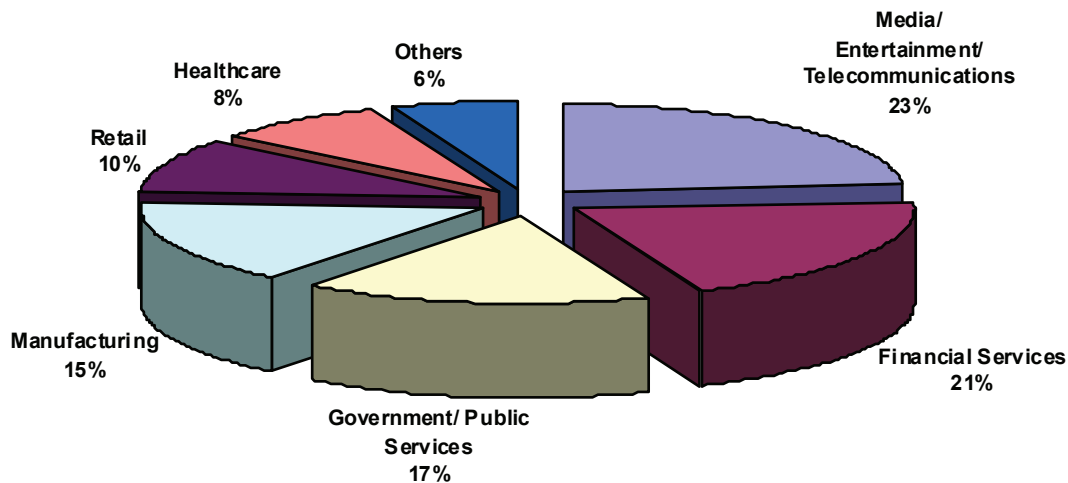
Others include energy and resources; tourism, hospitality and leisure; transport, etc.
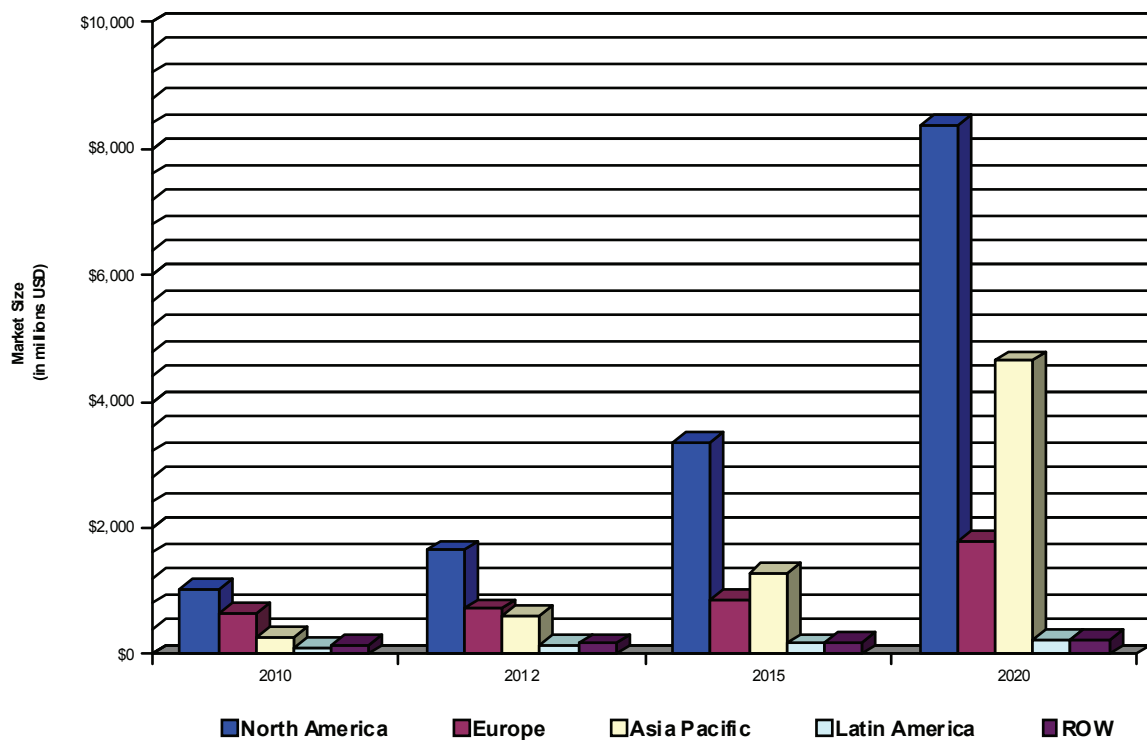
Source: Kalorama Information

GLOBAL MARKETS FOR HEALTHCARE CLOUD COMPUTING

The $3.2 billion healthcare cloud computing market is largely driven by adoption of the technology in North America, primarily the United States. The U.S. accounts for over $1.6 billion, or just over 50%, of the global healthcare cloud market. This region is followed by Europe with 22%, Asia Pacific with 19%, Latin America with 4% and rest of world with the remaining 5%.

