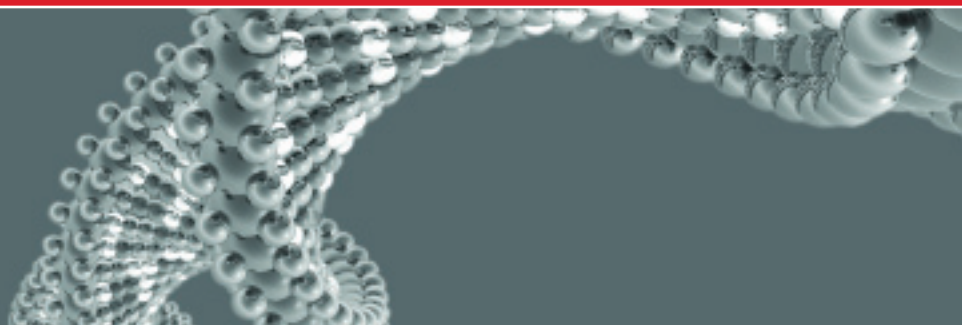# Kalorama Information

Tablet PCs in Healthcare

TABLET PCS IN HEALTHCARE

A KALORAMA INFORMATION MARKET INTELLIGENCE REPORT

Tablets PCs 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.

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                                                                                      July 2013

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Executive Summary

TABLETS IN HEALTHCARE: AN OVERVIEW

Tablet PC devices are often used to streamline healthcare workflow and improve efficiency in patient care. Tablets offer benefits to patient care by providing well-organized ways to complete common tasks, such as diagnosing, consulting, monitoring and treating patients.

Kalorama Information has added the *Tablet PCs in Healthcare* report to its complete line of health industry technology reports. The entire medical technology industry is in flux. The growing demands on the health industry have resulted in higher demand for new and better medical technology products. However, the government is also trying to limit and lower public health care costs by instituting a planned health system reform. The main goals of this reform are cost savings and increased efficiency. New technologies in the health IT segment are emerging in response to increased healthcare needs of an aging population, streamlining and efficiency demands, changes in reimbursement, new wireless technologies—including wireless monitoring technologies, decreasing healthcare resources, an emphasis on reducing hospital days, and proven cost-effectiveness.

End-Users

There are four primary markets for these new technologies, which are as follows:

- Hospitals

- Physician offices

- Home healthcare and nursing homes

- Other, including first responders, institutional, and military.

Each system has advantages and disadvantages, and each of the end-user markets—hospitals, physician offices, home healthcare and nursing homes, and other—has different priorities.

Hospitals

Hospitals are concerned with the ability to access patient data within the hospital, during transport and at ancillary facilities. The benefit of having the data sorted for a clinician to access direct patient data quickly and from all departments is far reaching. Use of electronic medical records is more prevalent within hospitals than in the other markets; mobile devices, such as tablet PCs can be invaluable to staff in facilitating patient care. Hospitals frequently use intranets for data storage rather than web-based systems so PCs must be able to support networking functions.

Physicians 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

Independent physicians, who practice in groups of five or less, form a majority of the practicing physicians. 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 and have been slower to adopt technology in their practices as compared to hospitals. However, the trend is growing and many physicians are finding the benefits of tablets and other IT solutions to be invaluable in their practices, both within the office and outside the traditional office environment.

Home Health and Nursing Homes

Home health care can be ordered by hospitals or physicians and can range from monitoring basic vital signs after discharge from an acute facility or to manage a chronic condition or disease such as obstructive pulmonary disorder (COPD), asthma, cardiovascular conditions, respiratory conditions, perinatal monitoring, sleep apnea, or diabetes. In these cases, a combination of on-site monitoring devices and mobile management devices (Tablet PCs) are used in combination to deliver optimal patient care.

Nursing homes, including skilled nursing homes, rehabilitation nursing homes, and assisted living facilities, have needs somewhere between those of hospitals and home healthcare. Patients in these facilities may require basic vital sign management, around-the-clock patient monitoring or select rehabilitative care. Patients range from short-term rehabilitative patients to long-term residents, with all ranges of patient mobility. A useful technology for nursing homes is a health kiosk, which in many cases uses a detachable tablet PC. A patient can sign in with a password, have various measurements taken, and then upload data into a patient record that can be accessed by the patient, his or her family, and the patient's healthcare providers. This is a cost-effective means for taking various measurements for a large number of patients.

Other Markets

Other markets include first responders, institutions (such as correctional institutions), and the military. Military users typically need different types of equipment, from first-responder type devices to portable field hospitals that can provide a full range of patient care services. Correctional institutions may use a

combination of home healthcare-type equipment. First responders need equipment that can provide patient monitoring, relay the information to an emergency room, and be both portable and heavy duty. Many tablets are designed specifically for first responder or military use.

METHODOLOGY

The information for this report was gathered using both primary and secondary research including comprehensive research of secondary sources such as company literature, databases, investment reports, and medical, information technology and business journals. Telephone interviews and email correspondence were the primary method of gathering primary information. Primary sources were the basis in gathering information specifically relating to revenue and market share data presented in this report. Specific interviews with IT company representatives included marketing directors, division managers, and product representatives.

All market data pertains to the world market at the manufacturers' level. The base year for data was 2013. Historical data was provided for the years 2008 through 2012 with forecast data provided through 2018. The forecasted market analysis was highly influenced by the uptake of new technologies in the health industry, government incentives and requirements, product marketing, availability and demographic trends.

SIZE AND GROWTH OF THE MARKET

The global market for tablet PC devices in healthcare is expected to increase to $1.7 billion for 2013, reflecting an annual increase of 26.8% over 2012. Several factors are driving the growth of this market including a growing and aging population, shortage of qualified medical professionals, cost restraints, medical error reduction measures, government incentives, expanding capabilities of devices, off-site medical care and more.

Revenues for the market include estimated sales for tablet devices, including hybrid and convertible tablets, where medical professionals or institutions have used these devices for at least 50% health-related use. For example, sales to physicians who use tablets for other than health use or less than 50% for their patients' care are likely to be excluded. Estimates are used to exclude this use.

Growth will remained strong, posting double-digit increases through the forecast period, with sales exceeding $4.5 billion in 2018. The increasing adoption of tablets in the health industry will drive developers/manufacturers to continue to rollout new, advanced products, securing a healthy market for upgrades and replacement units.

Figure 1-1

The Global Market for Tablet PCs in Healthcare
2008 through 2018
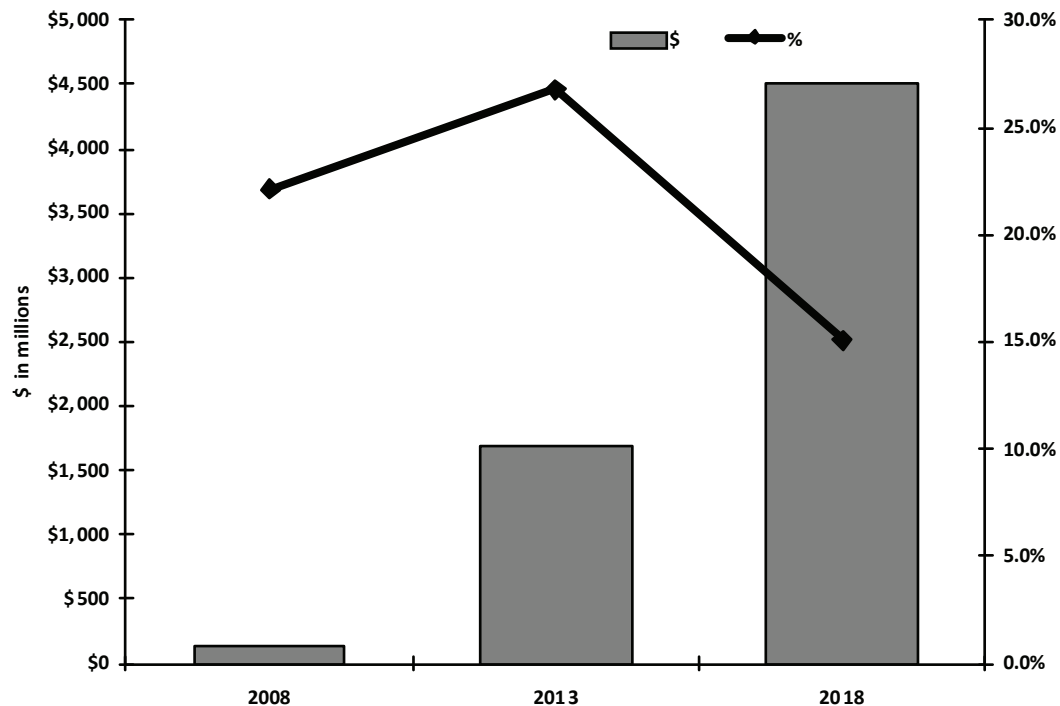
Source: Kalorama Information

Key Market Findings

Tablet PCs are increasingly being used for a variety of tasks in the health field including access to patient records at the point of care, improved viewing capabilities for medical images, and easy offsite patient monitoring. Some of the key findings in the report include:

- Sales for tablets vary by end user, hospitals account for the majority share of sales.

- Adoption of tablets in hospitals has experienced the highest growth over the 2008-2013 period, followed by physicians.

- Physicians account for the highest usage of tablets with 65% of physicians in the U.S. using a tablet for patient care and clinical functions.

- The U.S. market is the largest for tablet sales in healthcare with more than 40% of sales.

- Asia-Pacific has been the fastest growing market for tablets in health settings.

- Japan is the second largest individual country for sales behind the U.S.

- Apple is the leading provider of tablet PCs.

ISSUES FACING THE IT HEALTHCARE MARKET

As a whole, the healthcare industry is facing intense pressure to improve quality, control costs, and meet ever-changing government requirements. To meet these challenges, many health facilities are focusing on improving workflow and restructuring information system infrastructures. Some of the issues include:

The list of trends and factors affecting the market for tablet PCs in healthcare include:

- EMR Compatibility and Functions

- Efficiency in Healthcare with IT

- Growing Availability and Use of Medical Apps for Tablets

- E-Prescribing: A Driver to Tablet Adoption

- Demand on Healthcare with Aging Populations

- Health Spending and Cost Saving Efforts

- Health Information Technology and American Reinvestment and Recovery Act of 2009

- HIPAA

- FCC and Medical Wireless Communication

COMPETITORS

The once niche area of healthcare tablets has become a highly competitive segment of the industry, booming just after the iPad launch which took many professional industries by storm.

Several market participants are involved in this industry and a few are discussed in detail in this report including:

- Apple

- Barco

- Cybernet Medical

- Dell

- Fujitsu

- Hewlett Packard

- Lenovo

- Motion Computing

- Motorola

- Panasonic

- Research In Motion

- Samsung

- Socket Mobile

- Tangent

- ViewSonic

Introduction

MOBILE DEVICES: INDUSTRY OVERVIEW

Mobile devices, defined as smartphones, PDAs, tablets, hybrid notebooks, ultrabooks and other names, have become a growing area in the healthcare industry. These devices provide a range of programs, convenience and efficiency that can't be achieved with traditional computers and pocket drug references. Personal digital assistants (PDAs) have essentially transformed into smart phones due to the increases in compact technology and the demand for handheld digital devices that can "do-it-all". Tablets, mobile computers, hybrid computers, ultra books and the like, allow for more flexibility, a wider viewing area, more capabilities and options over smaller mobile devices. Tablets and similar devices are taking hold in the industry at a rapid pace.

Decreasing costs for mobile devices have also placed them within reach for a growing number of consumers in both developed and developing countries around the globe. These consumers have started using their mobile device to perform business tasks and the health industry is no exception. At a cost of roughly $500 many devices offer convenience in business tasks at an affordable price.

Specific capabilities that mobile devices offer include:

- Global internet connectivity/web browsing

- Relatively fast processors and operating systems

- Voice communication (through both cellular provider and Voice Over Internet Protocol—VoIP)

- Bar-code scanning (through accessories and applications)

- Larger, high resolution screens or touchscreens

- E-mail—including access through online providers (may also receive constant updates and read/write abilities)

- Photo/video capture and send (some with flash and audio)

- Local Area Network (LAN) and Wi-Fi wireless connectivity

- Removable storage for saving data, pictures, video, music and other stored content (often in the form of microSD cards)

- Bluetooth—short range wireless connection technology that can connect phone accessories (such as headsets) but can also support wireless internet access.

- Voice recognition. For example, smartphones with the capability can "listen" to a spoken word, and input the text in a program like a search engine. Other uses may be to convert speech-to-text and then convert text back to speech in another language. Professionals using smartphones have used the technology to save time by limiting the use of small keyboards to input short phrases.

Two well-known mobile brands are Blackberry by Research in Motion and the iPhone by Apple, Inc. Around the world the Blackberry was responsible for almost 30 million BlackBerry handheld devices sold. The iPhone sales were reported at 125 million units, while the iPad sales reached 58 million units for 2012. These two products offer comparable features, but generally, Apple offers the largest number of apps for consumers.

When considering a device, businesses and professionals often look to the available applications in making a decision. There are hundreds-of-thousands of apps available for users for both phones and tablets. For example, the Apple App Store offers more than 750,000 apps for its users. The Android app market has increased to

be comparable in offerings with Apple, having more than 700,000 apps available to users. Within specific categories like health management, there are several hundred apps available. Specific apps help monitor heart rate, manage diabetes, record exercise schedules, and link with larger computer systems for managing health records. The use of mobile devices in professional healthcare is continuing to take shape, but some providers have seen the potential and are taking advantage of the technology.

APPLICATIONS: EXPANDING CAPABILITIES

Mobile device apps are relatively small programs that are designed for a certain application or task. Apps are downloaded to advanced mobile devices that have the ability to operate them. Comparatively, standard devices, such as traditional cellular phones, do not have the software or hardware capabilities for running apps.

The powerful features of smartphones and tablets are part of the reason why apps are popular. These devices can be used for a variety of things but they are small and portable. The average smartphone is larger than a typical cellular phone, but they fit easily in a clothes pocket and the tablet is smaller than a laptop computer with an average size of about 10-inches.

In everyday use, a physician or healthcare worker could use one app to reference updated drug information, and at the same time, be informed if an e-mail was received from one or more e-mail providers. For example, a Google G-mail internet e-mail account can be accessed via the mobile device, even if the user is involved with another program. If an e-mail is sent to the G-mail account, the phone receives the information from the account and updates the user. This is one of a multitude of options that smartphone and tablet user have, because of the flexibility of programs and the hardware within the phones.

DEFINING TABLET PCS

Tablets are defined as portable personal computers, wireless, and most offering a touchscreen display. Tablets have much of the capabilities of a full size computer but are portable and fit in the hand of a medium to large adult. Tablets can be classified into several types:

- Traditional slate style - these are touchscreen tablets with an integrated screen keyboard.

- Rugged style - these tablets are often designed with a traditional styling in mind while providing added protection in the design against falls, shock, dirt, water or other fluids, and disinfecting.

- Convertible style - the unique feature with convertible tablets are the 180˚ rotating screen, these can swivel around, folded and closed, providing a range of viewing options. Input methods include either touchscreen or digital pen.

- Hybrid style - these tablets are designed with both tablet and mobile computer in mind. The keyboard is detachable to offer both laptop PC options and tablet PC options in one unit.

Leading Mobile Device Operating Systems

Android is a growing operating system (OS) especially in the U.S. market. Some of the current hardware developers are moving to make more products for the growing platform due to its popularity. Sony Ericsson announced that it was transitioning from the Symbian platform to the Android platform in 2010. Samsung, another device developer, also reported moving to develop more products for Android OS.

Table 2-1

Leading Smartphone Operating Systems

Operating System	Company
Android	Google, Inc., through purchase of Android Inc.
Blackberry OS	Research-in-Motion Ltd.
iOS	Apple, Inc.
Palm OS or Garnet OS	Hewlett Packard
Symbian	Nokia, through the purchase of Symbian Software Ltd.
Windows Mobile and its successor, Windows Phone 7	Microsoft Corp.

Source: Company websites

WHY TABLET COMPUTERS?

Tablet computers have been around for several decades. Earlier devices date back to the 80's and 90's but due to low application support, prices, and bulky systems the tablet concept never really took off. Advances in battery technology, application development, pen-input (handwriting to text conversion), compact internals, vivid screens, improved processors, lower prices, and lightweight packages have reinvigorated interest in the device.

There are also now more modifications to what was considered a traditional tablet, including some with a detachable keyboard to quickly transition from a touchpad to a more efficient typing device.

Research reports indicate that up to 30% of digital media users have a tablet for personal use, and the iPad is one of the most popular. The first iPad was originally launched in 2010 but is in its fourth generation as of late 2012. There are also now more specialty tablets available, sometimes called e-readers, including Kindle Fire from Amazon and Nook from Barnes & Noble.

Tablet Computer Technology

Tablet computers have been developed to fit average consumers with limited technological backgrounds to advanced users in specialty industries. Some are simple products with very few peripheral or wired connection options and others are offered with built-in barcode, mag-strip and RFID readers. In general however, the technology behind the typical tablet computer is fairly straightforward. The devices generally feature a touchscreen, compact CPU, compact battery, 6-12hr battery life, 1-2 GB of RAM, 1-2 GHz processors, integrated cameras, and built-in memory.

Available integrated memory ranges from about 8GB to 128GB but there are some that offer less. Many tablets can be expanded with added flash memory disks often with an optional MicroSD card or similar. Prices for MicroSD cards depend on capacity but they can be found for about $20-$100 each.

Some of the processors (CPUs) offered in tablets are a little different from desktop or laptops, but newer tablets can operate powerful programs with some very quick processors. For example, Motion Computing offers tablets with Intel's Core i3, i5, or i7 CPUs which are leading Intel products for any device. There are some quad core processors in tablets like the Samsung Galaxy Note 10.1 and the ASUS Transformer Pad. The number of cores combined with clock rate result in total performance. The speed of tablets are also limited by graphic processing units (GPUs), the amount of random access memory (RAM), and the efficiency of the software, among other things.

Big players in compact device processors include Nvidia (Tegra processors), Qualcomm (Snapdragon), Samsung (Exynos 5), and Apple (A6x). The speed of a processor is a big component but the efficiency is also key. Processors use battery power so low power usage with high speed is a desirable attribute for tablets.

Display type and resolution has been discussed by healthcare professionals as a strong feature for tablets. The 3rd/4th generation Apple iPad with Retina display stands-out in this category. When looking at detailed images on a Retina display the average human user looking from a normal viewing distance is expected to not see pixilation on the screen. An Apple 10" screen is similar in size to many other tablets but image detail within the screen size is a key component.

Different display technologies also affect the look of a screen. Display panels using In-Plane Switching (IPS) technology typically produce accurate colors and wider viewing angles. There are several variations of IPS technology but tablets that use a true IPS technology will display more accurate colors and be able to be viewed from more dramatic angles. The iPad features an IPS technology. In 2011, the FDA approved the use of the iPad and the first medical radiology app citing that the luminance, image quality, and noise levels were up to international standards.

Lithium ion batteries and lithium polymer batteries are used in tablet computers. The lithium polymer technology allows for smaller battery sizes and no active protection circuit for overheating protection. Lithium ion batteries generally have greater power capacity.

Table 2-2

Select Tablet Specification Comparison

Manufacturer	Samsung	Samsung	Apple	Microsoft	Motion Computing	Barco	Panasonic
Device	Galaxy Tab 2 7.0	ATIV Tab 3*	iPad (4th gen)	Surface RT	C5t	ProScribe (MTPP-0212)	Toughpad FZ-A1
Screen size	7"	10.1"	9.7"	10.6"	10.4"	12"	10.1
Resolution	1024x600	1366x768	2048x1536	1366x768	1024x768	1024x768	1024x768
Battery type	lithium polymer	-	lithium polymer	-	lithium ion	-	lithium ion
Battery size	4000 mAh	-	42.5Wh	31.5 Wh	40 Wh	-	4770mAh
Battery life	~12 hrs	~10 hrs	~10hrs	~8 hrs	~6 hrs (hot swap capability)	-	~10 hrs
Built-in memory	8GB	64GB	16GB, 32GB, 64GB or 128GB	32GB, or 64 GB	64GB, or 128GB	4GB	16GB
Random access memory (RAM)	1GB	2GB	1GB	2GB	2GB or 4GB	1GB	1GB
Camera	yes, 3 megapixel	yes	yes, 5 megapixel	yes	yes, 3 megapixel	-	yes, 5 megapixel
Warranty	1 year	-	1 year	1 year	3 year	-	3 year
Weight	12.2 oz	18.6 oz	23 oz	24 oz	52.8 oz	61.6 oz	33 oz
Processor	dual core Samsung 1GHz	dual core Intel Atom 1.8GHz	dual core A6X	quad core Nvidia Tegra 3 1.3 GHz	dual core 4 thread, Intel Core i7, i5 or i3 up to 3.2 GHz with Intel Turbo Boost	single core Intel Atom N270 1.6 GHz	dual core Marvell Armada PXA2128 1.2GHz

Continued next page

Table 2-2 (continued)

Select Tablet Specification Comparison

Manufacturer	Samsung	Samsung	Apple	Microsoft	Motion Computing	Barco	Panasonic
Wi-Fi	yes	yes	yes, dual band	yes	yes	yes	yes
USB port	USB 2.0 (1)	-	Apple Lighting port to USB cable, not available for video/audio output	USB 2.0 (1)	USB 3.0 (1)	yes	micro USB 2.0
RFID reader	none	none	none	none	yes, read and write	yes (optionally embedded)	none
Operating system	Android	Microsoft Windows 8	Apple iOS	Windows RT	Windows 7 Professional	Windows	Android
Barcode reader	none	none	none	none	yes, optional, 1D/2D	yes (optionally embedded) 1D/2D	yes, optional
MSRP	$199	-	$629	$499	~$2,200 for i7 model; prices based on options	-	$1,400

* announced June 2013

Source: Manufacturers

Connection Speeds

Data connection speeds have provided a boost for most tablet users. Data connection speeds are provided by the wireless infrastructures around the globe. If a tablet (or even a smartphone) has a faster connection speed type, it can browse the web quicker, send/receive large files faster, and generally allow a person to use information sources more quickly.