Figure 6-3

Global Healthcare Cloud Market by Region 2010-2020

(in millions of dollars)

Source: Kalorama Information

Table 6-2

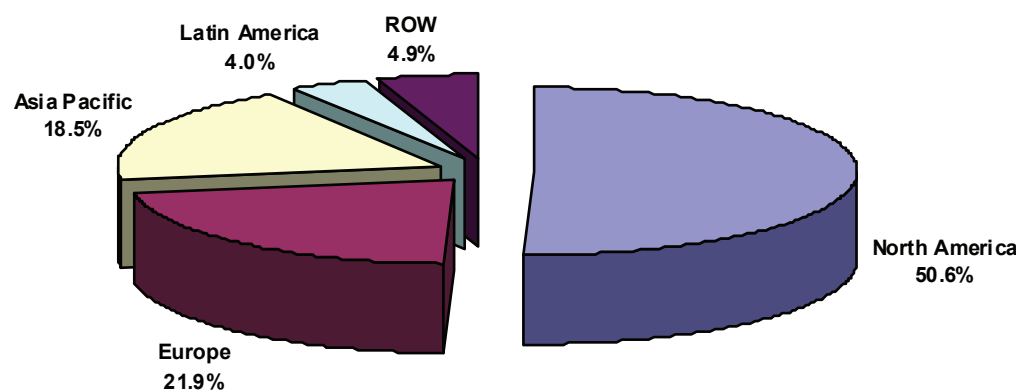**Global Healthcare Cloud Market by Region**
2012

($ in millions)

Region	Revenues	Share of Global Market
North America	$1,640	50.6%
Europe	$710	21.9%
Asia Pacific	$600	18.5%
Latin America	$130	4.0%
Rest of World	$160	4.9%
Total	$3,240	100%

Source: Kalorama Information

Figure 6-4

Global Healthcare Cloud Market by Region, 2012

Source: Kalorama Information

Developed vs. Developing Markets

The $3.2 billion healthcare cloud market is dominated by sales generated in developed regions, such as the United States. Today, developed regions account for 85% of the healthcare cloud market, accounting for nearly $2.8 billion. Although the developed market accounts for a higher volume of sales, developing markets are outpacing them in growth. For the forecast period, the developed region will increase at a compound annual rate of 17.7%, while developing regions will see growth exceeding 40% annually. Countries such as China and Brazil are leading in this growth. By 2020, the developed markets share of the market will be roughly 77%, compared to the growing share of the developing regions which will account for 23%.
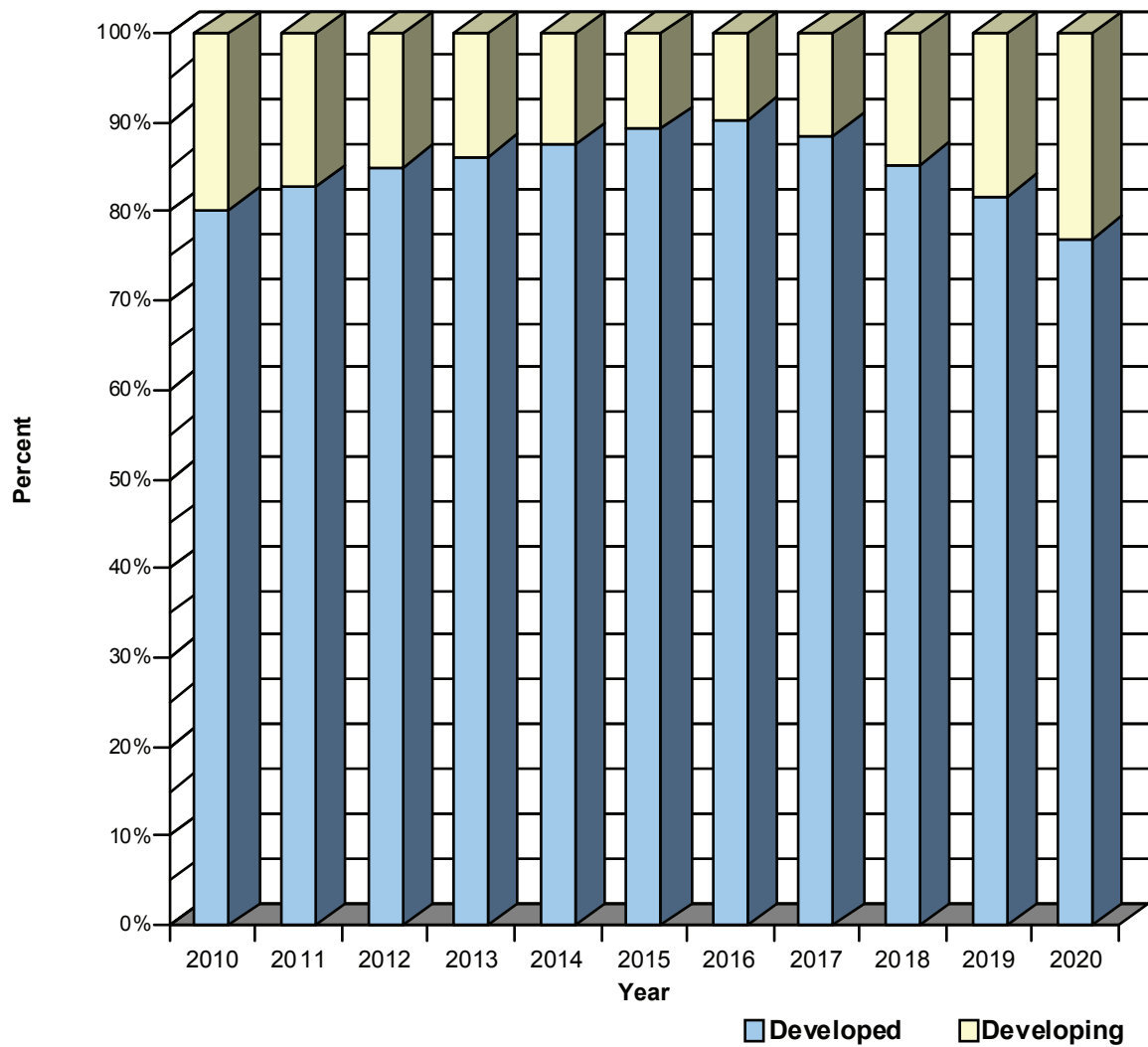
Table 6-3

**The Global Healthcare Cloud Market, Distribution of Revenues
by Developed vs. Developing Markets 2010-2020**

Year	Developed Market	Developing Market	Percent Total
2010	80.2	19.8	100%
2011	82.8	17.2	100%
2012	85.0	15.0	100%
2013	86.1	13.9	100%
2014	87.5	12.5	100%
2015	89.2	10.8	100%
2016	90.3	9.7	100%
2017	88.5	11.5	100%
2018	85.3	14.7	100%
2019	81.7	18.3	100%
2020	77.0	23.0	100%

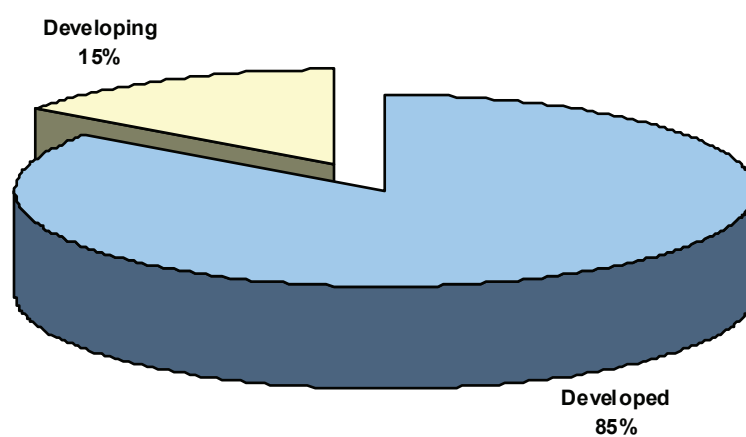Source: Kalorama Information

Figure 6-5

**The Global Healthcare Cloud Market, Distribution of Revenues
by Developed vs. Developing Markets 2010-2020**

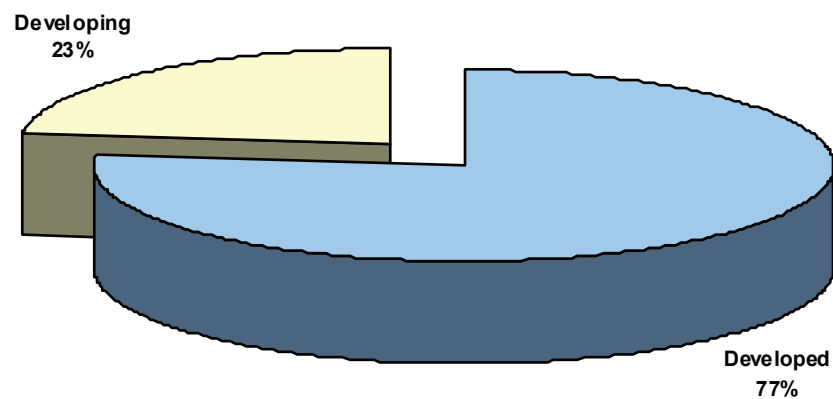Source: Kalorama Information

Figure 6-6

**Global Healthcare Cloud Market, Distribution of Revenues by
Developed vs. Developing Markets, 2012**

**Developing
15%**

**Developed
85%**

Source: Kalorama Information

Figure 6-7

**Global Healthcare Cloud Market, Distribution of Revenues by
Developed vs. Developing Markets, 2020**

Developing
23%

Developed
77%

Source: Kalorama Information

Industry Drivers and Challenges for Developing Markets

The healthcare IT spending environment in developing regions is variable and changes at a rapid pace. The following table outlines some of the drivers and challenges for developing markets in the healthcare IT segment.

Table 6-4

**Drivers and Challenges for Developing Markets**

Drivers	Challenges
Growing adoption of cellular and internet technologies	Existing capabilities of cellular and internet services are limited, many areas only with 2G services
Accounts for more than 80% of global population	Rural locations and access to technology
Growing income levels	Lower income levels compared to developed regions
Increasing interest in latest technologies and 'gadget items'	Limited available vendors
Becoming growing option for manufacturing locations	Wide adoption of prepaid services, such as prepaid cell phones
Growing interest in wireless options in business, versus wired systems	Scattered government regulation
	Compatibility issues

Source: Kalorama Information

Healthcare Markets and IT Spending by Country

One of the most important, established healthcare markets is the United States, generating the most spending on healthcare worldwide with $2.7 trillion recorded in 2012. However, several other global markets are important to the development and growth of the healthcare market as a whole. China, for example, has the largest population in the world, a growing aging population, an increase in technology usage and increased spending in many industries making it an attractive market for suppliers and service providers.