For faster connections, some physicians or health professionals may opt to use a wireless office internet modem (Wi-Fi) which can be much faster than a cellular data connection speed. Wi-Fi connectivity could also be integrated with an existing office setup reducing costs.

The 3rd Generation (3G) phone connection is a relatively fast connection method. This connection speed is offered in most industrialized nations around the globe. The cellular 3G mobile connection standard was first launched in Japan in 2001.

The newest connection generation, 4G has become more widespread in the U.S. in 2011 and 2012. By the end of the first quarter of 2012, estimates suggest that users of 4G connections account for less than 2% of global users but numbers are growing and several tablets feature 4G connectivity options.

The percent of users with 4G connection devices showed an increase in internet traffic. This indicates that users of 4G devices use the internet more, partially based on the faster connection speed.

Each consecutive transition to faster mobile connection speeds has been happening about every 10 years. The first generation 1G was introduced in the 1980s.

Table 2-3

Data and Wi-Fi Download Connection Speed Comparison

Connection Type	Estimated Real World Connection Speed
3G	.5 - 1.0 Mbps
4G	1 - 2.5 Mbps
Wi-Fi (wireless modem internet connection)	
• DSL internet connection	1.5 - 6 Mbps
• Cable internet connection	3 - 15 Mbps

Source: Kalorama Information

Consumer Acceptance

The iPad gained popularity with consumers partly due to the popularity of the earlier, smaller, siblings the iPhone and iPod Touch. Users that adopted the iPad after phones were familiar with the apps, interface, and the technology but enjoyed a bigger keyboard, larger screen, a little more power, and better resolution. Likewise, Samsung's popular Android Galaxy phones are also very similar to the Galaxy Tab tablet computers.

Bring-your-own-device (BYOD) is a component of the consumer involvement in mobile technology. The term BYOD represents using workplace-type programs but on a personal device. A health center might relegate the connection types available or what percentage of work access is allowed on personal devices. For example, a nurse could connect to a Wi-Fi router or use apps with an Android tablet but not access the hospital network. Alternatively, the workplace could offer an EMR app for access on personal devices with the correct security protocols.

Approximately half of Americans in 2013 use a smartphone. The use of smartphones by consumers has encouraged the adoption of the very similar tablets in professional work. This has been discussed by IT professionals who have noted an increase in the average employee's ability to navigate some new mobile computer technologies. Because healthcare professionals have used their personal smartphones and tablets for professional work, it seemed like a natural process to adopt similar technologies when moving to digital patient information systems.

Tablets have been viewed by some hospitals as a way to increase mobility and transition to a digital information sharing process specifically in electronic health records (EHRs) and computerized physician order entry (CPOE) at the point of care. The traditional computer systems at hospitals and clinics are attached to small desks often mounted to wall cabinets or moveable carts. The use of tablets has emerged as an alternative to desktop or other hardwired systems.

Tablets have some shortcomings however, popular consumer tablets are designed for consumer use, and many do not support the gamut of healthcare technologies like barcode readers, RFID scanners, or keyboards. Further, some professional tablets may not have the full app support of the consumer systems.

The benefits of the current tablets, as reported by physicians, are based on wireless connectivity of all the providers in a health network. For example, a physician can receive patient test results on the tablet minutes before visiting a patient, then update records digitally, and order prescriptions as needed.

HEALTHCARE EFFICIENCY

In May 2009, a group of leaders in the U.S. healthcare system met with President Obama to pledge a reduction in healthcare spending over the next 10 years. Those in attendance included:

- Advanced Medical Technology Association

- American Hospital Association

- American Medical Association

- America's Health Insurance Plans

- Pharmaceutical Research and Manufacturers of America

- Service Employees International Union.

The total amount set as a target decrease in spending is $2 trillion or more over the 10-year period. More specifically there is a target decrease in the growth of spending of 1.5% per year over 10 years.

The U.S. Healthcare Efficiency Index (USHEI) provided by an independent Advisory Council, reports that the U.S. Healthcare system is 43% efficient.

A significant focus of the U.S. Government and the healthcare industry is to move from paper-based system to an electronic system. The use of mobile devices may provide program developers with more options that healthcare workers can integrate easily into their workflow. A big part of the easy integration is that healthcare workers are using tablets and smartphones for personal use, which reduces the apprehension that can come from learning a new system.

HEALTHCARE ESTABLISHMENTS

The healthcare industry includes establishments ranging from small private practices 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 such as mental hospitals, cancer hospitals, and cardiac hospitals, etc.

- **Physician Offices** – Physician offices form approximately 40% of the total healthcare establishments in the U.S. Physicians practice privately as well as 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 needy patients. Another type is a residential care facility, which provides 24-hour care to children and elderly patients, etc., alike.

- **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.

- **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.

- **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 Centers** – These include inpatient medical/surgery units and critical care units.

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.

While growth in information technology will be slightly faster in the home healthcare segment, the hospital market is more established and likely to see stable market conditions. Additionally, the hospital segment is further along in adapting information technologies and EMRs. The hospital market now needs to incorporate hospital-grade wireless and remote technologies, applications with advanced clinical uses, and applications that transfer data to EMRs into their systems.

While growth for information technology, including tablets, will see steady increases, as compared to an increase in home health and physicians' offices, hospitals will account for a larger share of market revenue as these facilities buy much more expensive units. In addition, there will continue to be significant growth in the hospital market for advanced technologies as hospitals replace older equipment with portable and/or wireless technologies that upload data to centralized workstations.

U.S. Hospital Segment

Changes in the hospital segment of the industry have a great influence on the technology industry. In the United States there is a trend toward consolidation in the hospital industry which results in changes in hospital structures. As shown in the figure below, there is a declining trend in the number of hospitals in the U.S. This can have positive or negative effects on this segment of the market. However, statistics are showing some leveling off in declining facility numbers—by 2015 the figure is estimated to be fairly stable at 5,700 hospitals in the United States.

According to the American Hospital Association, the total number of hospitals has decreased in the last 30 years. From over 7,000 in 1975, the number of hospitals has reduced to 5,754 in 2010 and then to 5,724 in 2011, representing an overall

decline of 20 percent. The decline is present in most areas of hospital types, during 2010 there were 4,985 community hospitals which declined slightly in 2011 to 4,973. Government-owned hospitals have declined by about 35 percent from 382 in 1975 to 213 in 2010,[1] in 2011, this number declined further to 208.

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[1] Source: http://www.aha.org/aha/resource-center/Statistics-and-Studies/fast-facts.html

Table 2-4

U.S. Registered Hospitals by Type, 2011

Hospital Type	Registered Facilities
Community Hospitals[1]	4,973
Federal Government Hospitals	208
Nonfederal Psychiatric Hospitals	421
Non-federal Long-term Care Hospitals	112
Institutional Hospitals (includes prison hospitals, college infirmaries, etc.)	10
Total U.S. Registered Hospitals	5,724

[1]community hospitals include nonfederal, short-term general, state specialty hospitals. Excluded are hospitals not accessible by the general public such as prison hospitals or college infirmaries.
Source: American Hospital Association, U.S. Census Bureau.

Figure 2-1

Distribution of U.S. Registered Hospitals by Type, 2011

Hospital Units of
Institutions
0%

Nonfederal Long-Term
Care Hospitals
2%

Nonfederal Psychiatric
Hospitals
7%

Federal Hospitals
4%

Community Hospitals
87%

Nongovernment Not-
for-Profit Community
Hospitals
51%

For-Profit Community
Hospitals
18%

State and Local
Government
Community Hospitals
18%
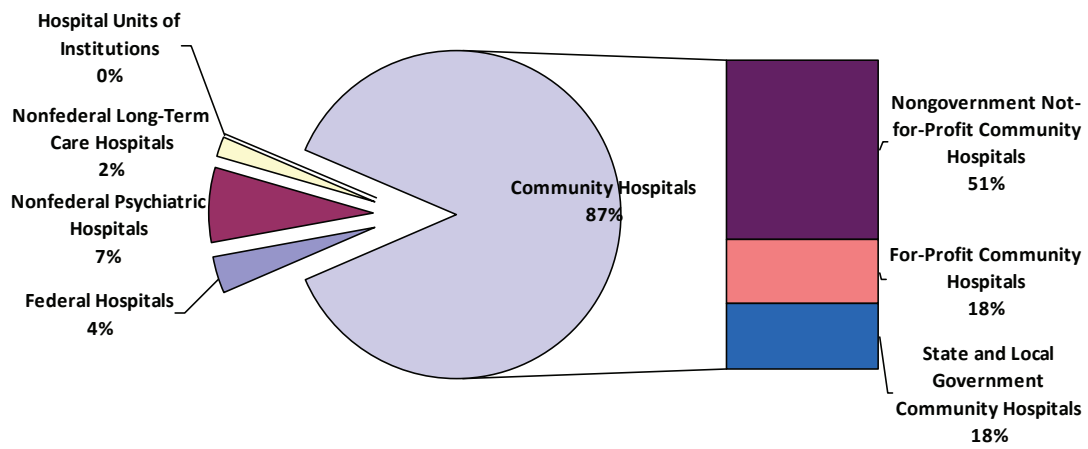
Source: American Hospital Association, U.S. Census Bureau.

Figure 2-2

Number of Hospitals in the US, 1975-2005, Estimated 2015

Source: http://www.aha.org/aha/resource-center/Statistics-and-Studies/fast-facts.html
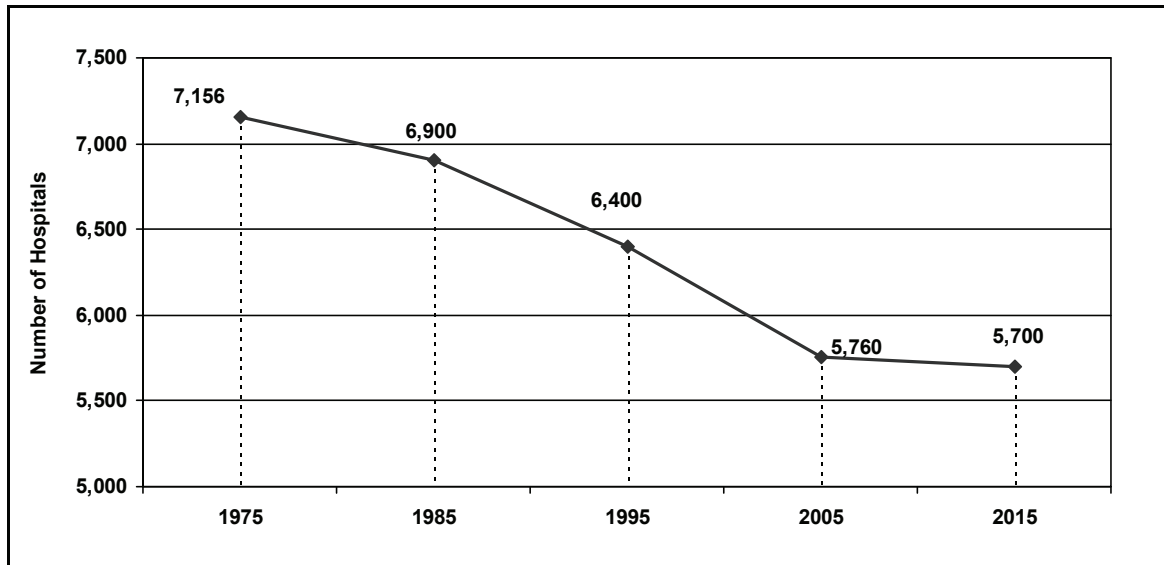
U.S. Hospital Chains

HCA, Inc is the largest hospital chain in the United States with 164 facilities in operation. This is followed by Community Health Systems with 130. Spending and budgets are also a key factor in the demand for new technologies. See the following tables for details.

Table 2-5

Leading For-Profit U.S. Hospital Chains, 2008 and 2010

Hospital Chain	Hospital Facilities		Licensed Beds		Revenue (million)	
	2008	**2010**	**2008**	**2010**	**2008**	**2010**
HCA Inc. (The Healthcare Company)	158	164	38,504	38,830	$28,374	$30,683
Community Health Systems, Inc.	118	130	17,245	19,372	$10,919	$12,987
Tenet Healthcare Corporation	54	50	14,352	13,428	$8,585	$9,205
Universal Health Services, Inc.	26	25	6,101	5,689	$5,022	$5,568
Health Management Associates, Inc.	56	59	7,684	8,864	$4,302	$5,115
Vanguard Health Systems, Inc.*	15	15	4,135	4,135	$2,791*	$3,377*
LifePoint Hospitals, Inc.	48	52	5,686	5,915	$2,701	$3,262
Select Medical Holdings Corp.†	93	111	4,222	5,163	$1,488	$1,702
HealthSouth Corporation	99	103	6,463	6,745	$1,830	$1,999
Kindred Healthcare	82	89	6,482	6,887	$1,837	$1,973
IASIS Healthcare Corporation**	15	17	2,644	3,570	$1,524	$1,729**

*fiscal year end June 30

**fiscal year end September 30 – reflects acute care revenues, excludes the company's premium revenues.

†includes specialty hospital figures only, excludes outpatient rehabilitation facilities and revenues.

Source: American Hospital Association, U.S. Census Bureau.

Consolidation in the Industry

Large U.S.-based hospitals benefit from economies of scale. They have lower costs per patient or per procedure because of volume discounts in purchases and other similar factors. Therefore, it has been observed that many hospitals have been merging to form a bigger group. Merged hospitals often find it easier to borrow money and make greater profits because of decreased competition.

Hospital Systems around the World

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 2-6

Registered Hospitals and Acute Care Centers by Country

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

Source: Kalorama Information

Figure 2-3

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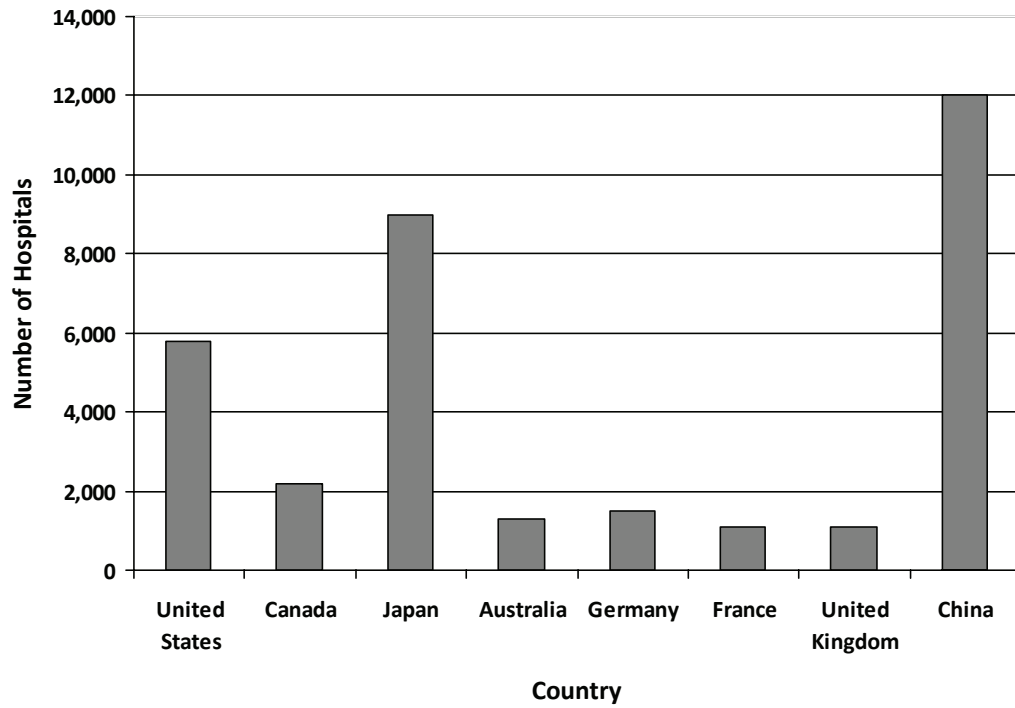
Source: Kalorama Information

Physicians

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 use handheld or portable technology devices 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. 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.

Figure 2-4

Number of Physician Offices, United States, 2000-2009
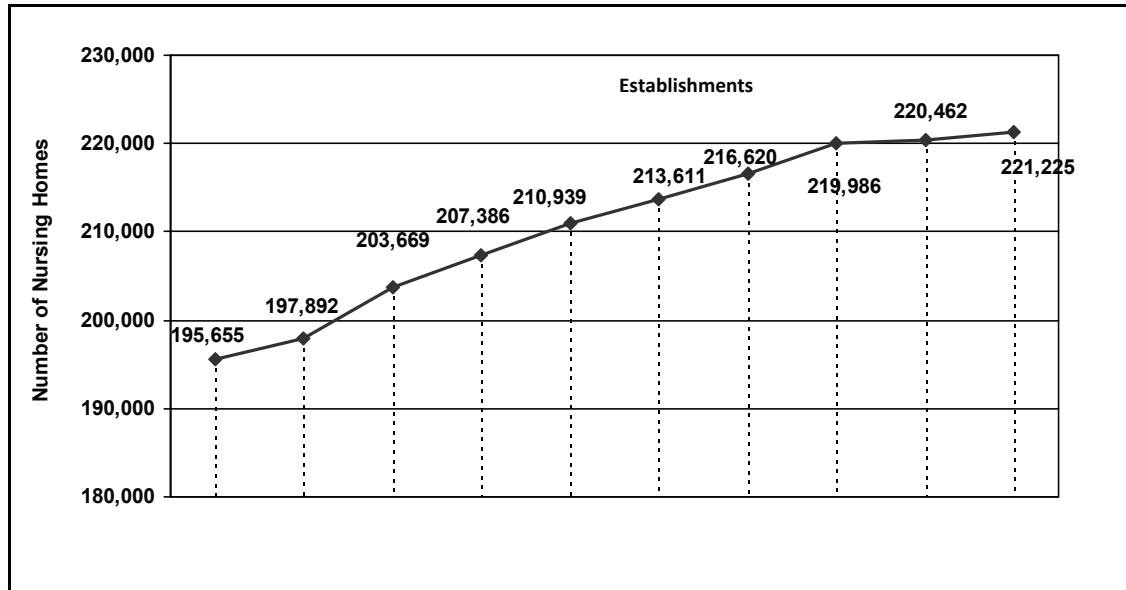
Source: http://www.census.gov/epcd/susb/2009/us/US623110.HTM

Note: The firms and establishments shown are only those with payroll

Note: latest year available.

Number of Physicians

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.[2] 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.[3]

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[2] Source: http://www.ama-assn.org/ama/pub/category/12930.html
[3] Source: http://www.aha.org/aha/content/2006/pdf/PreparedToCareFinal.pdf

The Association of American Medical Colleges (AAMC) estimated that there would be a shortage of over 124,000 physicians by 2025. Universal healthcare is expected to impact the shortage by increasing the demand.

Shortage of Specialist Physicians

The demand for specialist physicians is going to increase to about 800,000 by the year 2020, up from about 620,000 in 2010. Physician specialties showing the highest demand and inability to find adequate coverage in hospitals, emergency care centers, and ambulatory facilities most specifically include orthopedists, neurosurgeons, and psychiatry.

International Access to Physicians

Around the globe, the number of physicians per 1,000 people in the population is between about 1 and 4.

Table 2-7

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.

Nursing Homes

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.

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

As with home healthcare, there is a vast range of patient levels in nursing homes. Assisted living patients or those in rehabilitation facilities may be somewhat ambulatory, as may some patients in skilled nursing homes. Nursing homes with a large number of ambulatory patients may be candidates for healthcare kiosks that can capture data for a large number of patients. Some kiosks have users key in passwords for secure access to data and may upload the data to the internet, where it can be accessed by the healthcare provider. Low reimbursement rates for nursing homes will be a factor in limiting growth, although nursing shortages in this segment will eventually force nursing homes to find solutions that make better use of nurses' time.