Figure 6-8

Healthcare Spending by Country
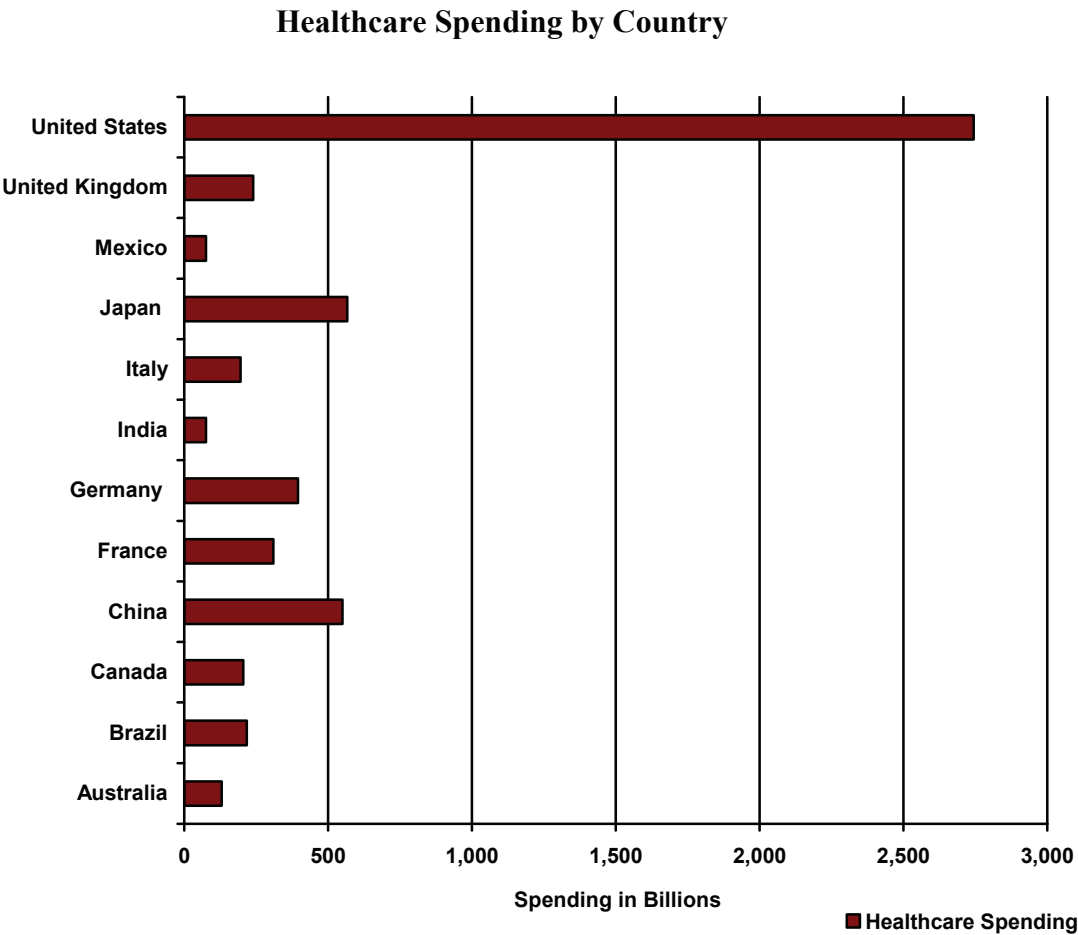
Source: Kalorama Information

United States Healthcare Market

The U.S. healthcare market is considered as the most fragmented and complex market in the world and is the leader in spending as a percent of GDP at a rate of 16-18% each year. In 2012, spending in the U.S. was reported at $2.7 trillion, up from $1.4 trillion in 2000. According to the U.S. government health statistics, in 2014 national health spending is projected to rise 2.1 percentage points faster than in the absence of healthcare reform. There are expected to be 1.5% less out-of-pocket expenditures but the increase is expected in insurance (Medicaid and private insurance). This is also reflected by an increase in the number of insured. By 2021, under the current state of healthcare reform in the U.S., healthcare spending is projected to reach 19.6% of GDP or $4.8 billion.9

In 2012, spending on IT in the health sector reached $36 billion, increasing from about $32 billion in 2010. The 6% increase is largely attributed to the increase in government mandates and incentives for increases in technology, such as EHR systems.

---

[9] Office of the Actuary in the Centers for Medicare & Medicaid Services

Figure 6-9

**United States: Healthcare Spending, Healthcare IT Spending,
Healthcare Cloud Spending**
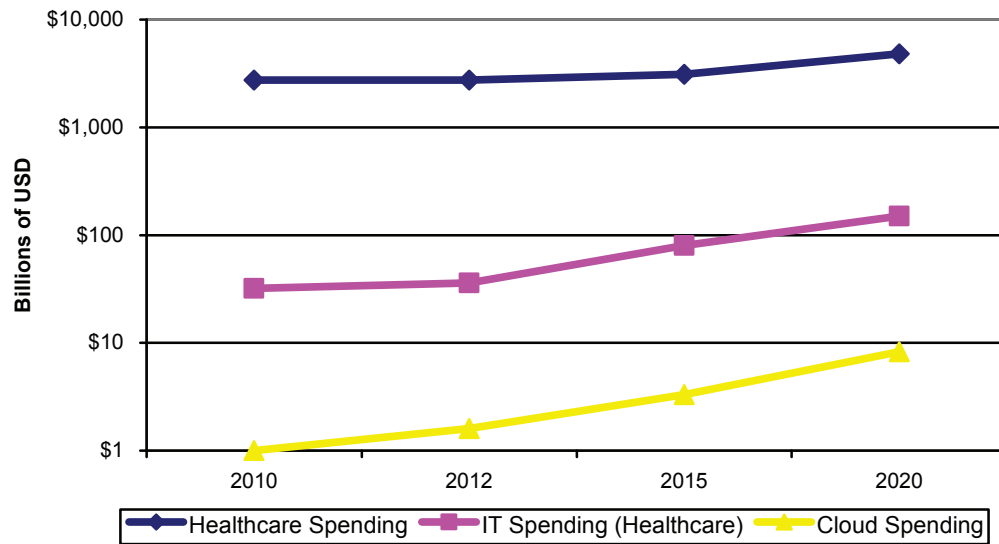
Source: Kalorama Information
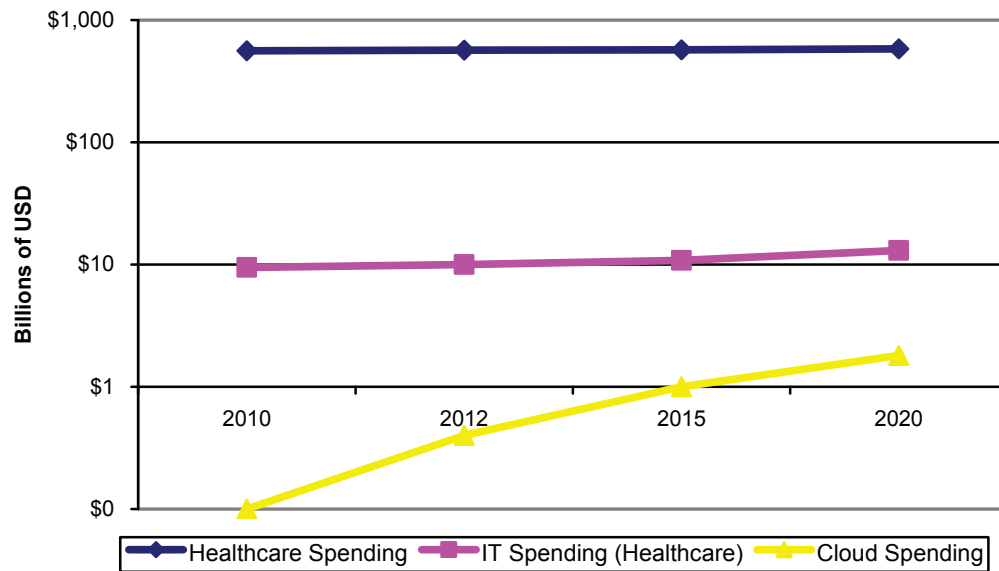
Japan Healthcare Market

Japan, the most advanced health market in Asia, reports health spending as a percentage of GDP at around 9.5%, showing slight increases over the years, from 6% in 1990. Japan's healthcare spending is influenced by different national diet norms, government healthcare plans, longer hospital stays than comparable nations and a pressure to provide efficient work. Doctors in Japan have complained of low pay and long hours but the country records one of the longest life expectancies in the world. Japan ranks third for the highest life expectancy globally.

Patients in Japan are expected to see a doctor more than in other industrialized nations but often for less serious diseases. High salt content foods contribute to disease and costs in Japan but patients have a lower level of heart disease than many other countries.

Another key focus for the healthcare system in Japan is preventative care. Health initiatives have also shown to produce a change in some of the activities of the people that has helped to prevent disease and lower costs. In 2012, the Japanese government announced plans to cut the number of smokers through several initiatives to help reduce the cancer rate.

Figure 6-10

Japan: Healthcare Spending, Healthcare IT Spending, Healthcare Cloud Spending

Source: Kalorama Information

Brazil Healthcare Market

The economy of Brazil is outpacing the other South American countries. Economic policies have established a highly resilient economy and reduced overall public debt. Brazil now accounts for the 8th highest GDP in the world at $2.4 trillion.

Brazil spent around 9 percent of GDP on healthcare in 2012. The country's spending on healthcare has continued to increase for several years and is considered to be among the highest in Latin America. However the country has some ground to make up in life expectancy and infant mortality. The large geographical area of Brazil is expected to be a leading reason for health inefficiencies. Health expenditures are often concentrated on highly populated urban areas. Brazil's land mass is roughly half (47%) of Latin America.

The public healthcare system is regarded as substandard with short levels of financial support, however this is slowly changing. Private health insurance has continued to increase which is improving the situation. Approximately 25 percent of the country relies on the private healthcare system. Opportunities are expected to arise over the next several years in private healthcare as a result.

One of the goals established by the country of Brazil is to provide better health services to the general population. Changes to the system in 1988 have attempted to create more help for the people but there is still progress to be made.

The public health service has been combating outbreaks of various diseases which includes sending healthcare workers to hard-hit regions of the country. Besides the movement of workers, the government has established more specialized care centers, better prenatal care, and preventative measures for diseases such as HIV/AIDS and improved care for the mentally disabled.

In the area of healthcare IT, Brazil's spending is below the average with about $2 billion spent on the country's health IT solutions. This has grown slowly over the past few years and is barely keeping pace with health spending, compared to countries where growth in IT is outpacing the total health spending.

Figure 6-11

Brazil: Healthcare Spending, Healthcare IT Spending, Healthcare Cloud Spending
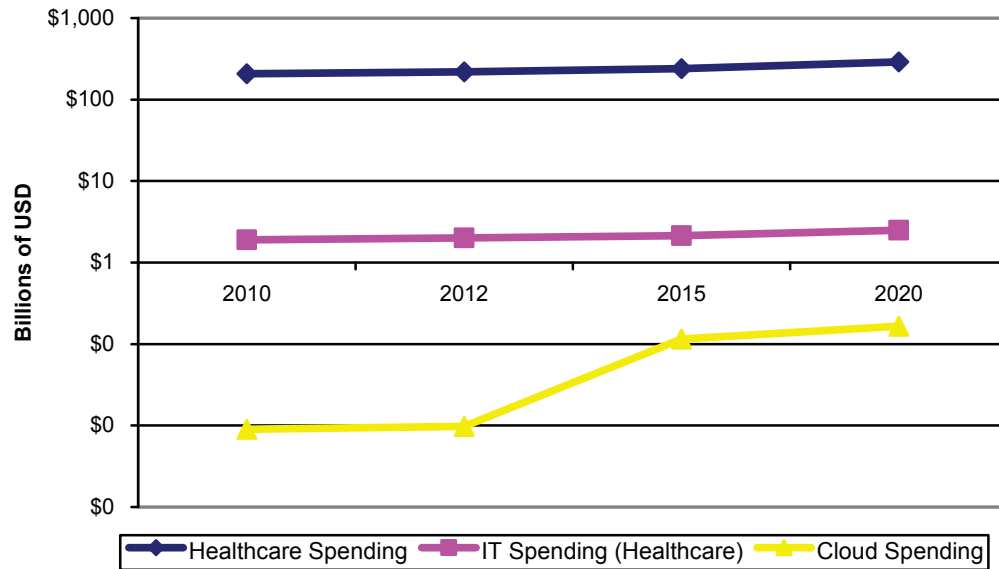
Source: Kalorama Information

India Healthcare Market

India's economy is growing and a large driver of this growth is the interest in companies seeking to relocate their production or service centers to the country. India has a large population which adds to the purchasing power and market potential of the country.

The diversity of India's economy is an advantage. The workforce is involved in both traditional Indian farming and modern industries including computer technology and technical services. Approximately 50 percent of India's economy is in services which utilizes about one third of the labor force. The majority of the workforce is involved in agriculture, representing 53%, followed by services with 28% and industry with 19%.