We will begin to see increases in this type of facility as the U.S. population shifts to a greater percentage over the age of 70. The number of nursing homes (establishments) in the U.S. declined from 16,891 in 2000 to 15,690 in 2010, however an increase is expected during the 2010-2020 period. See corresponding figure below.

In 2010, there were 15,690 nursing homes registered in the United States, housing more than 1.7 million residents. Overall, the country operates at a near 82% occupancy rate with some states operating at a rate of nearly 100%. New York is now the largest state for residents, with a climbing figure of nearly 110,000 residents. California follows with its steady 100,000 residents.

Figure 2-5

Number of Nursing Homes (United States), 2000-2010
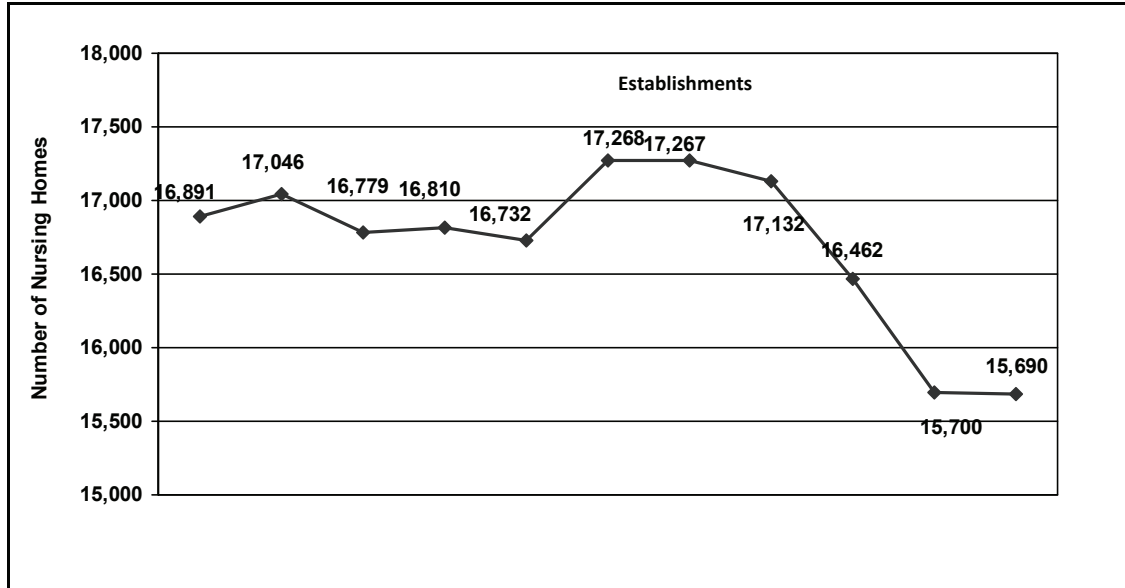
Source: http://www.census.gov/epcd/susb/2009/us/US623110.HTM

Note: The firms and establishments shown are only those with payroll

Note: latest year available.

Table 2-8

U.S. Nursing Homes, Beds, Residents and Occupancy Rate, 2010

	Nursing Homes	Beds	Residents	Occupancy rate[1]
Top 10 States				
New York	624	117,984	109,044	92.4
California	1,239	121,167	102,591	84.7
Texas	1,173	130,665	91,099	69.7
Pennsylvania	710	88,829	81,014	91.2
Ohio	960	93,043	79,234	85.2
Illinois	787	101,061	75,224	74.4
Florida	678	82,226	71,907	87.5
New Jersey	360	51,101	45,917	89.9
Michigan	428	47,054	39,894	84.8
Indiana	506	57,721	39,167	67.9
Subtotal	**7,465**	**890,851**	**735,091**	**82.5**
Other States	8,225	812,547	661,382	81.4
Total U.S.	**15,690**	**1,703,398**	**1,396,473**	**82.0**

[1] percentage of beds occupied (number of nursing home residents per 100 nursing home beds)

Source: U.S. National Center for Health Statistics

International Trends in Nursing Facilities

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 2-9

Estimated Nursing Service Establishments and Care Centers by Country

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

Source: Kalorama Information

Home Health

The home healthcare market is different from the hospital market, in large part because reimbursements are lower or nonexistent for some products. Vendors are more fragmented, privately-held companies and compatibility between devices and applications is of primary concern. Home healthcare will still be purchasing lower-priced units than hospitals, although they will begin to purchase more of them. Unit costs will go up as older units are replaced with wireless, compact, and feature-packed devices. EMRs are not yet a large factor in home healthcare, although there should be larger growth in the use of patient data processing applications and equipment.

Annually about 3 million Americans are under full-time home health care, and an additional 9 million require part-time or alternative home care. There are about 2 million home health care providers currently offering services. Additionally, the Bureau of Labor Statistics estimates that growth for home health providers will increase by 70% to 2020.

The current statistics provide estimates that about two-thirds of patients are over the age of 65 with women accounting for 69%. Women also account for about two-thirds of all patients.

From 1998 to 2010 the number of hospice programs in the United States increased by more than 2000. See growth in hospice programs figure below.

Figure 2-6

Growth in Hospice Programs in the United States, 1998-2010
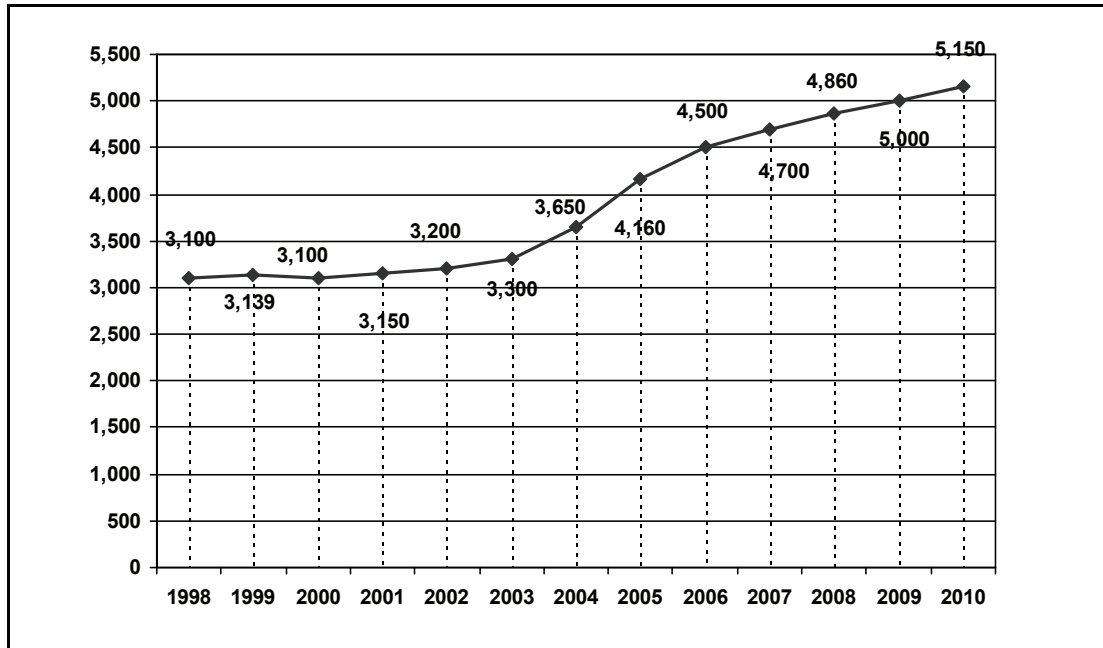
Source: NHPCO estimate. Includes primary and multiple locations.

Likewise, the number of patients utilizing hospice services continues to increase. The NHPCO estimates that 1.56 million people in the United States received services from hospice in 2009. See figure below.

Figure 2-7

Patients Served with Hospice Programs in the United States, 1998-2009
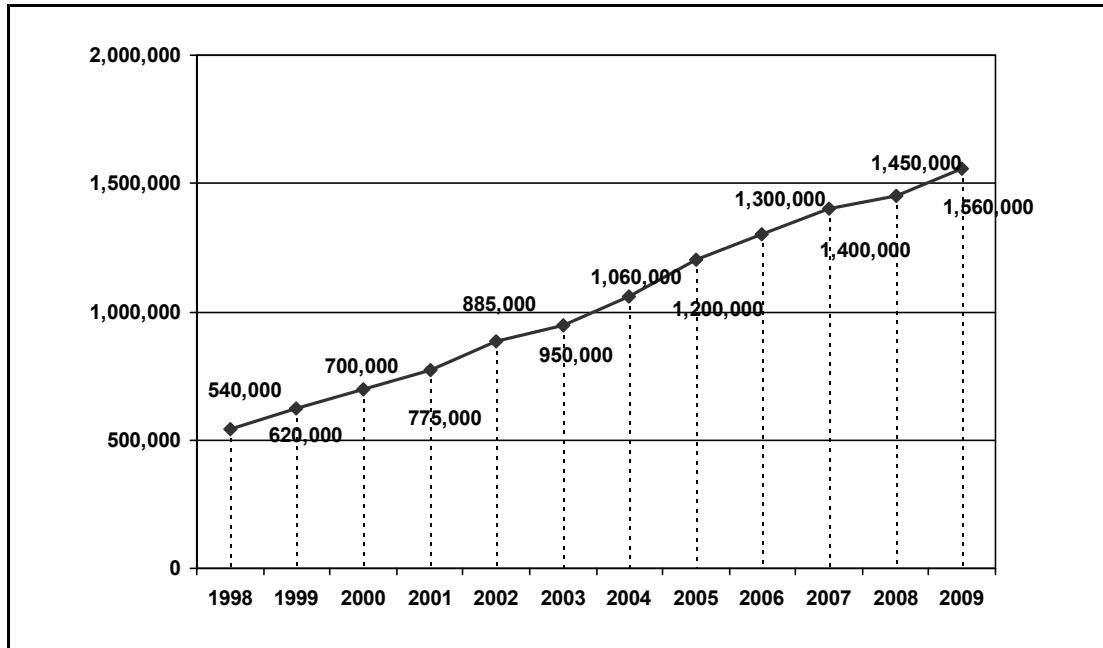
Source: NHPCO estimate.

Hospice began as a program for the cancer patient; however, it is quickly spreading to other diagnoses such as heart disease, HIV, and stroke. See corresponding table below.

Table 2-10

Percentage of Hospice Admissions by Primary Diagnosis, 2005 - 2009

(% of Hospice Admissions)

Primary Diagnosis	2009	2008	2007	2006	2005
Cancer	40.1%	38.3%	41.3%	44.1%	46.4%
Heart Disease	11.5	11.7	11.8	12.2	12.0
Debility Unspecified	13.1	15.3	11.2	11.8	9.2
Dementia, including Alzheimer's Disease	11.2	11.1	10.1	10.0	9.8
Lung Disease	8.2	7.9	7.9	7.7	7.5
Stroke or Coma	4.0	4.0	3.8	3.4	3.3
Kidney Disease	3.8	2.8	2.6	2.9	2.9
Motor Neuron Diseases (including ALS)	2.3	1.9	1.9	2.0	2.1
Liver Disease	1.8	1.5	2.0	1.8	1.7
HIV/AIDS	0.4	0.5	1.0	0.5	0.5
Other Diagnoses	3.6	5.0	6.4	3.6	4.6

Source: NHPCO National Data Set, 2010.

Other Facilities and Health Care Delivery Settings

As noted earlier, there are several 'other' settings included in this market such as first responders, institutions such as prisons, health clubs, malls, corporate locations, specialty clinics, and military. Health clubs, malls, corporate locations, and military bases are all candidates for health kiosks. Prisons are ideal candidates for telemedicine, which requires portable devices such as tablets. First responders are finding that the capability to send data ahead to the emergency department is resulting in lives saved. First responders require equipment that is durable, reliable, and portable. Equipment used by first responders will have a relatively high unit cost.

POPULATION STATISTICS

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 2-11

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 2-8

The Global Population, 1980-2050

(in millions)
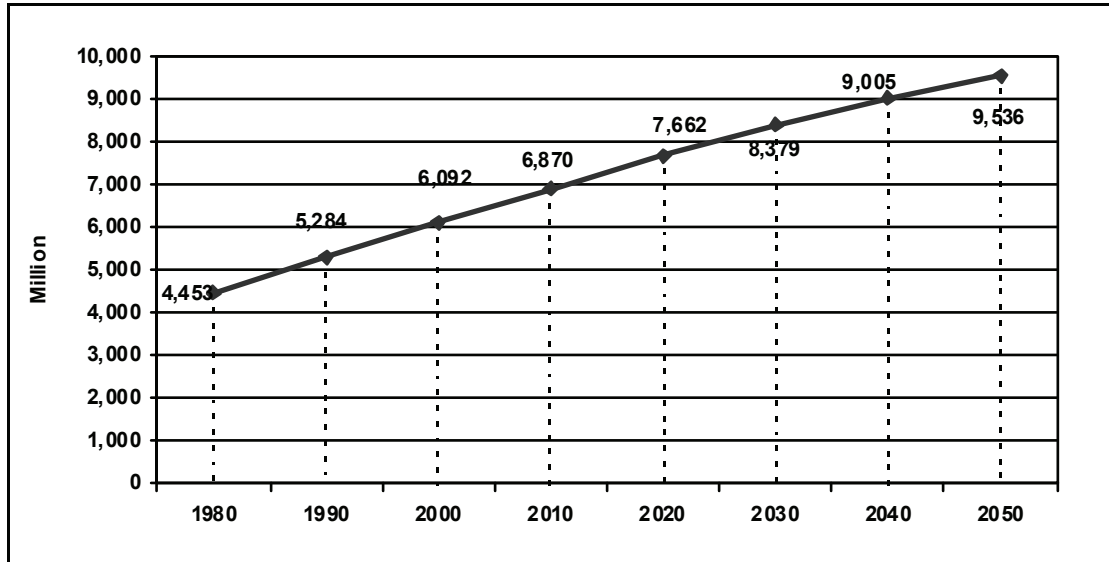
Source: US Census Bureau.

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 2-12

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 2-9

Global Population Trends Age 65+, 2000-2050

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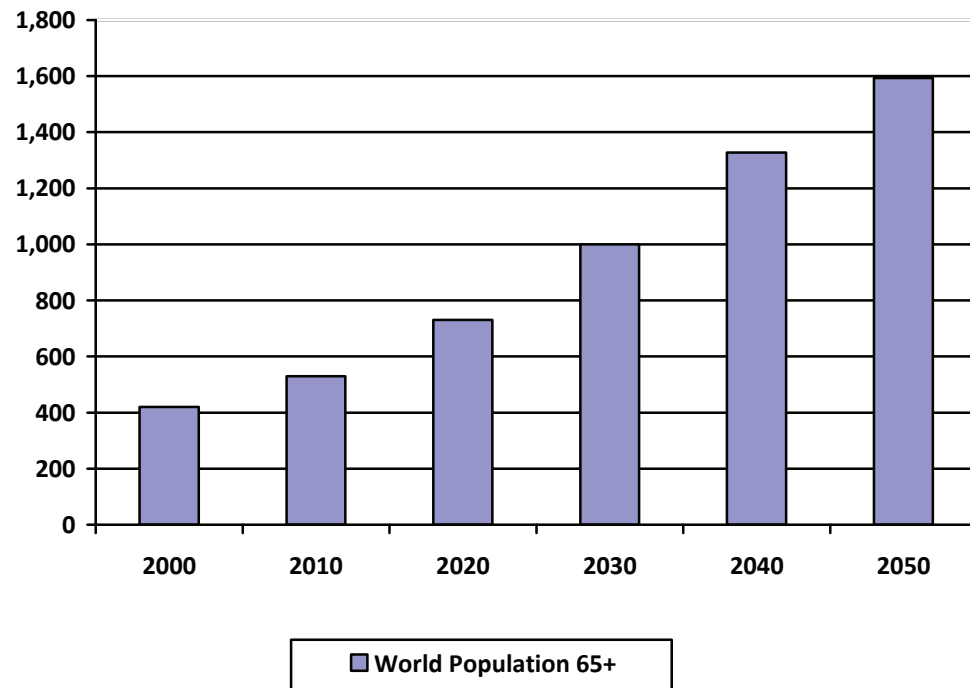
Source: U.S. Census Bureau International Database

U.S. Population Trends

The U.S. population has shown steady growth since the year 1980 and is expected to continue its growth at approximately the same rate of about one percent through the year 2030. The U.S. population in the year 1980 was estimated to be 228 million; this is expected to reach 374 million by the year 2030. Growth is expected to slow slightly for the 2030-2050 period, averaging about 0.8% annually.

Table 2-13

The U.S. Population, 1980-2050

Year	Population (millions)	% Growth
1980	228	-
1990	250	0.9%
2000	282	1.2%
2010	310	1.0%
2020	341	1.0%
2030	374	0.9%
2040	406	0.8%
2050	439	0.8%

Source: U.S. Census Bureau.

Figure 2-10

The U.S. Population, 1980-2050

(in millions)
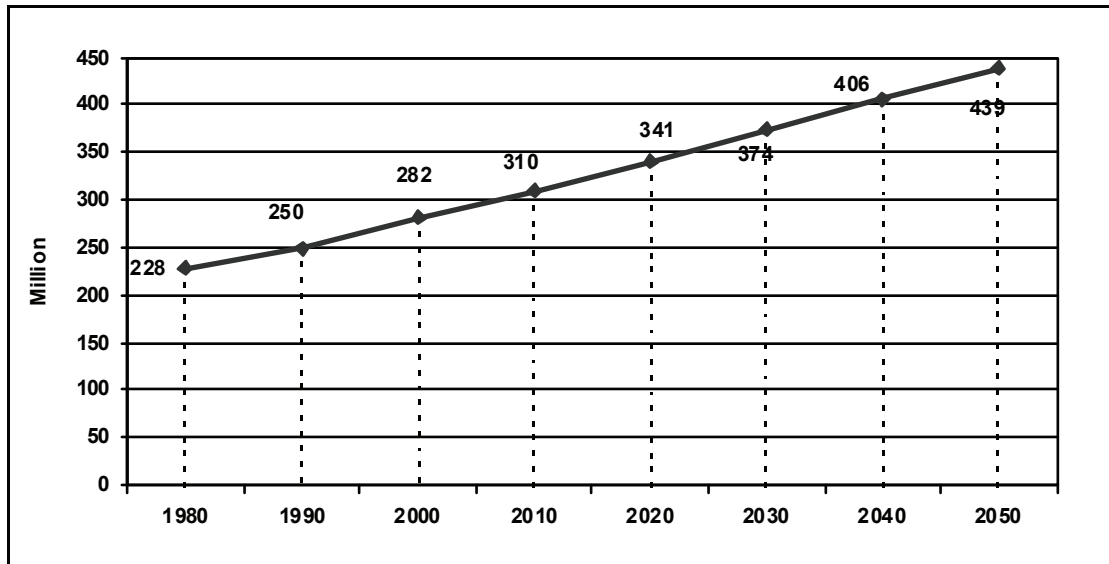
Source: U.S. Census Bureau.

U.S. Population over 65

In 2000, approximately 12.4% of the U.S. population was over the age of 65, or 35 million Americans. For 2010, this number increased to about 40 million, or 13% of the population. The future will likely show an increase in the number of Americans over the age of 65, incredibly growing to 89 million in 2050, or 20.3% of the population.

Table 2-14

Percent U.S. Population Over Age 65 by Year, 2000-2050

Year	Over 65 Population (millions)	% of Total U.S. Population
2000	35	12.4%
2010	40	12.9%
2020	55	16.1%
2030	72	19.3%
2040	81	20.0%
2050	89	20.3%

Source: U.S. Census Bureau.

Figure 2-11

United States Population Trend Age 65+, 2000-2050

(Millions)

| | 2000 | 2010 | 2020 | 2030 | 2040 | 2050 |

☐ **U.S. Population 65+**
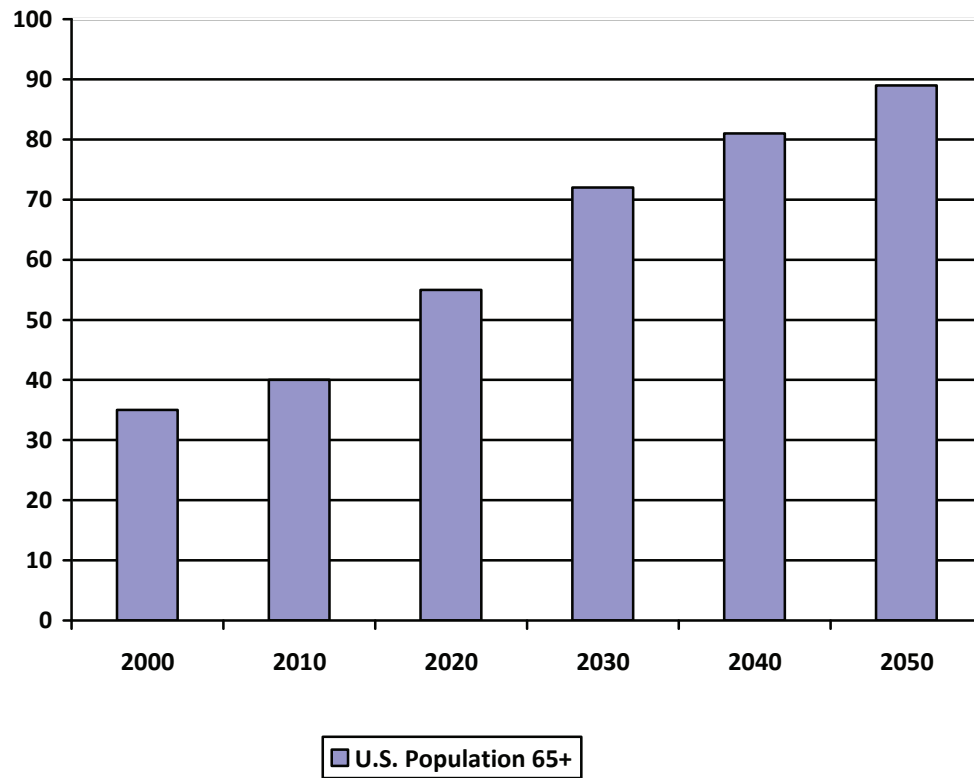
Source: U.S. Census Bureau International Database

Global Trends in Life Expectancy

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. Overall, women typically live longer than men. There are several theories why women outlive their counterparts. For example, men fight in more wars, and are believed to take more risks.

In the U.S. a child born in 1900 had roughly a 50 percent chance of living to the age of 50. By 1980 a U.S. child could expect, on average, to live to 74 years of age (77.4 for female and 70 for male). By 2012 the average life expectancy in the U.S. increased to more than 78 years of age.

Life expectancy is also increasing in other world regions such as Australia and Europe. In Australia, the average life expectancy was 74.6 years in 1980 and rose to about 82 by 2012. In 1980 the German population could expect to reach the age of 73, and lived an average of 80 years in 2012. In Turkey the average life expectancy was 58 in 1980, and has increased to 73 years in 2012.

Table 2-15

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 2-12

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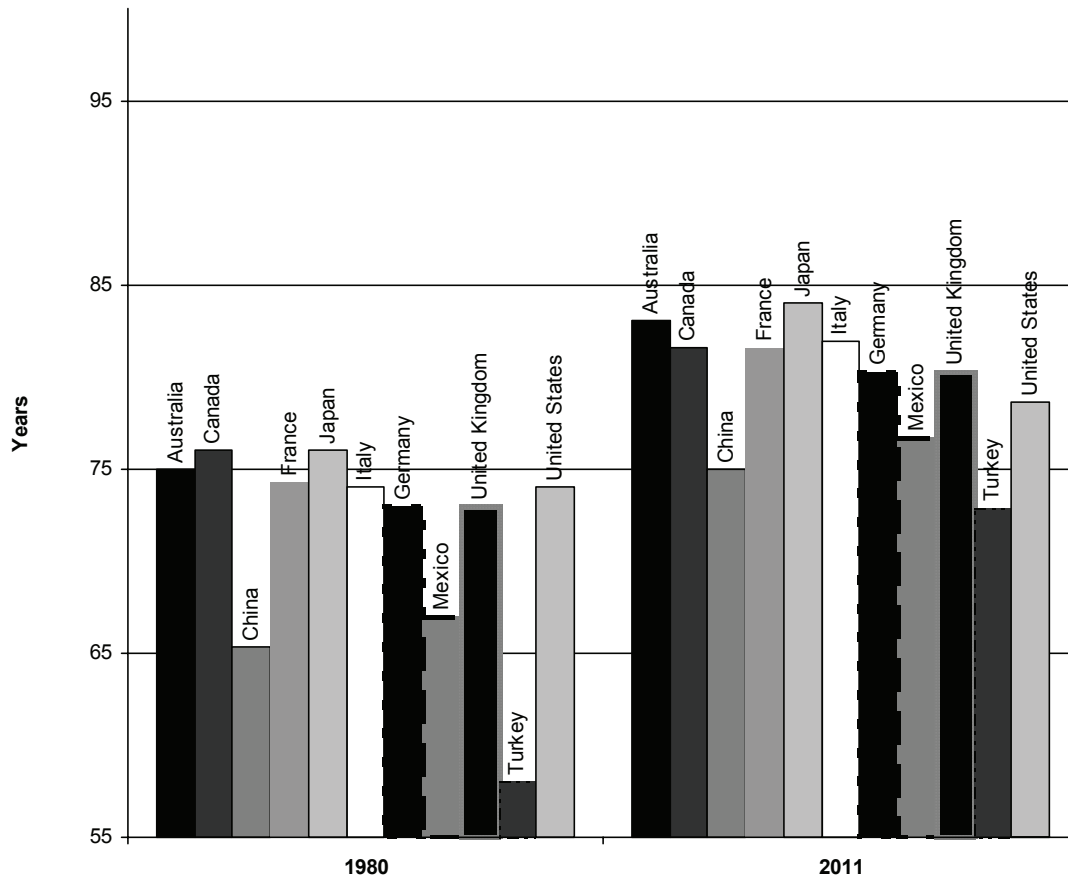
Source: Organization for Economic Cooperation and Development (OECD); U.S. National Center for Health Statistics, Vital Statistics of the United States; CIA World Fact Book; Kalorama Information

Technologies and Competitors

TABLET PCS IN HEALTHCARE

The use of technology to assist in everyday tasks in the health industry has become a growing interest among health providers and facility administrators. Focusing on improving workflow, reducing medical errors, streamlining patient care, and gaining control over health costs all while providing optimal patient treatment and monitoring has become a priority in recent years. Several factors have fueled growth in adopting technology such as tablets, and other similar devices, in the health environment, including:

- Increasing medical errors

- High cost healthcare

- Counterfeit drugs/blood products

- Hospital acquired infections

- Reduced staff availability

- Increasing admissions and long-term chronic care patients

Although this describes some of the primary factors leading to the adoption of these devices, many hospitals and other facilities have mentioned other uses such as:

- Mileage tracking for off-site staff

- Improved communication with on-call staff

- Access to EMR during emergency transport or off-site treatment

- Quick availability of drug references and medical journals

Tablet Features and Usability

The use of tablets in healthcare offers a wide range of features and usable options, including:

- Drug reference, interaction guides

- Treatment guidelines

- Laboratory order entry

- E-prescribing

- Interfacing with other devices/programs (i.e. EMR, schedules, billing software)

- Education for Intern MDs

- Access to medical journals and resources

- Patient kiosks and data entry solutions

Benefits of Tablets in Healthcare

- Faster treatment times

- Increased patient scheduling

- Improved workflow and efficiency

- Reduced number of medical errors

**Challenges in the Implementation of Tablets in Healthcare
Settings**

As with any new technology, there continue to be barriers to implementing efficient IT infrastructures in health facilities. In the case of new technologies in patient care, the concerns are very real and for some facilities prohibit the ability to move forward with implementation. From technological barriers to implementation costs, there are several obstacles, including the following[4]:

- Privacy issues, HIPAA compliance

- Sanitation concerns

- Poor vendor support

- Difficulty in end user acceptance

- Lack of time commitment from clinicians

- Lack of clinical leadership

- Difficulty proving ROI

- Lack of top management support

- Lack of interoperable systems

- Lack of strategic IT plan

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[4] 2012 Healthcare Information and Management Systems Society, HIMSS report

Figure 3-1

Most Significant Barriers to Implementing IT, 2011 vs. 2012
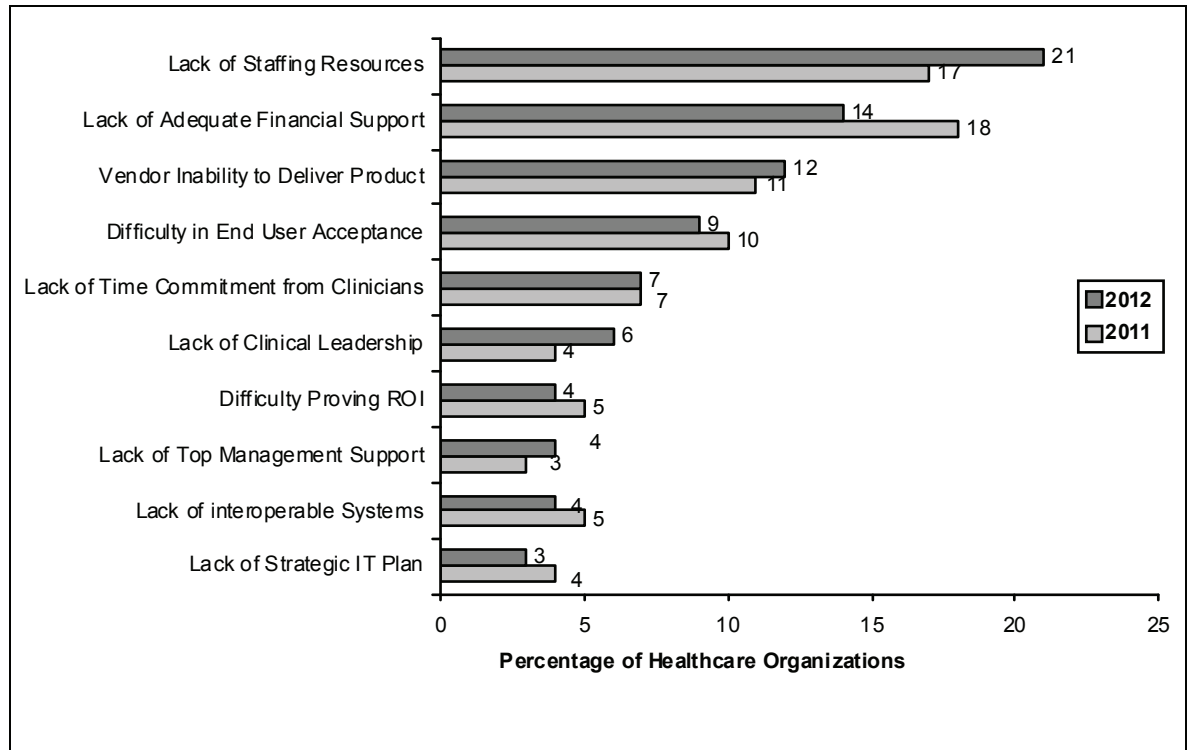
Source: 23rd Annual HIMSS Leadership Survey, sponsored by Citrix

PRODUCT EXAMPLES

Several providers of healthcare IT solutions offer tablet computers that are tailored to the healthcare environment. Some of these hospital-grade mobile devices are designed to meet the demanding requirements of the health care environment. Specifically mobile devices that can accommodate rigorous use and unsanitary conditions at the point-of-care are desirable. Furthermore, some manufacturers are building tablets that can withstand a drop up to 3 feet and be submerged in shallow water.

Apple

In April 2010 the launch of the iPad (Apple, Inc.) was completed in the largest market, the United States. The iPad is a tablet computer with approximately 10" of viewing surface. It is in its fourth generation; the latest version was launched in 2012. Users of the iPad can connect to the Apple iTunes store to purchase apps, music, e-books, and games for professional and personal use. There are also free products available to download as well.

Third party developers are able develop software apps or release digital products for sale through iTunes. They can also sell accessories for the iPad through retail or online stores. The iPad is a leading device due in part to the popularity of similar prior Apple products, the numerous offerings through iTunes, and the devices themselves. Apple has established itself as a strong software developer, marketer and a leader in this segment

Barco

Barco offers the Proscribe MTPP-0212, a wireless, point-of-care tablet, designed to meet the needs of health providers in a variety of specialties. The touch-screen design and rugged durability make it an ideal tablet solution for any medical practice. This model has a large 12.1" display making it one of the larger medical tablet screens. Barco has chosen to use a Microsoft Windows operating system.

Previous models for the medical field offered by Barco include the CliniScape tablet. The CliniScape was also designed specifically to meet the needs of clinicians who perform tasks at the point-of-care. Barco has discontinued offering this product.

Cybernet Manufacturing

Cybernet's CyberMed T10 is a Windows-based tablet PC with medial certification. It is a fully antimicrobial design for use in sterile environments, offers a low-weight design of 1.9 pounds, wall mountable, EMR cart ready.

Additionally, the company offers a full line of all-in-one PCs and computers for the medical environment, featuring antimicrobial coatings and other medical-specific attributes.

Cybernet's All-in-One PCs for the medical setting include:

- CyberMed H22

- CyberMed H6

- CyberMed H19

- iOne-MP171

- CyberMed G45

- iOne-MP172

- CyberMed MP15T

- iOne-N19

Cybernet's medical computers offer fanless designs and reliable components for critical care environments, including:

- CyberMed N19

- Cyber Med N22

Dell

Dell offers several tablets suitable for personal and business use. The Dell Latitude 10 features a mobile Intel chip, a 10.1" display (1280x800 resolution), Pen & Touch input, optional external DVD drive, Wi-Fi, plus mobile broadband, and GPS options. The Latitude 10 operates Windows 8.

Dell also markets it XPS 10 tablet, a device with Qualcomm's snapdragon S4 processor and Windows RT operating system. This device is available with a mobile keyboard and other accessories. It features a 1366x768 resolution 10.1" display, 32GB flash storage, and Wi-Fi for connectivity.

Fujitsu

Fujitsu offers a full line of tablets for professionals under the Stylistic brand. Some of the company's offerings include:

- Stylistic M532 Tablet is an android-based tablet featuring a 10.1-inch touchscreen display and 32GB hard drive. The tablet is designed to meet the needs of professionals on-the-go and has a rugged design for durability.

- Stylistic Q550 is a 10-inch, rugged design to meet the high demands of the medical environment. The tablet weighs just 1.7 lbs and is capable of working with wireless infrastructures.

- Stylistic Q572 Tablet PC is a 10.1-inch LED tablet ideal for mobile professionals. The tablet features a 64GB hard drive and is a dual digitizer, offering both pen and touch input capabilities.

- Stylistic Q702 Hybrid Tablet PC is a corporate hybrid tablet with an 11.6-inch widescreen. The screen is anti-glare and offers dual digitizer capabilities (pen input and capacitive multi-touch screen). It includes a 64GB hard drive.

- Lifebook T732 Tablet PC is the most advanced tablet offered by Fujitsu with a 12.5-inch pen and multi-touch widescreen, Intel HD graphics, 500GB hard drive and professional-capable installed operating system and software. The tablet carries a price tag that reflects its features, ranging from $1,000 to $1,800 dependent upon features.

Hewlett Packard

Hewlett Packard currently offers the HP Slate 7, a lightweight, 13.05 ounce, tablet PC with a variety of software packages and features—making it ideal for the

health industry. The Slate 7 is less than 11mm thick, has a 5 hour video playback battery life, and LCD wide view angle screen, Wi-Fi capabilities, Bluetooth, touchscreen and many more benefits.

Hewlett Packard also offers the HP ElitePad weighing in at 1.38 lbs, and just over a third-inch thick and 7 inches tall. It's a small package but offers high performance and capabilities. The ElitePad is equipped with Windows 8 Pro operating system, dual core Intel processor, wide-viewing angle screen, 10.1-inch multi-touch display, 32GB hard drive, a number of security features and accessories. This tablet is ideal for the working professional on- or off-site.

Lenovo

In June 2013, Lenovo announced the anticipated release of its new Lenovo Miix multi-mode tablet. The Lenovo Miix is a 10.1-inch tablet equipped with Windows 8 operating system and a number of features and software additions to move through programs and filed rapidly. The tablet is also a laptop, providing users with an attachable/detachable monitor for use with a keyboard or alone. The company announced the product will be released later in 2013.

Lenovo has two additional tablet lines the Thinkpad detachable ultrabook, and the Ideatab, both equipped with Windows 8. The Thinkpad line includes systems with Intel processors, large IPS displays, Ericsson wireless network connectivity, Wi-Fi, Ethernet via USB, solid-state drives, and up to 8GB of RAM. The lower cost Ideatabs feature either Android or Windows operating systems, IPS displays, USB ports, Wi-Fi, Bluetooth and accessories.

MiTAC International Corporation

The MioCARE line of tablets includes the A100, A105, A90 and Z100. These tablets are specifically designed for the demands of the medical field, offering slim designs, integrated barcode scanners and cameras, and able to withstand disinfecting processes.

Motion Computing

Motion Computing offers a full line of tablets for the medical professional. The company's tablets include:

- Motion F5 - Rugged, considered nearly unbreakable by the company, the Motion F5 has an Intel core with long battery life, camera capabilities and more.

- Motion C5 - Motion Computing launched the C5 Mobile Clinical Assistant in 2007, which features tools to improve workflow for the medical clinician. This has been one of the company's most popular systems for medical professionals.

- J3500 - The J3500 is another rugged tablet PC designed to enhance mobility for professionals. This tablet has multiple uses and is available to medical and other professional fields.

- CL900 - The CL900 offers all the capabilities of the J3500 but in a smaller package. This product was launched in June 2011.

Motorola

Motorola launched the ET1 Enterprise Tablet in the second half of 2011. These tablets are customizable to health setting needs. For this, Motorola chose to use a dual core processor (1GHz), 1GB of RAM, Android operating system, 7" Gorilla glass display, USB connectivity, optional Bluetooth keypad, Wi-Fi, GPS, Wireless WAN with 4G/HSPA capability, and front and rear cameras.

Panasonic

The Toughbook is described by Panasonic as a lightweight, durable PC with 10.4" dual-touch screen with twin batters for improved usability. The Toughbook H2 was introduced to the market in July 2011 and is ideal to meet the demands of medical markets.

In November 2011, Panasonic released its Toughpad family of tablets. The Toughpad A1 is a lightweight (2lb) 10" tablet designed for health care workers and is HIPPA compliant. The Toughpad B1 has all the function of the A1 but in a smaller package, 7" screen.

Pantech Mobile

Pantech Mobile's tablet, the Element, was built with durability in mind. The Element is designed to be water proof--from light splashes to submerged in 1 meter of water for up to a half hour. The Element offers a vivid HD 8" touch screen, Bluetooth capabilities, lightweight 16.57oz design, camera and video features, multimedia in HD, and long battery life using a lithium ion battery.

RIM

In April 2011, Research in Motion (RIM) launched the BlackBerry PlayBook for a variety of business and consumer uses. In January 2013, the company announced plans to operate under the BlackBerry company name.

The PlayBook Cellular + Wi-Fi model features a 7" display with 1024x600 resolution, a dual core 1.5GHz processor, 1GB RAM, micro USB port, 4G LTE and HSPA+ connectivity, and micro HDMI. Both the Playbook Cellular + Wi-Fi and just the Wi-Fi devices have a standard 32Gb of memory with an optional 64GB for the Wi-Fi only model. There are two cameras, front and rear mounted with 3 and 5 megapixels respectively.

Samsung

Samsung's tablets are generally called Galaxy Note, Galaxy Tab, or ATIV. Samsung also markets Google's Nexus tablet, with a 10" high resolution (2560x1600) display, advanced MIMO Wi-Fi, 1.7GHz dual-core processor, Bluetooth, front/rear facing cameras, and Android OS. Samsung co-developed the Nexus tablet with Google.

Specific tablets from Samsung include:

- Galaxy Tab 7
- Galaxy Tab 7.7
- Galaxy Tab 2 10.1
- Nexus 10
- Samsung ATIV Smart PC
- Galaxy Note 10.1
- Galaxy Note 8
- Galaxy Tab 3

Samsung offers devices that are designed for different provider networks like T-Mobile, or Verizon but it also has Wi-Fi only products. Its devices are available in several different sizes, connection types, and processors.

Socket Mobile

In 2009, Socket Mobile, Inc. released the SoMo 650Rx hospital-grade PDA. This unique PDA features antimicrobial materials that provide improved protection against the spread of bacteria and microbes. Reducing the spread of bacteria in healthcare settings has become a recent area of focus with the growing concern of hospital-acquired infections (HAIs) and growing drug treatment resistance. The product has RFID capabilities which lends itself to patient tracking technology and asset tracking, a feature which is becoming more common in hospital settings.

Socket Mobile recently launched the new SoMo 655 Windows-based mobile device. It's available in three form factors: 655Rx for healthcare, 655DXS for security or similar environments, and the 655 Standard is a general use device.

The SoMo 655 system utilizes Wi-Fi, 4GB memory, barcode scanners and other peripherals, touchscreen, programmable buttons, expansion slots, battery and cradle options, and rugged construction.

Tangent

In May 2009, Tangent announced the launch of the MCA Medix 10T touchscreen tablet PC. It runs Windows and has a water/dust resistant exterior for disinfection. It also runs fanless. This particular PC is designed with optional barcode and RFID capabilities. Tangent is a provider of education, health, government, and business computing solutions. A competing tablet is the Panasonic Toughbook H1 tablet PC.