The versatility of India's population contributes to the country's GDP. Large numbers of English speaking people place India in a good position to export software services. However, there are social and economic problems from the huge growing population. The population of India in July 2013 was reported at 1.22 billion which is just below China making it the second largest country in the world. On a purchasing power parity basis the country's GDP ranks fourth in the world at $4.76 trillion for 2012.

India's health expenditures as a percent of GDP is between 4 and 5 percent. Rising literacy and a desire to learn about personal health is expected to increase healthcare spending in India over the next several years.

The country relies heavily on a privately funded healthcare system that is not well organized. Roughly 80 percent of healthcare is privately funded. However, a large percentage of the population in India is unable to pay for healthcare placing an increased burden on the country.

In recent years there has been an effort to increase the level of the not-for-profit healthcare in the country which is expected to take hold more as the economy grows. Bribery to get necessary treatment is not unheard of, and the number of hospitals beds for the size of the population is deficient.

For-profit hospitals are typically the better providers and are better positioned to serve wealthier Indian and Western tourists. More expensive healthcare from the U.S.

and Europe is a driver, pushing people to travel elsewhere to receive expensive services. Medical tourism in India often includes cosmetic procedures, heart transplants, skeletal replacements, and dental care.

As India's healthcare system becomes more streamline and conforming in terms of government support and regulations, the market will continue to offer increasing opportunities for medical supplies, technologies and services. The large population, aging populations, healthcare education, and increased income are significant growth points. Health IT is beginning to take hold in the region, however much of the market is in exports and services. It is likely that as the export market increases, sales within the country will also show increases.

Figure 6-12

India: Healthcare Spending, Healthcare IT Spending, Healthcare Cloud Spending
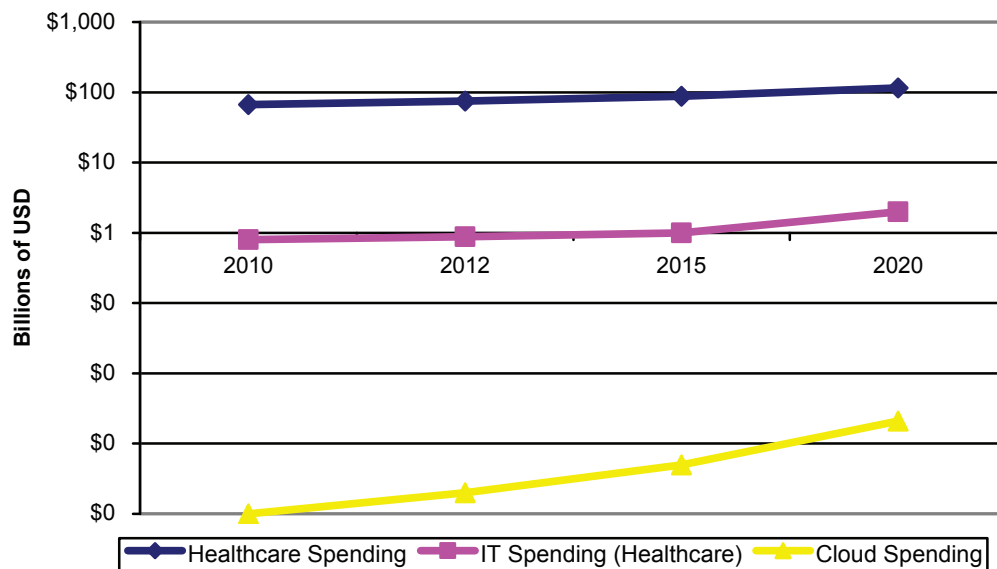
Source: Kalorama Information

China Healthcare Market

China is the largest country in the world with more than 1.3 billion people, or 20% of the global population. China's population coupled with a higher standard of living and increased disposable incomes provides an attractive market for many industries including the health segment. Investments in China's healthcare are continuing at a strong rate, posting high double-digit growth in some areas.

China's economy has changed to be more market oriented with increased international trade and a growing private sector. Many of the restructuring changes started in China in the 1970s. The subsequent efficiency of the economy is seen in an average annual growth of 10% since the 1970s. In 2011, China's expenditures on health equaled about 5.1% of GDP.

Due to the rapid and drastic changes in the economy the country has seen shifts in the environment and the people. The number of births is limited creating one of the fastest aging populations in the world. Air pollution and smoking has caused a burden on healthcare as well. The government has been pushing efforts to stop pollution and increase energy production from sources other than oil and coal. There are approximately 175 million people living below the poverty line (income of $3,600 per year) accounting for about 13.4% of the population.

Healthcare in China is very diverse, partly due to the immense size of the country and the drastic financial differences of the regions. The country's healthcare system is lacking primary care centers and relies heavily on hospital-based care. Changes in the government system have also removed some of the financial support for hospitals requiring them to procure some of their own finances.

The growth of the aging population in the country will likely force the majority of treatments from preventative care to treating chronic ailments. Treating conditions using Western style medicine is a rising trend. Others believe mixing traditional Chinese medicine and biomedical treatments may be a good approach when treating a growing aging population.

The growing adoption of IT in the Chinese health system is attracting more interest among vendors. IT spending in the country is upwards of 20% growth annually, with spending in the telecommunications segment posting the highest

increases. Growth in healthcare IT is slowing climbing, with technologies such as cloud computing also taking some hold in the country. We will likely see an increasing adoption of healthcare IT in China over the next ten years with cloud computing showing steady acceptance.