Tangent also offers the healthPad, a 10.1" widescreen tablet PC—offering a more user friendly design to health professionals.

Toshiba

Toshiba introduced its tablet, the Excite 10 LE, in early 2012. This tablet is powered by the Android operating system, offers 16GB and 32GB options and is thin at just 0.3 inches thin and weighting just 1.18 pounds while featuring a 10-inch screen.

The company also offers a preferred compact PC line for the medical environment, the Portégé PC. The Portégé is listed by the company as a strong, reliable and durable portable computer designed to meet the needs of the health industry. The company's EasyGuard Technology helps safeguard these units to be resistant to shocks, spills and falls. The Portégé comes in the Z10t model which claims to be a full laptop and full tablet in one device. The Z10t offers a detachable screen to offer instant portability and tablet features.

ViewSonic

ViewSonic's ViewPad 10pi features an Intel 2670 processor. The ViewPad supports two leading operating systems, Android and Windows—for full use of apps and features for healthcare or other settings. It has a multi-touch LCD with IPS screen and offers 64 GB of storage and 2GB of RAM. It also features dual cameras, Wi-Fi, and expansion slots for SD cards or USB (2). The ViewPad 10pro, a healthcare capable tablet was discontinued.

ViewSonic also offers several other tablets and tablet accessories. It has both Windows-based and Android-based devices, all with a low price point.

Table 3-1

**Select Tablet PCs in Healthcare
Current as of June 2013**

Supplier	Product Examples
Apple, Inc.	*iPad*
Barco	*Proscribe*
Cybernet	*CyberMed T10*
Dell	*Latitude XT3 Convertible Tablet*
Fujitsu	*Stylistic Q550*
Hewlett Packard	*Slate*
Lenovo	*X220t Convertible ThinkPad*
MiTAC International Corp.	*MioCARE*
Motion Computing	*Motion F5* *Motion C5* *J3500* *CL900*
Motorola	*ET1 Enterprise Tablet*
Panasonic	*Toughbook Family of Tablets—Health* *Toughpad Tablets*

Table 3-1 (continued)

**Select Tablet PCs in Healthcare
Current as of June 2013**

Supplier	Product Examples
Research in Motion	*BlackBerry PlayBook*
Socket Mobile	*SoMo*
Tangent	*Medix family of tablets* *healthPad*
ViewSonic	*ViewPad 10pro*

Source: Kalorama Information

MEDICAL APPLICATIONS

The growing availability of healthcare applications has expanded the capabilities of physicians using advanced mobile devices. In all, applications for Apple's iPhone have grown in number to exceed 750,000 with around 2,000 for medical applications alone. Apple launched the App Store in July 2008. Android had approximately 700,000 apps available in December 2012.

Business Model for Device/Platform Developers

The reason for such a numerous offering in the application segment is due to contributions from third-party developers. The platform developers such as Apple and Google make their platform source information available to developers, who then create applications for them. Some third-party developers may then charge for the use of apps, especially if the apps require constant updating or other time-intensive work.

Another way to recover app development costs is to provide the app for free and then sell advertising space.

The number of apps available to consumers has been a marketing tool for platform developers. The availability of sophisticated or fun apps for a platform will typically help sell the devices on the same platform. Apple has become one of the best known providers of applications.

The Android platform is being developed with the Mobile Handset Alliance, a business alliance between developers of devices and services.

Apps and Tablet PCs

Smartphone device developers have launched or are developing tablet PCs that also run apps. Apple launched the iPad tablet in April 2010, and Research-in-Motion followed with the BlackBerry PlayBook tablet. These medium-sized mobile devices combine laptop-like power in smaller packages. Tablets can run apps and connect to the internet much like smartphones, but have more usable features for the health industry like larger screens. This comes at the expense of decreased portability and more weight compared to smartphones. Tablets may be designed with touchscreens (no physical keyboard), or offered with a traditional keyboard. The newest tablets often come with a touchscreen keyboard.

The medical tablet PC is not a new product in the medical community however, the addition of some new apps, technologies and touchscreen interfaces like on the Apple iPad has brought more attention to tablet PCs. Apple and other developers have large databases of apps which can be familiar to medical professionals. Some tablets can also be connected online wirelessly via cellular 3G networks.

The increased screen size are now allowing medical professionals to view radiology images in a portable device, through the use of a secure server. One medical radiology app, eUnity, is web-based and uses Flash. Flash is an Adobe Systems, Inc. platform that allows internet browsers to creatively display media such

as animations and images. With eUnity, medical images stay on the server, and are viewed at the point-of-care. This can also be integrated with an Electronic Medical Record. The benefit of storing images on a server and viewing them using a web-browser is increased data security, a constant concern in the medical industry.

Leading Apps for Healthcare Providers

The number of apps for medical providers can change daily. There are also new ways that companies are using mobile devices, so the way apps are used is expected to transform in the future. However there are certain useful apps that have been on the market for years, and several new interesting apps.

Apps may be developed for a single platform but many are offered for all major platforms. The well-known Epocrates drug reference app is offered for: Android, Windows Mobile, Palm, iOS, and BlackBerry.

The Medscape app by WebMD Health Corporation is another multi-purpose medical reference program available for free. The program offers drug interaction checking, drug reference, multimedia clinical references, medical news, peer-reviewed/evidence-based information, procedural information, and articles.

Another popular medical app, Care360 Mobile, is an application from Quest Diagnostics. It is used as a mobile companion for the company's Care360 software. Care360 Mobile is a HIPAA compliant app that allows medical professionals to access patient lab results, medication history, and interactions.

Electronic Medical Records and Apps

The electronic medical record (EMR) or electronic health record (EHR) gives patients and physicians greater freedom, improved accuracy, and should result in better outcomes as critical records are all in one, easily transportable record.

Applications for EMRs include network-based programs connected to hospital community systems or programs like iChart which can help single physicians manage patient information.

Market Overview

MARKET INTRODUCTION

The global market for tablet PC devices in healthcare reached $1.3 billion in value during 2012. This is expected to increase to $1.7 billion for 2013, reflecting an annual increase of 26.8% over 2012. Several factors are driving the growth of this market including a growing and aging population, shortage of qualified medical professionals, cost restraints, medical error reduction measures, government incentives, expanding capabilities of devices, off-site medical care and more.

Revenues for the market include estimated sales for tablet devices, including hybrid and convertible tablets, where medical professionals or institutions have used these devices for at least 50% health-related use. For example, sales to physicians who use tablets for other than health use or less than 50% for their patients' care are likely to be excluded. Estimates are used to exclude this use.

Tablet PCs are increasingly being used for a variety of tasks in the health field including access to patient records at the point of care, improved viewing capabilities for medical images, and easy offsite patient monitoring.

Growth will remain strong, posting double-digit increases through the forecast period, with sales exceeding $4.5 billion in 2018. The increasing adoption of tablets in the health industry will drive developers/manufacturers to continue to rollout new, advanced products, securing a healthy market for upgrades and replacement units.

Table 4-1

**The Global Market for Tablet PCs in Healthcare
2008-2018**

Year	Revenues (in millions)	Percent Change
2008	$132	-
2009	176	33.3%
2010	310	76.1%
2011	857	176.5%
2012	1,325	54.6%
2013	1,680	26.8%
2014	2,100	25.0%
2015	2,680	27.6%
2016	3,350	25.0%
2017	3,910	16.7%
2018	4,500	15.1%

Compound Annual Growth Rate

Period	CAGR
2008-2013	66.3%
2013-2018	21.8%
2008-2018	42.3%

Source: Kalorama Information

Figure 4-1

**The Global Market for Tablet PCs in Healthcare
2008-2018**
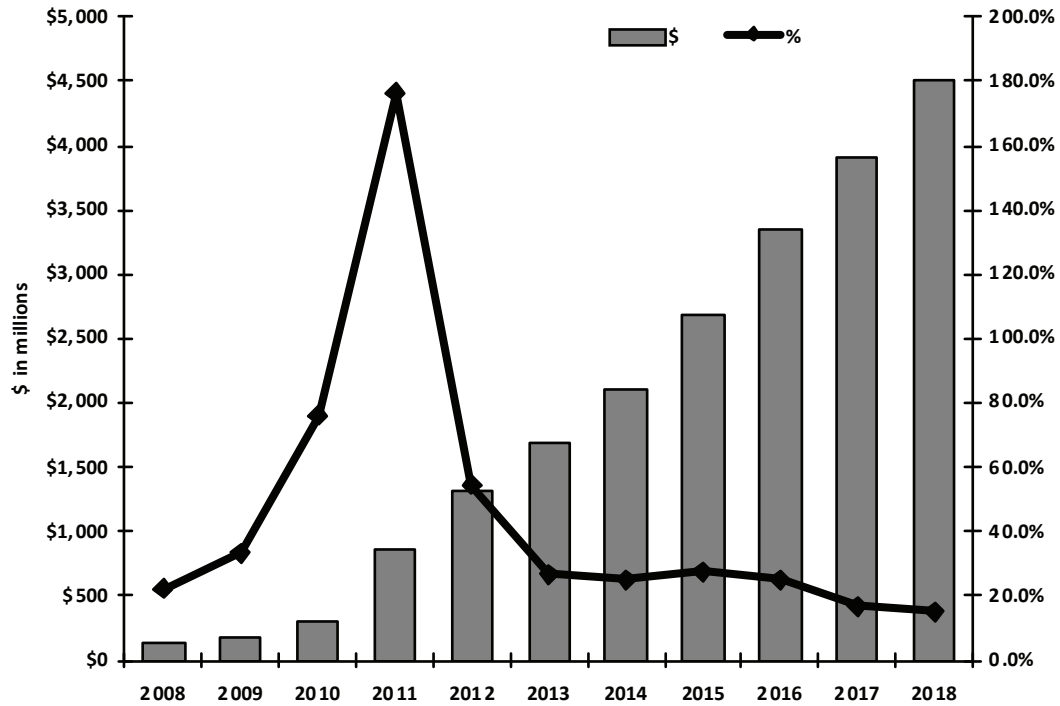
Source: Kalorama Information

TABLET PC SALES BY END-USER

For the purpose of this report, sales are segmented by four basic end-user segments:

- Hospitals/Acute Care Centers

- Physician Offices/Practices

- Nursing Establishments/Home Health Services

- Others (first responders, institutions such as prisons, health clubs, fitness facilities, malls, corporate locations, specialty clinics, and military)

Tablet use in hospitals have exploded in recent years, producing a value of $1 billion for 2012 and expected to reach $1.3 billion by the end of 2013. This end user group accounts for the largest portion of sales for tablets, largely due to government incentives and overall long-term cost savings benefits, with 78% of total sales expected for 2013.

Home health and Nursing establishments are becoming larger drivers of the market with about 12% of the health tablet sales generated from this group. Sales for tablets to home health and nursing establishments reached $153 million in 2012, expected to grow to $191 million by the end of 2013.

Physicians represent the second fastest growing end user group behind hospitals. Roughly, 4-5% of sales for tablets to the health industry are generated by physicians. The value for the physician tablet market is $54 million, expected to increase to $77 million in 2013.

Other health facilities and users account for the remaining sales of $71 million for 2012. This market will continue to experience strong growth, increasing by 42% to reach $101 million in 2013. First responders are a major contributor to this segment.

Table 4-2

Global Market for Tablet PCs in Healthcare by End User, 2008 - 2018

Year	Revenues (millions)					Percent Change
	Hospitals/ Acute Care	Physicians/ Offices	Nursing Homes/ Home Health	Others	Total	
2008	$76	$8	$30	$18	$132	-
2009	110	8	38	20	176	33.3%
2010	191	19	63	37	310	76.1%
2011	627	34	146	50	857	176.5%
2012	1,047	54	153	71	1,325	54.6%
2013	1,311	77	191	101	1,680	26.8%
2014	1,623	106	229	142	2,100	25.0%
2015	2,092	128	265	195	2,680	27.6%
2016	2,630	150	320	250	3,350	25.0%
2017	3,010	175	415	310	3,910	16.7%
2018	3,430	200	490	380	4,500	15.1%

Compound Annual Growth Rate

	Hospitals/ Acute Care	Physicians/ Offices	Nursing Homes/ Home Health	Others	Total
2008-2013	76.7%	57.3%	44.8%	41.2%	66.3%
2013-2018	21.2%	21.0%	20.7%	30.3%	21.8%
2008-2018	46.4%	38.0%	32.2%	35.7%	42.3%

Source: Kalorama Information

Figure 4-2

Global Market for Tablet PCs in Healthcare by End User, 2008-2018
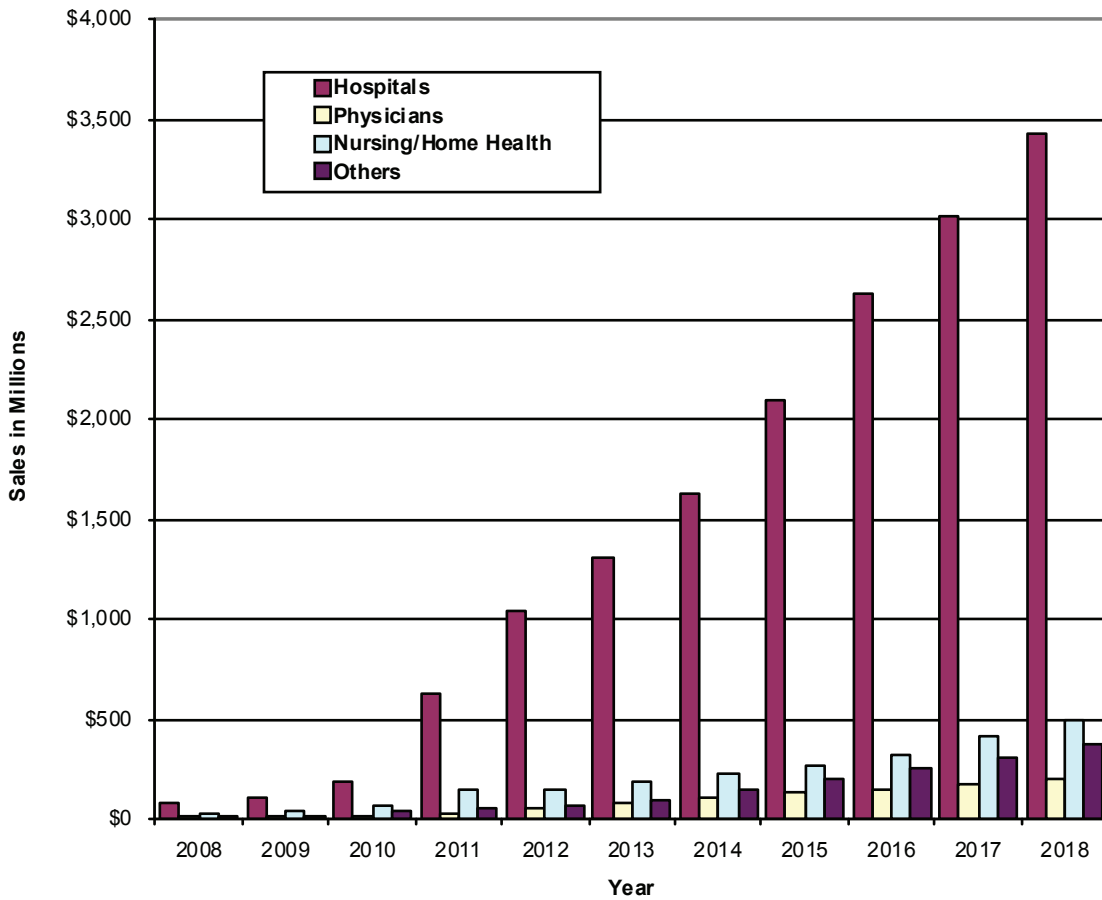
Source: Kalorama Information

Figure 4-3

**Global Market for Tablet PCs in Healthcare: Estimated Distribution of Sales
by End User, 2012**
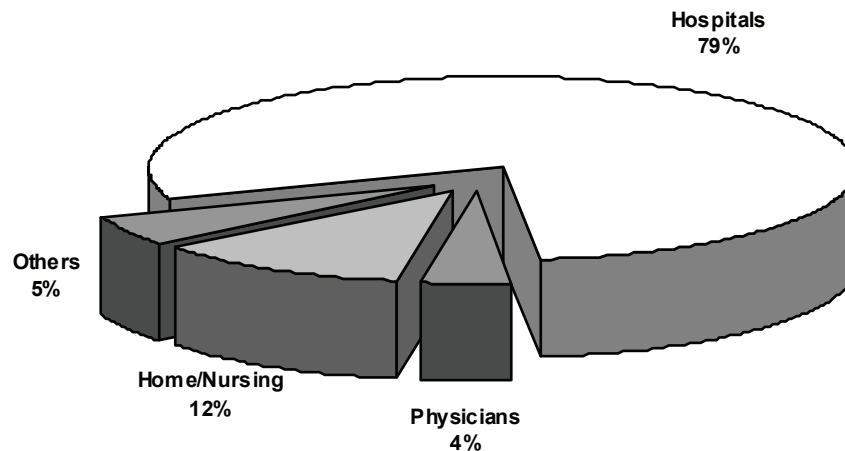
Source: Kalorama Information

Hospitals/Acute Care Centers

The number of hospitals using tablet PCs is increasing annually, with about 7% of hospitals using tablets for at least one specific task during 2008, by 2013 this has increased to about 58% of hospitals. The benefits to both the delivery of care and administrative efficiencies has led to the widespread adoption of tablets. In contrast, health professionals in the hospital and acute care setting have reported use of smartphones at a level of 80% or more.

The use of tablet PCs have seen a high rate of adoption in recent years due to regulatory pressures, cost savings pressures, and pressures to control medical errors which result in billions in unnecessary burden on the health system.

Figure 4-4

Tablet PC Adoption Trends for Hospitals/Acute Care Centers, Estimates and Projections 2008-2018
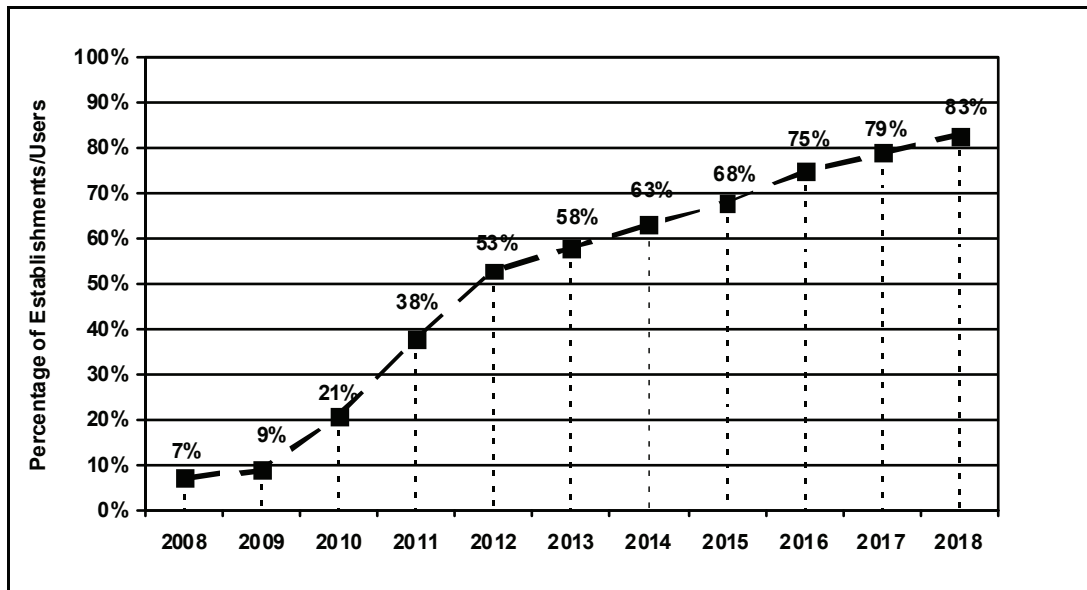
Source: Survey Data, Industry Sources, Kalorama Information
Note: U.S. Estimates, Projections

Physician Offices/Practices

The delivery of healthcare by the physician is changing due to the demands both patients and governments have made for physicians. Today, the requirements for EMR updating, e-prescribing and remote monitoring have all made the tablet PC and other technologies almost a requirement for delivering quality care, efficiently, while also meeting all the requirements. In 2008, it was estimated that about 5% of physicians were using tablet PCs to deliver patient care. Limited availability and high cost were major inhibitors to adoption. However, the introduction of Apple's iPad provided a system for physicians to perform both personal and professional tasks in one unit, making it appealing and ideal for investing in these devices. During 2010, the use of

these units increased to about 38% of physicians using tablets for professional use. For 2013, this has increased to roughly 65%.

Figure 4-5

Tablet PC Adoption Trends for Physicians and Physician Offices, Estimates and Projections 2008-2018
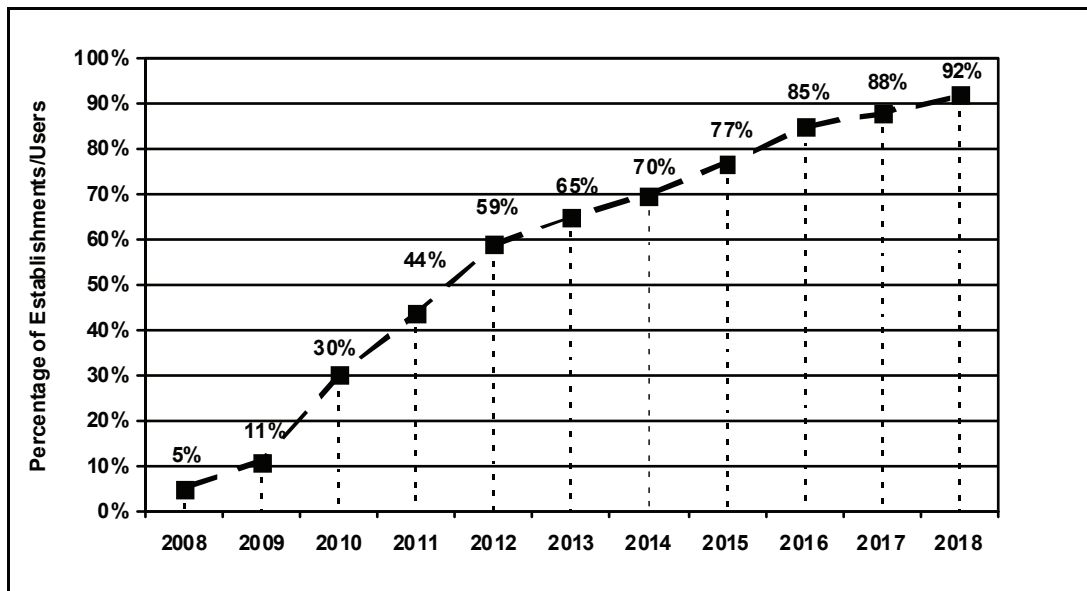
Source: Survey Data, Industry Sources, Kalorama Information
Note: U.S. Estimates, Projections

Nursing Establishments/Home Health Services

The adoption rate of tablets in the nursing establishment sector is slowly growing, with less than 10% of facilities using any type of health IT system. However, physicians that visit nursing homes often use tablets and other devices to complete patient evaluations, prescription orders or other tasks. Reducing costs in nursing homes will likely contribute to the growth of mobile technologies in this type of facility in the near-term.

The home health sector is a growing segment of the market as many clinicians find that the advantages of a tablet over other devices, such as smartphones, are proving to be valuable in the home health setting. The increasing number of home health patients due to an aging population will continue to generate increases in the tablet market. Clinicians report immediate access to patient files and records, uploading capabilities with Bluetooth from home medical

devices, video conferencing capabilities and other advantages with tablets will drive growth for these devices in the home health sector.

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Figure 4-6

**Tablet PC Adoption Trends in Nursing Establishments/Home Health
Services, Estimates and Projections 2008-2018**
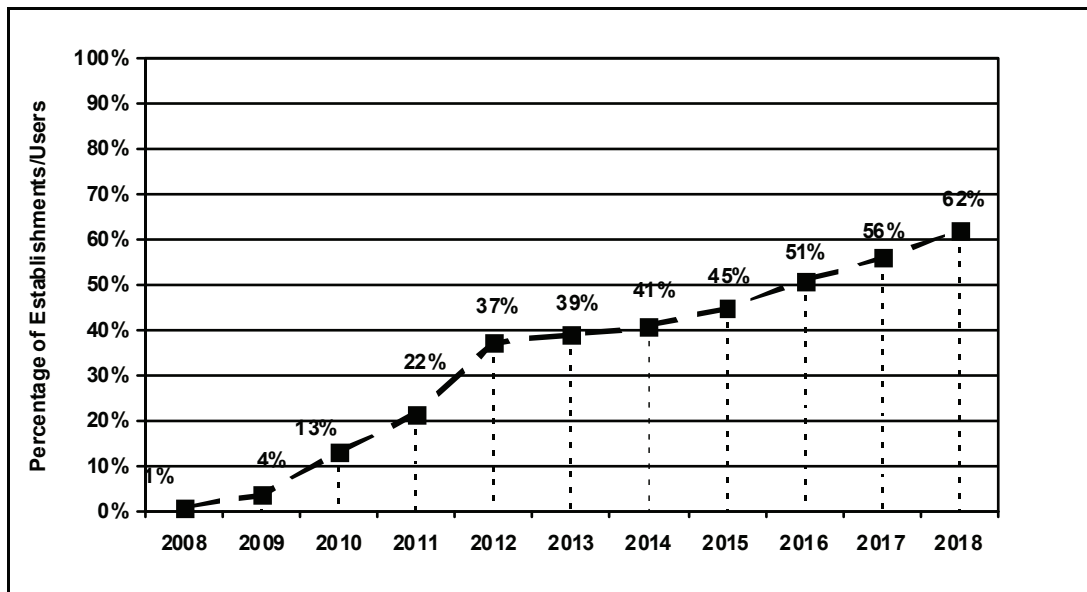
Source: Survey Data, Industry Sources, Kalorama Information
Note: U.S. Estimates, Projections

Others

Other locations include pharmacies, medical and diagnostic laboratories, emergency responders, fitness centers with health kiosks, school nursing units, and similar facilities. The adoption of tablet PC is growing in this segment with free-standing health kiosks popping up in various types of businesses, most using some type of tablet PC compatible with the unit. Pharmacies are also a growing segment, from the kiosk center, to pharmacists and technicians now using tablets to verify medical records, physician orders, and patient contact data. First responders have expressed an increasing benefit in the growing options and equipment now available to meet the needs of a rugged atmosphere with high requirements for mobile

communication. Fitness clubs have added tablets to the wish list, with many large outfits investing in this technology. Personal trainers have found the use of tablets to be an improved method for tracking patient results on location and improve session efficiency. The education sector is also jumping on the bandwagon for tablets and the school nursing office is also benefiting from widespread adoption. Several interviews with both primary and secondary education facilities have revealed the benefits to nurses in these locations, from point-of-care access to interacting medications to laboratory results.

We can expect to see the use of tablets increase in remote locations, untapped markets, and health markets where technology has been lacking. The general availability, reasonable cost, user-friendly features, and convenience of the tablet will likely drive the market for these devices in the future.

REGIONAL DISTRIBUTION OF TABLET PC SALES TO HEALTH ESTABLISHMENTS

The $1.7 billion medical tablet PC market is generated with sales from about 100 countries worldwide with the top countries including:

- United States

- Japan

- Germany

- France

- United Kingdom

- Italy

- Canada

Countries included in the table under 'rest of world' include some areas with high growth in tablet sales and countries where manufacturers are focusing their international expansions. Some of these include China, India, and Brazil. Mobile device sales in general have been labeled as robust, by companies such as Research In Motion, for Latin America, Asia Pacific, the Middle East and Western Europe.

Apple is a large contributor to the U.S. market with about 40% of its sales generated in the U.S. Apple reported 50% increase in the Americas during 2012 due to a variety of factors including strong demand for iPad, continued demand for iPhone, and higher sales of third-party applications from Apple's app store. Apple has reported consistent sales for the iPhone in Europe and strong demand for the iPad during the year. However, growth for Japan was reported at 94% compared to 2011. The company cited increased demand for iPhone and the launch of iPad to be the primary contributors to growth. Apple also reported strong growth in other Asia-Pacific countries including China, Korea, and Australia.

The U.S. market is the largest market, generating more than $582 million in sales for 2012, growing to $720 million in 2013. The push to implement systems which have long-term cost savings capabilities to the health system and reduce medical errors while providing high quality patient care has fueled growth in the U.S. Government incentives have improved conditions for health facilities to expand IT budgets and take advantage of the advanced

technology for mobile devices. Sales will continue to growth at high rates, reaching almost $1.9 billion by 2018, increasing by 20.9% from 2013 to 2018.

The European market has continued to show steady growth for tablets in the health field. In 2013, the total European tablet healthcare market will reach $481 million, representing 29% of the market. The European market will show double-digit growth over the forecast period, increasing to $1.3 billion by 2018.

The Japanese market will continue to show strong demand for handhelds as the country continues to push long-term cost-savings plans and reduce overall healthcare costs. For 2018, the Japanese market is expected to reach $270 million, displaying compound growth of 22% from 2013.

The Asia-Pacific market, excluding Japan, represents 13% of the global tablet healthcare market. The region continues to experience increasing demand for mobile devices particularly in China, Korea, Taiwan, and Australia. The $222 million Asia-Pacific market is expected to increase to $660 million by 2018, showing growth of 24.3% over the period.

Table 4-3

**Global Market for Medical Tablet PCs in Healthcare
Estimated Products Sales by Geographic Region, 2008-2018**

Year	Region					Total Revenues (in millions)	Percent Change
	United States	**Europe**	**Japan**	**Asia-Pacific (exc. Japan)**	**Rest of World**		
2008	$71	$39	$7	$7	$8	$132	-
2009	95	52	9	9	11	176	33.3%
2010	157	92	17	23	21	310	76.1%
2011	391	243	40	105	78	857	176.5%
2012	582	378	81	163	121	1,325	54.6%
2013	720	481	100	222	157	1,680	26.8%
2014	894	590	126	290	200	2,100	25.0%
2015	1,135	740	160	395	250	2,680	27.6%
2016	1,390	950	200	490	320	3,350	25.0%
2017	1,620	1,105	230	575	380	3,910	16.7%
2018	1,860	1,270	270	660	440	4,500	15.1%

Compound Annual Growth Rate

Period	Region					Total
	United States	**Europe**	**Japan**	**Asia-Pacific (exc. Japan)**	**Rest of World**	
2008-2013	58.9%	65.3%	70.2%	99.6%	81.4%	66.3%
2013-2018	20.9%	21.4%	22.0%	24.3%	22.9%	21.8%
2008-2018	38.6%	41.7%	44.1%	57.6%	49.3%	42.3%

Source: Kalorama Information

Figure 4-7

**Global Market for Medical Tablet PCs in Healthcare
Market Share by Geographic Region, 2013**
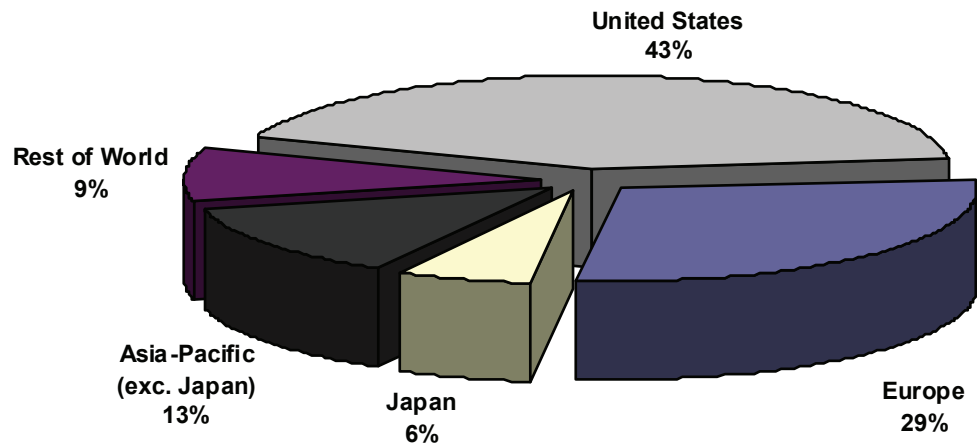
Source: Kalorama Information

MARKET DRIVERS AND INHIBITORS

Growth Drivers

The healthcare industry is facing challenges such as an aging population, an increased number of patients with chronic diseases, and an increase in medical errors leading to fatal results. Thus, the healthcare industry is looking at methods to counter these challenges and also to streamline the overall processes related to the industry. Although the adoption of mobile devices and other wireless technologies in the healthcare industry poses some challenges, the drivers and benefits associated with the adoption are multifarious. Some of the drivers of the rapid adoption of mobile devices and similar technologies in healthcare are as follows:

- **Growing Healthcare Cost**

- **Aging Society**

- **Limited Availability of Nurses and Physicians**

- **Reduction of Medical Errors**

- **Telemedicine Benefits**

- **Federal Initiatives**

Growth Inhibitors

The use of tablets in healthcare involves the use of both devices and software (or applications) and the integration of these combinations in daily operations. This can include some significant challenges. Thus, only when all patient-related information, such as billing, laboratory, medical history, etc., is available and accessible securely and seamlessly from a single resource, these devices and applications will become ubiquitous. Some of the factors which restrict the adoption of these technologies in healthcare are as follows: [5]

- **Threat to Security**

- **Low Availability of Suitable Medical-grade Devices**

- **Implementation Failures**

- **Resistance to Change**

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[5] Source: http://eprints.usq.edu.au/archive/00000204/01/HealthFocus_Group_Report_Paper.pdf

- **Lack of IT Resource in Provider Settings**

- **Electromagnetic Interference**

- **High infrastructure Cost**

EMERGING TRENDS

Trends resulting from emerging technologies and evolving social scenarios are bound to have a direct impact on the execution of medical processes and the way communication takes place. Some of the trends that are affecting the healthcare industry are as follows:[6]

- **Increasing Expectations** – Medical research is paving the way for new technologies and offering further scope for improvement. It is being aggressively presented by the media to the public, thus, increasing the expectations of customers. This, in turn, is pressurizing healthcare organizations to implement new technologies.

- **Internet Penetration** – Computers and the Internet are increasingly being used in healthcare organizations. Information on almost every topic can be accessed with the use of the Internet, which is helping in the creation of high-quality communications network.

- **Emerging Technologies** – The high pace of technological advancement is putting pressure on healthcare organizations to update, and/or overhaul their existing information and communication technologies.

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

- **Changing Demographics** – Elderly people are increasingly forming a majority of the American population. Baby Boomers will reach the retirement age by the next decade which will lead to the need for a widespread application of wireless and mobile technologies within the healthcare industry because of greater requirement of tele-homecare, remote patient monitoring, etc.

- **Rising Cost of Healthcare –** The successful treatment of a number of ailments with the use of the latest technologies is leading to the widespread adoption of superior technology for

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[6] Source: http://www.id.iit.edu/profile/gallery/healthnet/healthnet_inf_report.pdf

both diagnostic as well as meditative interventions. The cost of healthcare has been rising and will continue to rise.

Competitor Market Share Analysis

OVERVIEW

Several providers of healthcare IT solutions offer tablet computers that are tailored to the healthcare environment. Many hospital-grade mobile devices are designed to meet the demanding requirements of the health care environment, targeting the ability to accommodate rigorous use and unsanitary conditions. A growing number of manufacturers are building tablets that can withstand a drop up to 3 feet and be submerged in shallow water for up to 30 minutes. This segment of the market has expanded dramatically over the past five years.

On a global scale, the tablet PC market is worth about $70 billion with more than 200 million units sold for 2012. The market for tablet PCs in healthcare settings is worth about $1.7 billion for 2013, showing steady double-digit growth. Tablet PC adoption rates have increased during the last five years with the resurge in the market driven by Apple's iPad and other well-known technology brands. In addition to mainstream companies such as Apple introducing tablet PCs, a number of more rugged and healthcare specific equipment are available, such as that by Motion Computing and Panasonic.

COMPETITOR MARKET ANALYSIS

Apple has continued to grab a larger share of the market each year and the company's share increased most significantly during 2011. The adoption of Apple's iPad and newest iPad 2 in health settings is contributing to the company's growth share of the market. In 2013, it is estimated that Apple's share will increased to about 57% of the tablet for healthcare market.

Other competitors generate the remaining 44% in 2012 and 43% in 2013. These companies—Samsung, Research in Motion (BlackBerry), Panasonic, Hewlett Packard, Motion Computing, Lenovo, Fujitsu, Tangent and others—struggle to keep pace with the adoption rate of Apples iPad products. For example, in 2012, Apple reported total tablet sales of 58 million units, compared to Research in Motion's tablet unit sales of just over 1 million.

Table 5-1

Leading Competitor Analysis, Global Tablet PC Healthcare Market, 2012 vs. 2013

Competitor	2012			2013	
	Revenues $ (estimates)	**Share %**		**Revenues $ (estimates)**	**Share %**
Apple, Inc.	$737	56%		$959	57%
Others	588	44%		721	43%
Total	$1,325	100%		$1,680	100%

Source: Kalorama Information

Figure 5-1

**Leading Competitor Analysis, Global Tablet PC Healthcare Market, 4 Year
Growth Trend**
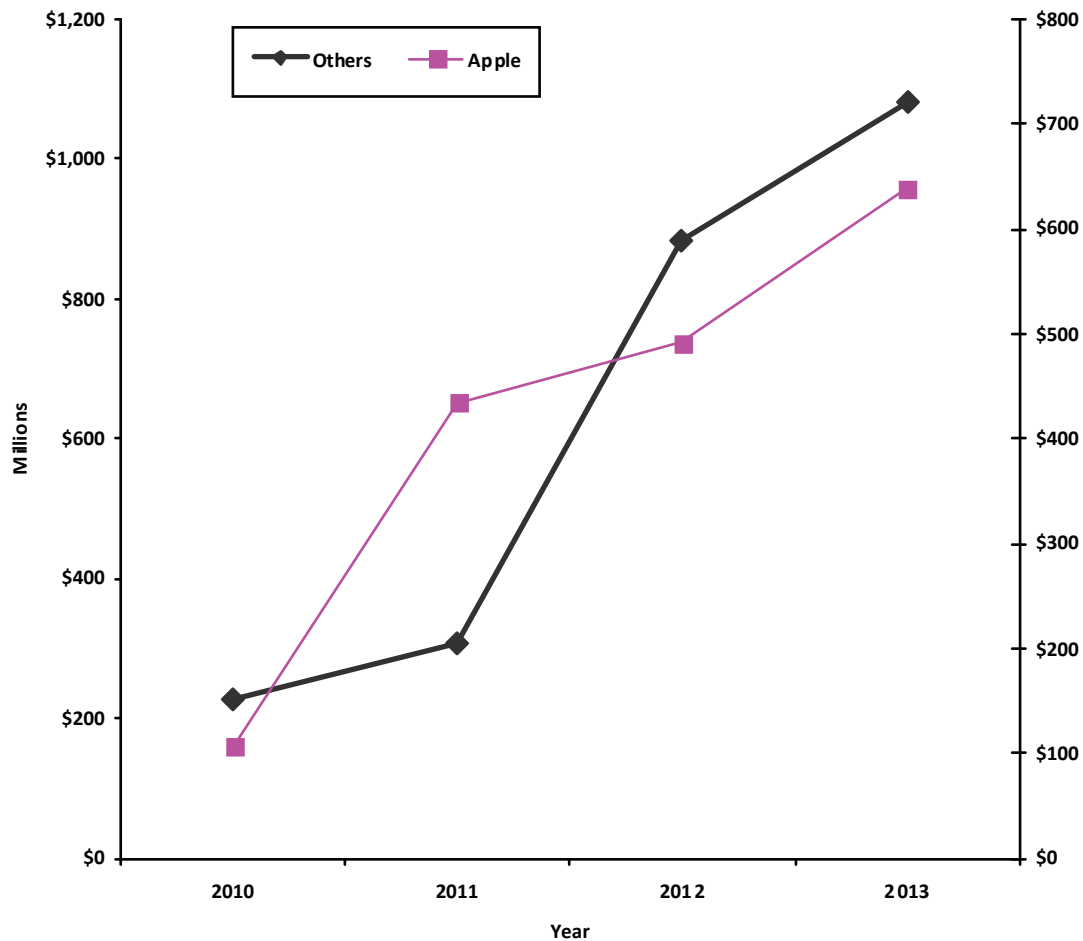
Source: Kalorama Information

Industry Trends

INTRODUCTION

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. The medical community is noted for lagging in IT area advancements. However, manufacturers in this field have been working diligently to engineer systems that make it easier for physicians to adopt and use these technologies for a wide range of daily patient care functions, both in and outside the clinical setting.

The list of trends and factors affecting the market for tablet PCs in healthcare include:

- EMR Compatibility and Functions

- Efficiency in Healthcare with IT

- Growing Availability and Use of Medical Apps for Tablets

- E-Prescribing: A Driver to Tablet Adoption

- Demand on Healthcare with Aging Populations

- Health Spending and Cost Saving Efforts

- Health Information Technology and American Reinvestment and Recovery Act of 2009

- HIPAA

- FCC and Medical Wireless Communication

TABLETS AND EMR FUNCTIONS

The electronic medical record (EMR) or electronic health record (EHR) give patients and physicians greater freedom, improved accuracy, and should result in better outcomes as critical records are all in one, easily-transportable record.