Figure 6-13

China: Healthcare Spending, Healthcare IT Spending, Healthcare Cloud Spending
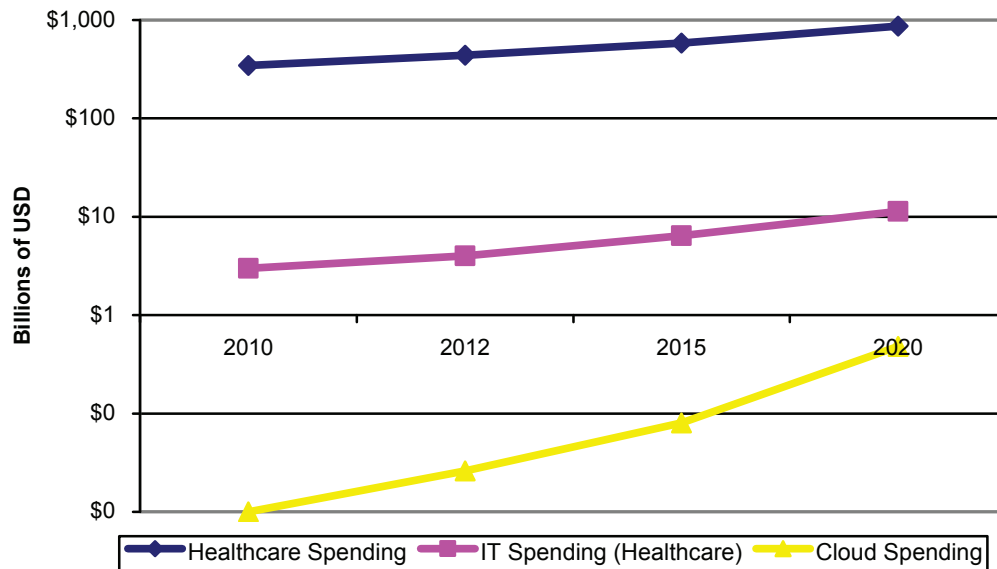
Source: Kalorama Information

European Healthcare Markets

The top region in terms of GDP is the European Union (EU). It had approximately $16.7 trillion in GDP for 2012. This group of countries spends about 11% of GDP on healthcare. France, Portugal, Belgium, Germany, and Austria are typically the biggest spenders with between 10-12% of GDP spent on healthcare.

The United Kingdom (UK) healthcare market stood at approximately $240 billion, which is around 10% of GDP. Finland's healthcare spending is in the region of 9% of GDP. Less developed regions of Europe often display a lower percentage of spending on healthcare compared to GDP, however there has been an increasing trend overall.

The approximate EU spending on healthcare is likely to remain around 10-12 percent of GDP. This is mainly attributed to the basis that the EU countries, particular those reliant on social insurance, find acceptable ways to restrain spending. This is offset by the current increase in the number of elderly people and a lower number of working age people in the workforce. All EU countries are likely to face obstacles for care including controlling costs.

Healthcare IT spending is now valued at nearly $25 billion in Europe, with cloud spending at just about $710 million. Barriers to entry have produced slow adoption of cloud in healthcare with privacy and compatibility issues among the leading obstacles. Germany is currently generating the largest share of healthcare cloud revenues, estimated at 22% of the European health cloud market.

Figure 6-14

**Healthcare IT Spending, Cloud Spending by European Country,
2012**
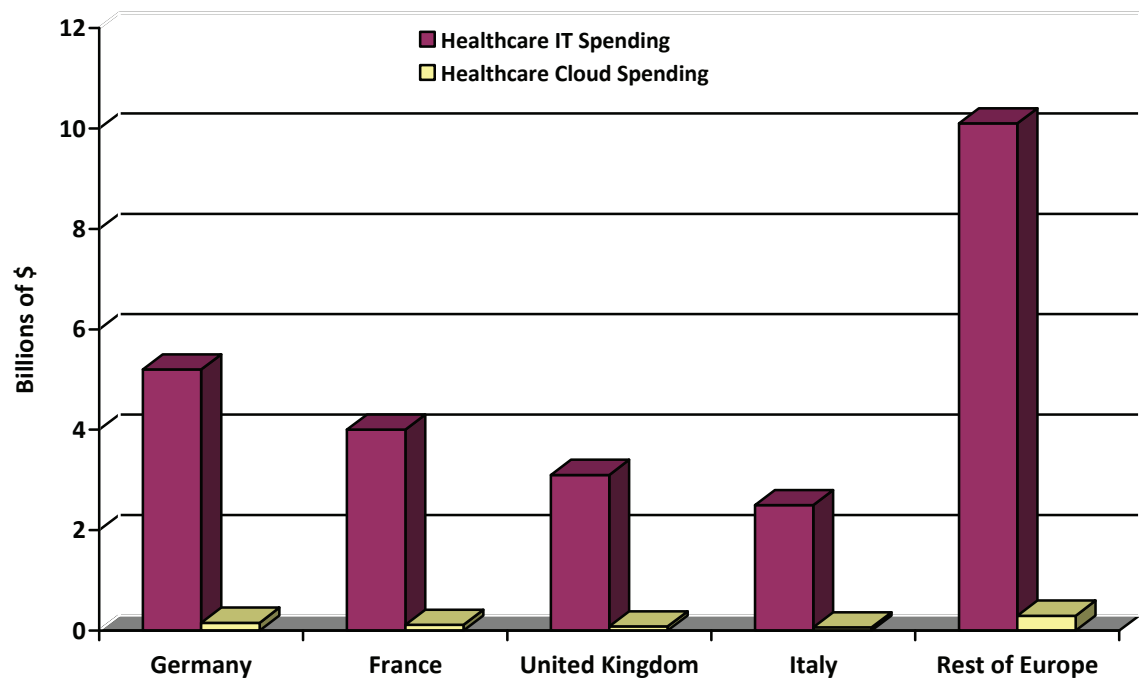
Source: Kalorama Information

CONCLUSION AND FUTURE OUTLOOK

The U.S. will continue to be the most sizeable market for cloud computing in healthcare, however, the industry is expected to witness a substantial growth in markets outside the U.S., particularly in key developing market such as China and Brazil. Industry experts and key players in the information technology industry also rate the U.S. as the most promising sector in the global healthcare IT market, but are expanding investments to other promising areas of the world.