Overview of EMRs

EMR is a clinical IT solution, which broadly encompasses five areas – Pharmacy Information Systems (PISs), Radiology Information Systems (RISs), Laboratory Information Systems (LISs), other information systems for clinical functions, and wireless-enabled systems and surgical management systems. Tools, such as Computerized Practitioner Order Entry (CPOE) systems and decision support systems, are used across all these information systems.

As with office-based physicians, EMR use in hospitals increases with larger facilities, and with hospitals or hospital networks located in urban areas versus rural areas.

EMR Adoption

Data from the 2010 National Ambulatory Medical Care Survey (NAMCS), conducted by the Center for Disease Control and Prevention's (CDC; Atlanta, GA) National Center for Health Statistics (NCHS), showed that more than 50% of office-based physicians used any type of EMR system and 10% used a fully functional system.   For 2012, Kalorama interviews suggest that more than 80% of office-based physicians are using EMR systems.

The NAMCS conducted face-to-face interviews with sampled physicians. In an effort to clarify use of EMRs physicians who said that they used either full or partial electronic records were asked an additional seven questions regarding the features of their EMRs. There are four features deemed necessary for a comprehensive EMR system, which are as follows:

- Computerized orders for prescriptions;

- Computerized orders for tests;

- Test results; and

- Clinical notes.

It is estimated that resistance by physicians is a significant barrier affecting EMR adoption. The use of familiar technologies like smartphones and tablets may continue to lessen

the resistance of clinical EMR use. Further, it is believed that in the long term, the concerns regarding physician resistance will be alleviated. Various other factors, such as computer anxiety and the lack of educational opportunities, are also predicted to be significant barriers in certain cases. The other barriers are as follows:

- Lack of support by medical staff

- Difficulty in achieving end-user acceptance

- Disconnect between physicians and the management in making appropriate decisions

Decreased opportunity for training is a major drawback in the adoption of EMR and other clinical IT solutions. It is estimated that time-consuming activities of entering orders and patient histories using EMR and its various component tools, such as CPOE, is a major inhibitor to EMR adoption. Technological inhibitors include the lack of knowledge in choosing the appropriate EMR solution, knowledge of standards, etc. The major inhibitors are as follows:

- Difficulty in shifting over from paper-based records to a computerized record-keeping system

- Huge time and effort needed to establish the EMR infrastructure in the organization

- Difficulty in integrating various systems across all departments

- Challenges in selecting the appropriate EMR solution for the organization

- Inadequate or incomplete information standards

- Difficulty in evaluating vendors

- Lack of a commonly-accepted and structured medical terminology

- Security concerns

- Lack of a user-friendly way to input patient information

Are Electronic Healthcare Systems More Efficient?

In February 2012, the analysis unit of Healthcare Information and Management Systems Society (HIMSS) reported that hospitals with advanced EMR systems reported benefits in several areas of care. Hospitals are rated by HIMSS Analytics on a scale up to stage seven. Stage seven hospitals have the most complete EMR systems. Stage six and seven hospitals were surveyed to find out what specific benefits were achieved.

Survey results were collected from chief information officers from 33 hospitals across the U.S. These respondents targeted greater clinical success, specifically to reduce adverse drug events (ADEs) and increase treatment quality. All hospitals that responded found at least one core measure benefit and a safety measure benefit from advanced EMR adoption. Hospitals that targeted improvements in care often achieved the benefits they focused on. More than 75% saw an improvement in pediatric asthma, pregnancy, AMI, CHF and VTE due to targeting these areas of care.

Around 75% of hospitals that targeted ADE reductions reported seeing improvements in this area. Additionally, two hospitals that did not target ADEs saw improvements in this area.

Other than clinical improvements, hospitals reported operational benefits. The following benefits are shown along with the percent of respondents that experienced them.

- reduction in order turnaround times (76%)

- improved drug order to administration times (73%)

- decreased cost of paper forms (67%)

- improved charge capture (64%)

- decreased transcription costs (61%)

- reduction in duplicate lab testing (58)

- reduction in antibiotic start times (58%)

- improved documentation quality (55%)

- improved quality of coding (46%)

- medical record staff reduction (42%)

- improved reimbursement (42%)

- reduced payment denials (39%)

- pharmacist time savings (33%)

- reduced drug use or cost (30%)

- clinical cost reduction (24%)

- length-of-stay reduction (18%)

- nursing staff time savings (15%)

- increased use of preventative care (12%)

- reduced staff (9%)

- other (6%)

- don't know (3%)

- no additional benefits (3%)

Surveys for this analysis were sent to 180 hospitals in late 2011. Of the mailed surveys 18%, or 33, were returned. The average bed size of the hospitals was 376, but the number of beds ranged from 25 to 900 per hospital. The majority, 82%, of hospitals were rated a stage 6 EMR hospital.

The EMR and Mobile Apps

Hospitals, especially large hospital networks, have significant investments in large EMR systems. For example, Kaiser Permanente is based in California, but it has hospitals located in and out of the state, increasing the expense of a complete system. The Kaiser electronic health system cost several billion dollars.

Mobile apps are available as a compliment to a large system or a smaller clinic-based system. Apps may even be offered as standalone EMR systems. The ability to use a small standalone system can be appealing to smaller providers using mobile devices such as tablets. Clinics with only a couple of physicians and nurses are reluctant to make the investment in complex systems due to cost, skepticism, and the learning process.

DrChrono, Inc. offers a portfolio of medical iPad apps for professionals in health systems management and patient care. It has a certified complete EMR/EHR solution that meets ONC-ATCB stage 1 criteria which entitles users to stimulus plan funding if all requirements are met.

DrChrono also offers a patient check-in app called, OnPatient. This system is iPad-based and it automatically updates patient information. A patient fills out their information after checking in at an office center, reducing the paperwork from the very beginning.

USING TABLET PCS IN E-PRESCRIPTION

Electronic prescription (e-prescription) refers to the use of computerized devices to enter, modify, review, and transmit drug prescriptions. It may include one-way or multi-way communication and integration with electronic health records and practice management systems. E-prescription has evolved from being a fragmented, niche market to an integrated, standards-based solution over the last few years. A nationwide e-prescription system can minimize the confusion caused by hard-to-read prescriptions, and thus, prevent serious errors in dosage and drug combinations.

E-prescription links healthcare providers, pharmacies, and payers by allowing physicians to send prescriptions to pharmacies through a handheld device. A physician, with the use of computerized devices and equipment, can access patients' medication information. This information allows physicians to see patient cost-sharing, discuss therapeutic alternatives, and check medicines being used by the patient.

There are six distinct components or levels of e-prescription solutions.[7]

- **Basic Reference Information** – This is the basic tool that provides clinicians with computer-based drug and formulary information. The prescription is completed manually, and the tool is delivered on workflow-compliant devices such as PDAs.

- **Standalone Prescription Writer** – This solution enables physicians to search for and select a drug, while creating an electronic prescription and the possible dosage information.

- **Supporting Patient Information** – This is a third-level tool that also supports patient-specific demographic and clinical data, including information like allergies, past history, insurance, etc.

- **Medication Management** – This e-prescribing tool provides physicians access to medication history of patients for creating new prescriptions and managing renewals. It also facilitates a higher level of checking that prevents drug-to-drug contradiction errors.

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[7] Source:
http://www.mckesson.com/static_files/McKesson.com/MPT/Documents/Electronic%20Prescribing_WHT176.pdf

- **Connectivity –** The fifth level of an e-prescription solution provides electronic connectivity between the physicians' office and retail pharmacies. There are also intermediary companies to facilitate the connectivity needed at both the front-end and the back-end of the prescribing process. The types of transactions that are important to the process include the following:

  - Ability to download up-to-date formulary information

  - Access to patient-specific medication claims history

  - Ability to send a certified prescription to a pharmacy

- **Integration with an EMR –** This is the highest level tool. It facilitates the process of making a medical data bank of a patient, and is considered to be a part of the complete clinical automation set-up at a physician's office.

Benefits of E-Prescription

- E-prescription solutions provide clinical decision support by checking, correcting, and offering suggestions and recommendations on a prescription.

- The adoption of e-prescription can avoid many of the more than 2 million adverse drug events every year in the United States alone—out of which roughly 130,000 events are considered to be life-threatening. This can lead to a cost saving of up to $30 billion each year.[8]

Challenges in the Implementation of E-Prescription

- Physicians' resistance to change

- Unwillingness of pharmacies to adopt e-prescription

- Expensive and complex solutions

- Controversies over security requirements

- Readiness of software vendors

- Connectivity

- Transaction Fees

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[8] Source: http://www.hhs.gov/healthit/documents/AHIC112905MeetingReport.pdf

U.S. FOOD AND DRUG ADMINISTRATION REQUIREMENTS FOR MOBILE MEDICAL APPLICATIONS

Due to the increasing use of medical software applications in healthcare, the U.S. FDA issued a guidance document informing the public how it intends to regulate specific products to better ensure public safety. This document was issued in July 2011.

In general, the FDA does not regulate the non-medical devices themselves. The smartphones, tablets or other mobile devices along with the majority of applications do not fall under the scope of the FDA's oversight. Guidance documents from the FDA represent the "current thinking" of the agency and it is used as a industry recommendation instead of a legally enforceable requirement. In some instances the guidance documents cite specific regulations that must be followed.

Part of the guidance of medical devices is based on the performance of the devices or their hardware components such as screens. Viewing and interpreting radiological images on a mobile device could be affected by the contrast ratio, ambient light, and screen resolution. The software applications that the FDA intends to regulate are defined in effect as a "device" in section 201(h) of the Federal Food, Drug, and Cosmetic Act and are either:

• used as an accessory to a regulated medical device, or

• transforms a mobile platform into a regulated medical device.

One of the determining factors that helps define a medical app as a device is how it is marketed. If the software is used to operate a device that is marketed for medical use, it is considered a medical device. The FDA considers a mobile glucose meter reading app, a medical device, because it is similar to desktop glucose analysis software, also regulated by the FDA.

Manufacturers are also regulated as medical device manufacturers if they meet specific requirements. A mobile platform manufacturer that offers products with no specific intended use is considered a component manufacturer. This may be related to a smartphone manufacturer that offers devices for general use, not medical use. This means the manufacturers are exempt from quality systems, registration and listing requirements that may be enforced for medical device manufacturers.

The FDA does not consider some mobile medical apps as regulated medical devices. Examples include:

- Electronic "copies" of medical textbooks, teaching aids or reference materials, or are used to provide clinicians with training or reinforce training previously received. These types of apps do not contain any patient-specific information. This includes the Physician's Desk Reference (PDR).

- Mobile apps that are solely used to log, record, track, evaluate, or make decisions or suggestions related to developing or maintaining general health and wellness.

- Mobile apps that only automate general office operations with functionalities that include billing, inventory, appointments, or insurance transactions

- Mobile apps that are generic aids that assist users but are not commercially marketed for a specific medical indication.

- Mobile apps that perform the functionality of an electronic health record system or personal health record system.

The regulated mobile medical apps and devices fall under the classifications that pertain to other medical devices such as class I, class II, and class III devices. The device classifications are:

- class I (general controls)

  o Establishment registration, and Medical Device listing (21 CFR Part 807);

  o Quality System (QS) regulation (21 CFR Part 820);

  o Labeling requirements (21 CFR Part 801);

  o Medical Device Reporting (21CFR Part 803);

  o Premarket notification (21CFR Part 807);

  o Reporting Corrections and Removals (21 CFR Part 806); and

  o Investigational Device Exemption (IDE) requirements for clinical studies of investigational devices (21 CFR Part 812)

- class II (special controls in addition to general controls)

class III (premarket approval)

INCREASING LIFE EXPECTANCY AND THE DEMAND FOR ADVANCED HEALTHCARE DELIVERY OPTIONS

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. Overall women typically live longer. There are several theories why women outlive their counterparts. For example, men fight in more wars, and are believed to take more risks.

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 mobile technologies that can meet these needs.

GLOBAL HEALTHCARE TRENDS

The worldwide spending on healthcare is approximately $6.5 trillion. This is around 10% of the global GDP. North America is the largest region in terms of total dollars spent on healthcare followed by Europe, then Asia Pacific.

Healthcare costs as a percent of GDP are increasing in almost all countries but there are some exceptions like the Czech Republic. The European Union (E.U.) spends about 10% of the GDP in healthcare. As a whole, the E.U. region has seen some of the smallest increases in healthcare spending between 2000 and 2009 with an average of approximately 3.5-4% growth in total expenditures in real terms.

South America, Asia Pacific and the Middle East are the smallest healthcare markets. This can be attributed to the fact that the health systems in use are unbalanced in terms of demand and supply, and are preventing many from meeting international goals centered on health and poverty. Furthermore, the healthcare systems of many countries in these regions are failing to deliver services of adequate quality, often using resources inefficiently or inappropriately. However, these regions are experiencing more growth as their economies grow.

Table 6-1

Total Healthcare Expenditures as a Percent of GDP by Country 1990, 2000 and 2010

Country	Total Health Expenditures as Percent of GDP by Country		
	1990	**2000**	**2010**
Australia	6.9	8.3	9.1
Austria	8.4	9.9	11.0
Canada	8.9	8.8	11.4
Czech Republic	4.7	6.3	7.5
Finland	7.7	7.0	8.9
France	8.4	10.1	11.6
Germany	8.3	10.3	11.6
Greece	6.6	7.8	10.2
Italy	7.7	8.1	9.3
Japan	6.0	7.6	10
Mexico	4.8	5.6	6.2
Switzerland	8.2	10.2	11.5
United Kingdom	6.0	7.0	9.6
United States	11.9	13.2	17.5

Source: Organization for Economic Cooperation and Development; U.S. Census Bureau

Figure 6-1

Total Healthcare Expenditures as a Percent of GDP by Country 1990, 2000 and 2009
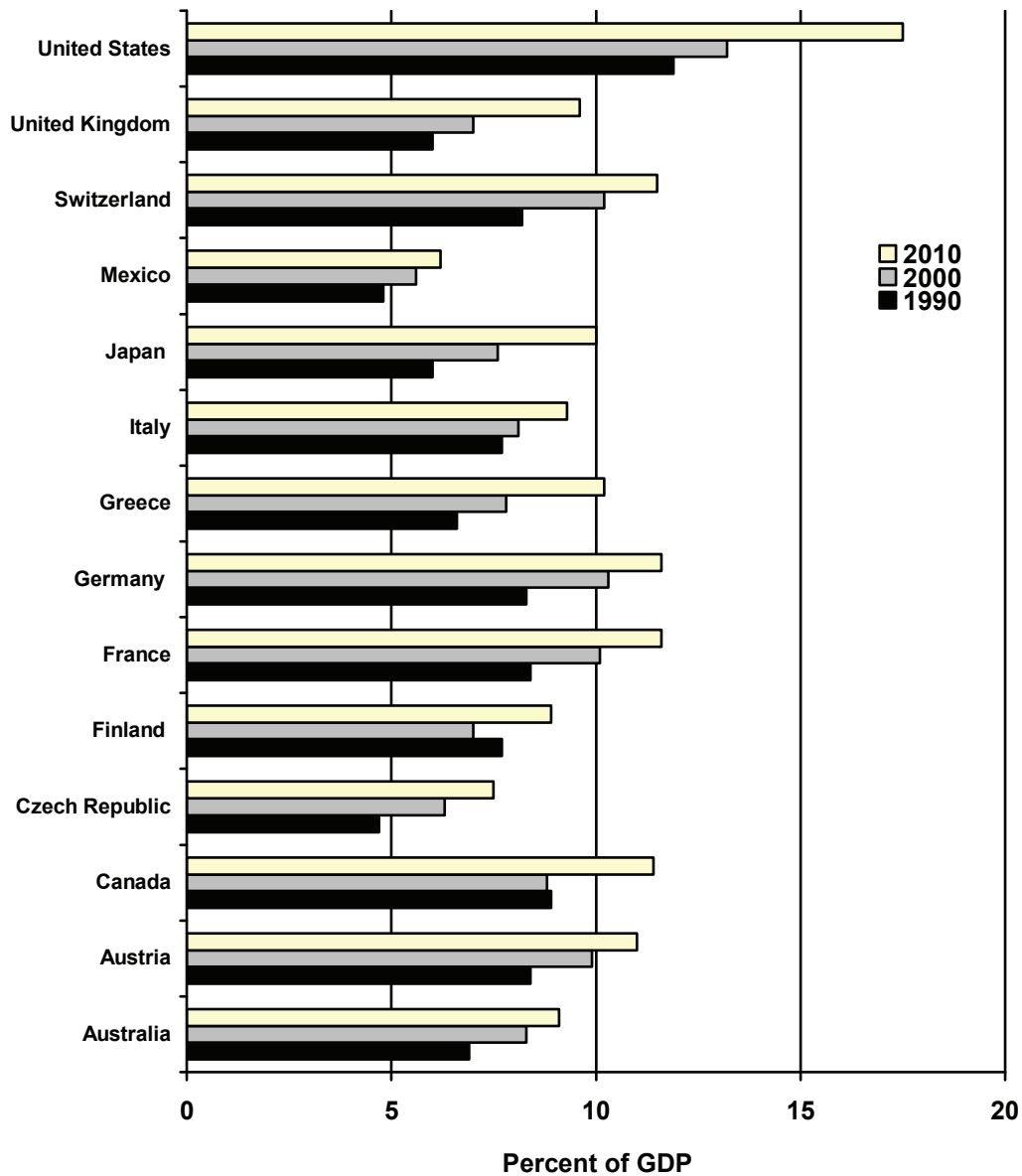
Source: Organization for Economic Cooperation and Development; U.S. Census Bureau; Kalorama Information

General Economic Trends by Country

In recent years, profound socioeconomic expansion has been seen in emerging markets such as China, India, South America, and Russia. Some countries in Asia-Pacific have also seen strong growth in GDP. Many competitive companies in all industries around the globe have attempted to take advantage of shifting market opportunities especially after the financial crises in the E.U. and the U.S. This is not to say that these emerging markets have been immune to the financial problems, but they have shown some of the highest levels of economic growth.

Table 6-2

Average Annual Growth of GDP by Country 2007-2011

Country	Average Annual Growth of GDP in %
Greece	-4
United Kingdom	-.5
France	.1
Austria	.5
Germany	1
United States	1
Australia	2
Brazil	4
Chile	4
Bolivia	5
Cambodia	5
Ecuador	5
India	7
China	10

Source: Organization for Economic Cooperation and Development; CIA The World Factbook; Kalorama Information

The financial crisis in 2008 and 2009 led to a global recession and an introduction of new fiscal and monetary policies that were designed to regain job creation and boost growth. The typical government response has been to put federal stimulus packages in place which resulted in large budget deficits.

At the global level, the money supply has approximately doubled over the past five years and countries are attempting to sustain growth while controlling inflation and providing an avenue for long-term growth.

There are 180 countries that have released data on their fiscal and monetary policies for 2012. The following breakdown categorizes these countries into groups of similar policies:

- 85 countries chose expansionary policies growing the money supply greater than the 6% average

- 47 countries chose restrictive policies to hold money growth to less than 6%

- 48 countries chose counterbalancing policies

The combined effect of these policies resulted in a decelerating global GDP growth rate for 2010, 2011 and 2012.

For the future there are issues such as over-crowding, waste control, pollution, over-fishing, and depletion of non-renewable resources. There are new technologies that are working to combat these issues such as using renewable resources for power, and increasing medical efficiency.

U.S. HEALTH INDUSTRY TRENDS

The healthcare industry is considered to be among the largest and also the fastest growing industry segments worldwide. It is estimated that in the most developed nations, healthcare spending forms about 10% of the Gross Domestic Product (GDP) on an average. In this respect, the percentage of healthcare spending in the U.S. is larger than average for the world, and in fact the largest, with the healthcare system forming roughly 17% of the GDP of the U.S. in the year 2011.

The U.S. healthcare market is considered as the most fragmented and complex market in the world. The spending on healthcare in the U.S. has increased from $1.4 trillion in 2000 to $2.8 trillion in 2010.

Even amid healthcare reform in the U.S., healthcare spending as a percent of GDP is expected to increase to almost 20% by the year 2021. This is due to increased government spending, increased home health spending, health insurance costs, and cost-sharing subsidies.

Table 6-3

National Healthcare Expenditures in the United States 1960-2020

(millions)

	Healthcare Spending
1960	$28,000
1965	$42,000
1970	$75,000
1975	$133,000
1980	$254,000
1985	$440,000
1990	$714,000
1995	$1,017,000
2000	$1,353,000
2005	$2,000,000
2010	$2,800,000
2015	$4,000,000
2020	$4,400,000

Source: U. S. Centers for Medicare & Medicaid Services; U.S. National Coalition on Healthcare; U.S. Census Bureau Statistical Abstract 2011

Economic Trends in the U.S.