Hospitals are likely to witness most of the investment in the cloud segment, compared to physicians, pharmaceutical developers/manufacturers and payers. In total, healthcare providers —hospitals, physicians and nursing homes, etc.—are expected to comprise about 80 percent of the IT spending in the industry with hospitals alone representing roughly 60 percent of the market.

Despite the presence of many players in the market, few players are significant. The market is expected to have more players in the future.

Most of the healthcare organizations are expected to increase their IT budget in the coming years. Rising healthcare costs, increased focus on reducing costs through preventative measures, increasing pressures to address patient safety and reduce errors, enhancement of equipment capabilities, and the increasing aged population are creating pressure on healthcare providers to reduce the operating cost of the organizations. Adopting IT solutions can help the organizations to bring down the cost over the long-term.

List of Contributors

7 Medical Systems LLC
651 Nicollet Mall
Suite 501
Minneapolis, MN 55402
612-230-7700

Allscripts Healthcare Solutions, Inc.
222 Merchandise Mart Plaza
Suite 2024
Chicago, IL 60654
312-506-1200

Acuo Technologies
Riverview Office Tower
8009 34th Ave. S
Suite 900
Bloomington, MN 55425
952-905-3440

AT&T, Inc.
208 South Akard St.
Dallas, TX 75202
210-821-4105

Athenahealth, Inc.
311 Arsenal St.
Watertown, MA 02472
800-981-5084

Axeda Corporation
25 Forbes Boulevard
Suite 3
Foxboro, MA 02035
508-337-9200

Bizmatics, Inc.
4010 Moorpark Ave.
Suite 222
San Jose, CA 95117
408-873-3032

Calgary Scientific
Suite 208 1210 – 20 Ave SE
Calgary, AB T2G 1M8
Canada

Cardinal Health
7000 Cardinal Place
Dublin, OH 43017
614-757-5000

Carestream Health, Inc.
150 Verona St.
Rochester, NY 14608
585-627-1800

Caringo, Inc.
6801 North Capital of Texas Highway
Building 2
Suite 200
Austin, TX 78731
512-782-4490

Cerner Corporation
2800 Rockcreek Pkwy.
North Kansas City, MO 64117
816-221-1024

Cisco Systems, Inc.
170 W. Tasman Dr.
San Jose, CA 95134
408-526-4000

Clario Medical Imaging, Inc.
2033 6th Ave.
Suite 333
Seattle, WA 98121
206-315-5410

ClearDATA
1600 W. Broadway Rd.
Suite 300
Tempe, AZ 85282
602-635-4020

CloudVelocity Software
2350 Mission College Blvd.
Suite 1250
Santa Clara, CA 95054
408-841-4800

Client Outlook, Inc.
103 Bauer Place
Suite 3
Waterloo, Ontario N2L 6B5
Canada
519-342-3049

CureMD
55 Broad St.
New York, NY 10004
212-509-6200

Dell, Inc.
One Dell Way
Round Rock, TX 78682
800-289-3355

EMC Corporation
176 South St.
Hopkinton, MA 01748
508-435-1000

Epic Technical Solutions, Inc.
44 Upjohn Rd.
Toronto, Ontario
M3B 2W1 Canada
416-477-7324

Forcare Holding B.V.
Laan van Vollenhove 2931
3706 AK Zeist
The Netherlands
+31 30 699 1930

General Electric Company
3135 Easton Turnpike
Fairfield, CT 06828-0001
203-373-2211

Global Net Access
2839 Paces Ferry Rd.
Suite 1110
Atlanta, GA 30339
855-280-4629

Google, Inc.
1600 Amphitheatre Parkway
Mountain View, CA 94043
650-253-0000

HealthFusion, Inc.
100 N. Rios Ave.
Solana Beach, CA 92075
877-523-2120

Hewlett Packard Corporation
3000 Hanover St.
Palo Alto, CA 94304
650-857-1501

Hitachi Data Systems Corporation
2845 Lafayette St.
Santa Clara, CA 95050-2639
408-970-1000

International Business Machines (IBM)
1 New Orchard Rd.
Armonk, NY 10504
914-499-1900

Intel Corporation
2200 Mission College Blvd.
Santa Clara, CA 95054
408-765-8080

McKesson Corporation
One Post Street,
San Francisco, CA 94104
415-983-8300

Medical Insight
1040 W Adams St.
Suite 426
Chicago, IL 60607
773-255-8215

Medicalis Corporation
201 Mission St.
Suite 2240
San Francisco, CA 94105
877-579-5454

Microsoft Corporation
One Microsoft Way
Redmond, WA 98052
425-882-8080

Nuvodia
1200 12th Ave. S.
Q10 Building
Seattle, WA, 98144
855-568-8634

Oracle Corporation
500 Oracle Parkway
Redwood Shores, CA 94065
650-506-7000

Quest Diagnostics
3 Giralda Farms
Madison, NJ 07940
800-222-0446

Practice Fusion, Inc.
420 Taylor St.
San Francisco, CA 94102
415-346-7700

Sevocity
9830 Colonnade Blvd.
Suite 377
San Antonio, TX 78230-2202
877-777-2298

Siemens AG
Healthcare Sector
Henkestrasse 127
D-91052 Erlangen
Germany
+09131-84-0

Siemens Medical Solutions USA, Inc.
51 Valley Stream Parkway
Malvern, PA 19355
888-826-9702

Verizon Communications, Inc.
140 West St.
New York, NY 10007
212-395-1000

VMware, Inc.
3401 Hillview Ave.
Palo Alto, CA 94304
650-427-5000

Xerox Corporation
45 Glover Ave.
Norwalk, CT 06856
203-968-3000