The economy of the U.S. is the largest economy in the world with a per capita GDP on a purchasing power parity basis (PPP) of about $50,000 for 2012. A per capita GDP of $50,000 is the 12th position for the world. China has the second-largest GDP. Income in the U.S. has decreased in several recent years. In 2011, incomes on average decreased by 1.5% compared to 2010. In 2010, incomes decreased 2.3% compared to 2009.

Two wars in Iraq and Afghanistan have pressured the U.S. towards more military spending totaling approximately $900 billion through 2011.

Technological advancements in the U.S. have contributed to growth and also an increase in an unbalanced labor and income market. The top 20% of all earners have enjoyed faster

income growth than the bottom 80% of earners. This income inequality has expanded largely since the 1970s. In 2011, income inequality (Gini index) increased by 1.6% compared to 2010. This was noted as a rare increase.

The number of households living on less than $2 per day (before government benefits) has doubled over the past 20 year to reach 1.5 million.

Long-term U.S. economic issues are related to healthcare spending, pensions, social spending, an aging population, energy shortages, budget deficits, and stagnant wages for low-income earners.

U.S. Health Expenditures by Type

National Health expenditures in the U.S. are projected to grow by 46% between 2015 and 2021. Total health expenditures in 2015 are projected at around $3.2 trillion, increasing to $4.4 trillion in 2020.

Table 6-4

National Health Expenditure Amounts, by Type of Expenditure: Calendar Years 2015-2021 [1]

(In billions of dollars)

Type of Expenditure	2015	2016	2017	2018	2019	2020	2021
National Health Expenditures	$3,239.6	$3,434.0	$3,653.4	$3,895.7	$4,154.4	$4,432.0	$4,723.9
Health Services and Supplies	3,065.5	3,249.3	3,457.1	3,686.9	3,932.9	4,197.4	4,475.8
Personal Health Care	2,725.6	2,892.3	3,082.4	3,289.7	3,512.2	3,748.9	3,998.1
Hospital Care	1,037.9	1,100.9	1,173.0	1,252.0	1,336.1	1,425.2	1,519.2
Professional Services	825.3	874.8	932.9	995.6	1,062.2	1,132.2	1,203.2
• Physician and Clinical	614.5	651.7	695.3	742.4	792.3	844.9	898.7
• Other Professional Services	86.3	91.7	98.0	104.8	112.0	119.6	127.4
• Dental Services	124.5	131.4	139.6	148.5	158.0	167.7	177.1
Other Personal Health Care	169.1	180.4	193.0	207.0	222.4	238.9	256.7
Home Health Care	96.3	104.0	112.5	122.0	132.3	143.6	155.8
Nursing Care Facilities and Continuing Care	182.7	192.7	203.6	215.6	228.7	243.1	259.1
Retail Outlet Sales, Medical	414.3	439.5	467.4	497.5	530.5	566.1	604.1
• Prescription Drugs	309.4	328.8	350.0	373.3	398.9	426.9	457.3
• Other Medical Products	104.9	110.7	117.4	124.2	131.5	139.1	146.8
o Durable Medical Equipment	51.2	54.2	57.7	61.5	65.5	69.7	74.1
o Other Non-Durable Medical Products	53.7	56.5	59.6	62.8	66.1	69.4	72.7

Continued on next page

Table 6-4 (continued)

National Health Expenditure Amounts, by Type of Expenditure: Calendar Years 2015-2021 [1]

(In billions of dollars)

Type of Expenditure	2015	2016	2017	2018	2019	2020	2021
Net Cost of Private Health Insurance	195.6	204.7	213.3	225.8	238.7	255.1	272.0
Government Public Health Activities	104.7	110.6	117.0	124.0	131.4	139.3	147.9
Investment	174.0	184.7	196.3	208.8	221.5	234.6	248.1
• Research [2]	53.3	56.7	60.4	64.4	68.7	73.1	77.8
• Structures and Equipment	120.7	128.0	135.9	144.4	152.9	161.5	170.3

[1] The health spending projections were based on the 2008 version of the National Health Expenditures released in January 2011.

[2] Research and development expenditures of drug companies and other manufacturers and providers of medical equipment and supplies are excluded from research expenditures. These research expenditures are implicitly included in the expenditure class in which the product falls, in that they are covered by the payment received for that product.

Note: Numbers may not add to totals because of rounding.

Source: Centers for Medicare & Medicaid Services, Office of the Actuary

European Healthcare Markets

The European Union (EU) spends about 9 percent of GDP on healthcare. France, Germany, and Austria are typically the biggest spenders with about 10-11 percent of GDP spent on healthcare. The United Kingdom (UK) healthcare market stood at approximately $200 billion, which is roughly 8.7 percent of GDP. Finland's healthcare spending is in the region of 8.4% of GDP. Less developed regions of Europe display a lower percentage of spending on healthcare compared to GDP, however there is an increasing trend overall.

The approximate EU spending on healthcare is likely to remain around 8-12 percent of GDP. This is mainly attributed to the fact that EU countries, particular those reliant on social insurance, would 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.

Asia-Pacific Healthcare Markets

On the Asia-Pacific front, the healthcare market is the smallest in terms of size out of the three geographic regions, namely the U.S. and Europe, and Asia-Pacific. This can be attributed to the fact that the healthcare systems in use are unbalanced in terms of demand and supply of healthcare services, and are preventing many Asia-Pacific nations from overcoming challenges centered on health and poverty. Furthermore, the healthcare systems of many Asia-Pacific countries are often using the limited resources inefficiently or inappropriately, thereby failing to deliver services of satisfactory quality.

Despite all these drawbacks, Asia-Pacific markets are greatly influencing the worldwide healthcare scene. This is primarily due to expanding interest in medical tourism and the availability of skilled labor across Asia. As a result, it is expected that there would be significant growth of the healthcare industry in Asian countries, while the more developed countries in the EU and North America will continue to focus on containing the healthcare costs and improving quality.

Japan, the most advanced health market in Asia, reports health spending as a percentage of GDP at around 8%, showing slight increases over the years, from 6% in 1990.

Reducing Hospital Days to Lower Costs

Due to the expense of admitting a patient to the hospital, healthcare providers and insurers are all seeking to reduce the number of hospital admissions and lengths of stay (LOS). This can be complicated when seeking to maintain a high quality of care and preserve patient safety. Some of the methods of accomplishing this task include reducing the size of surgical incisions, improved time/resource management, using interpreters, and more efficient monitoring of patients. One hospital estimated that reducing patient LOS by 25% would save them several hundred thousand dollars per year.

The average length of stay (LOS) in U.S. hospitals is approximately 4.9 days and increases with age. The 65 and over age group accounts for the longest stay in hospitals at 5.5

days on average. The U.S. experienced a reduction in the average patient LOS between 1990 and 2010. In 1990, the average LOS for all hospital patients was 6.4 days compared to 4.9 days in 2010. In the European Union (E.U.), member countries reduced hospital LOS by approximately one day on average over the last decade.

Table 6-5

U.S. Hospital Length of Stay, Average by Age Group

Age Group	Days
Under 18 years	4.4
18-44 years	3.6
45-64 years	5.2
65-74 years	5.5
75-84 years	5.8
85+ years	5.8
Total (average)	4.9

Source: U.S. Census Bureau

Figure 6-2

U.S. Hospital Length of Stay, Average by Age Group
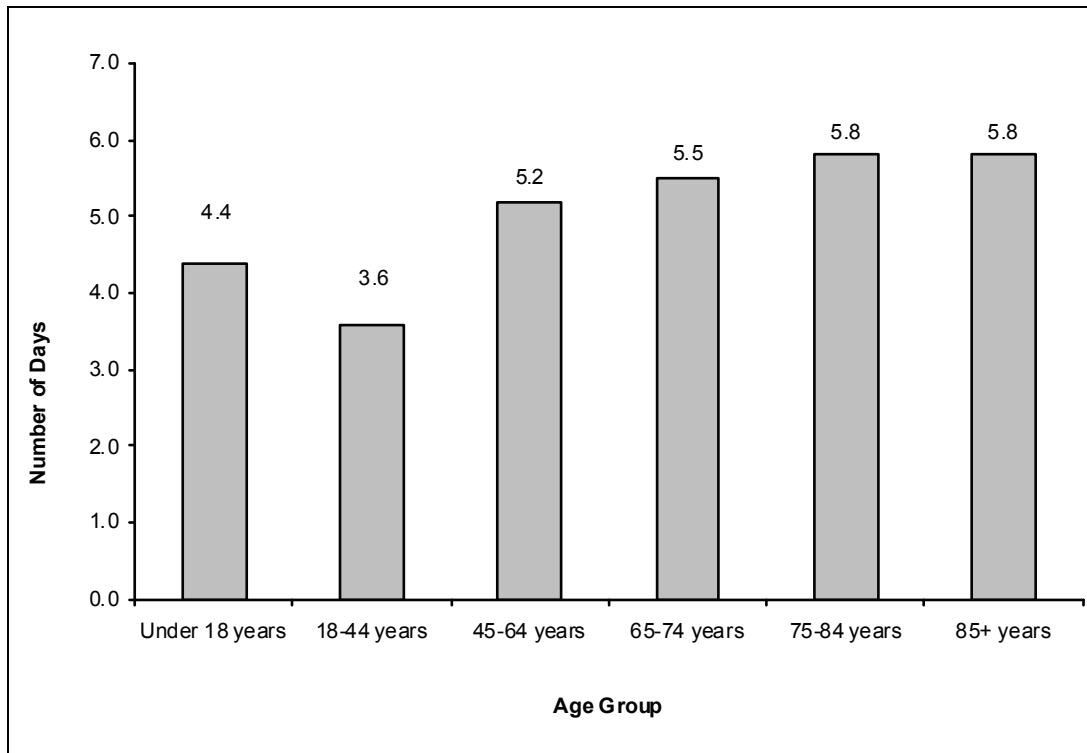
Source: U.S. Census Bureau

Table 6-6

Average International Length of Stay, by Country 2010

Country	Days
Australia	5.1
Austria	6.6
Belgium	7.0
Canada	7.7
Estonia	5.5
Finland	5.4
France	5.2
Germany	7.3
Hungary	5.8
Ireland	6.1
Israel	4.0
Japan	18.2
Mexico	3.9
Netherlands	5.6
Slovenia	5.4
Spain	6.3
Sweden	4.6
United Kingdom	6.6
United States	4.9

Source: OECD Health Data Health Care Resources: OECD Health Statistics (database); Kalorama Information

Figure 6-3

Average International Length of Stay, by Country 2010
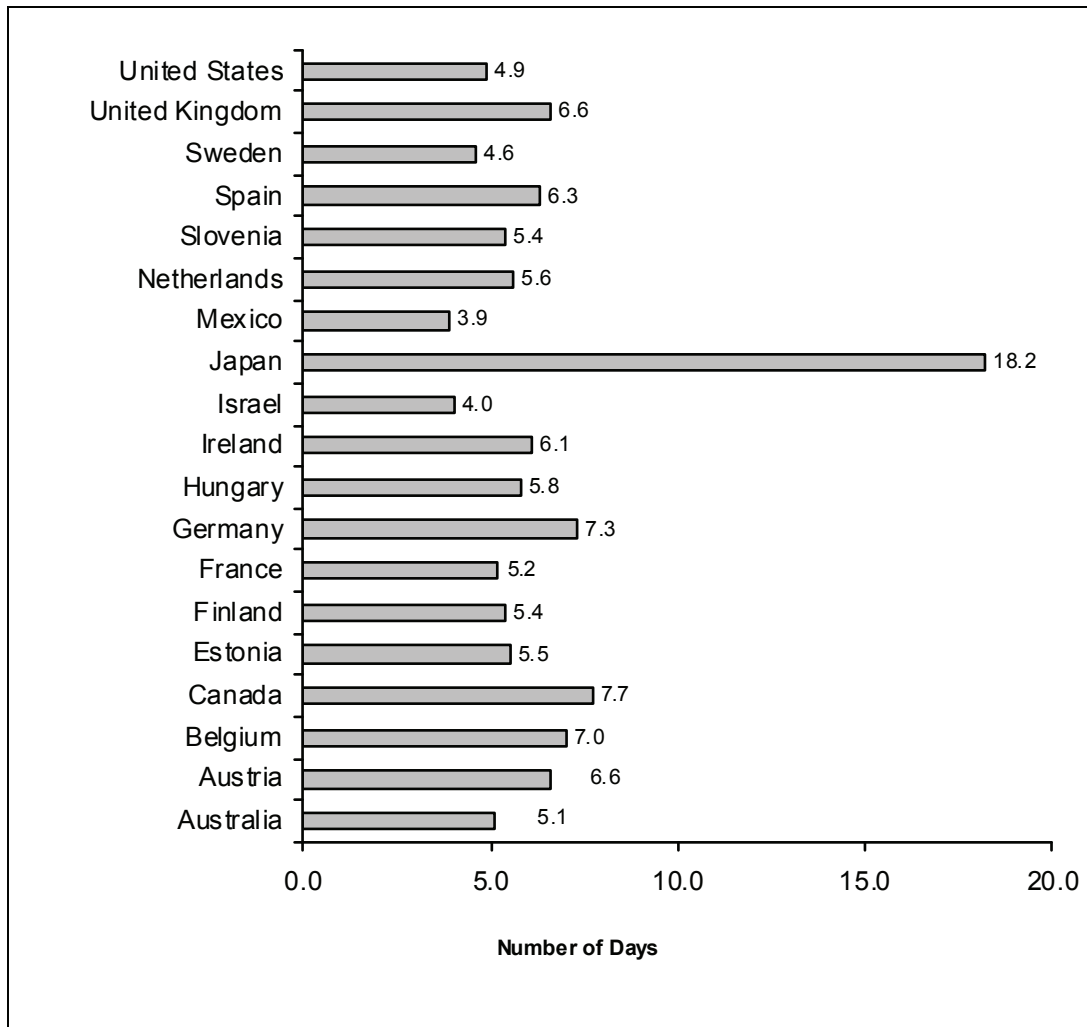
Source: OECD Health Data Health Care Resources: OECD Health Statistics (database); Kalorama Information

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

In February 2009, President Obama signed into law the ARRA. This $787 Act (stimulus package) was 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 electronic medical records (EMRs), and medical information exchange technologies.

Providers of HIT systems can be expected to offer both current technologies and be influenced to focus on R&D. The transition also includes the training needed to move a workforce in the direction of EMRs and healthcare information exchange.

The Act establishes the development of a national interoperable HIT infrastructure through the Office of the National Coordinator for Health Information Technology (ONCHIT) within HHS. The ONCHIT was started originally by President Bush in 2004. The ONC is currently the principal Federal organization charged with coordination of nationwide efforts related to the implementation and use of electronic health information exchange. Furthermore the ARRA provides:

- HIT Policy and Standards Committees of healthcare professionals to provide recommendations on HIT policy, framework, standards, implementation specifications, and certification.

- HHS develops a set of standards, implementation specifications, and certification criteria.

- The ONCHIT may provide an HIT system to providers for a nominal fee.

- Provide financial incentives for providers through Medicare to implement EMRs in a meaningful way as defined by the Secretary (may include reporting quality measures). The ONCHIT may also provide grants to states in order to make competitive loans to providers.

- Early adopters would be eligible for an initial incentive payment up to $18,000, but adopters whose first payment year is 2015 would receive $0 payment.

- Rural professionals may receive increased payment amounts (if in a shortage area).

- Medicaid incentive payments would also be available to physicians but only under one program (not both Medicaid and Medicare).

- Physicians who do not adopt an HIT system would see a reduction in Medicare fee schedule (-1% in 2015, -2% in 2016, and -3% in 2017 and beyond).

- The HHS would be allowed to increase penalties in 2019 with some exceptions for significant hardships.

Healthcare Mandate

Government mandates are influencing the adoption of a personal healthcare records and forcing providers to take a serious look at efficient ways to access, organize, streamline, and input patient data. The Health Information Technology for Economic and Clinical Health (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 the HITECH Act, eligible health care professionals and hospitals can receive Medicare and Medicaid payments when they adopt certified EHR 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.

Meaningful Use Criteria

Healthcare centers that implement a Medicare health IT system that meet meaningful use criteria are eligible to receive funding under the ARRA. The Office of the National Coordinator for Health Information Technology (ONC) has granted six organizations the power to determine if an IT solution has met the criteria for meaningful use. There is also a product list (Certified Health IT Product List) containing approved products for healthcare organizations.

Payments to healthcare professionals are completed through the Medicare EHR Incentive Program and the Medicaid EHR Incentive Program. Eligible professionals (EPs) and hospitals are required to demonstrate meaningful use to qualify for payment through the Medicare EHR Incentive Program. Providers eligible for the Medicaid Incentive Program *do not* need to attest to meaningful use in 2011, but must have an EHR system to receive a payment, which is processed through each provider's respective State.

Stages of Meaningful Use

There are three stages of the incentive program, each attempt to focus on several key areas of healthcare.

Table 6-7

Stages of Meaningful Use

Stage 1: Meaningful use criteria focus on:	Stage 2: Meaningful use criteria focus on:	Stage 3: Meaningful use criteria focus on:
Electronically capturing health information in a standardized format	More rigorous health information exchange (HIE)	Improving quality, safety, and efficiency, leading to improved health outcomes
Using that information to track key clinical conditions	Increased requirements for e-prescribing and incorporating lab results	Decision support for national high-priority conditions
Communicating that information for care coordination processes	Electronic transmission of patient care summaries across multiple settings	Patient access to self-management tools
Initiating the reporting of clinical quality measures and public health information	More patient-controlled data	Access to comprehensive patient data through patient-centered HIE
Using information to engage patients and their families in their care		Improving population health

Source: How to Attain Meaningful Use, www.healthit.gov

Qualifying for Stage One Meaningful Use

Most organizations throughout the United States have or expect to qualify for meaningful use. For 2012, HIMSS reported that about 26% of its survey respondents had already met the requirements for stage one. However, about 20% of survey respondents decided to wait until 2013 or are not planning to meet the criteria.

Figure 6-4

Percent of Organizations that Expect to Qualify for Stage One Meaningful Use
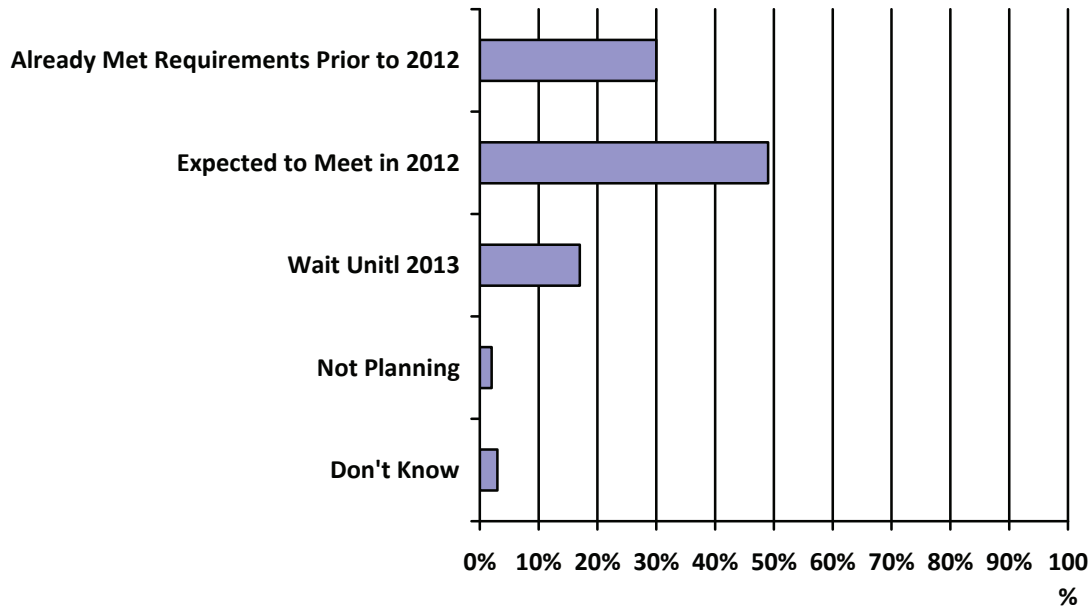
Source: HIMSS

Stage Two Meaningful Use

Stage two 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.

HIPAA

The Health Insurance Portability and Accountability Act (HIPAA) of 1996 established standards for the movement and uses of healthcare information. The standards affect privacy, security, and administrative simplification. With private medical information, Social Security numbers, birthdates, addresses, and other data available, ensuring that EMRs are accessible but secure is imperative. Web-based secure sites are generally username- and password-protected. Hospital systems that make data available on an intranet can use the same authorizations as are used to access data throughout the system. It is an extremely delicate balance to have data properly secured while still being accessible to the proper parties and transferable to new healthcare providers.

Improved technologies with advanced security measures can reduce the risk of a security breach. The HIMSS 2012 survey of hospitals found a decrease in security breaches in hospitals in the United States.

Figure 6-5

Percent of U.S. Hospitals Reporting Security Breach of IT System, 2011 and 2012
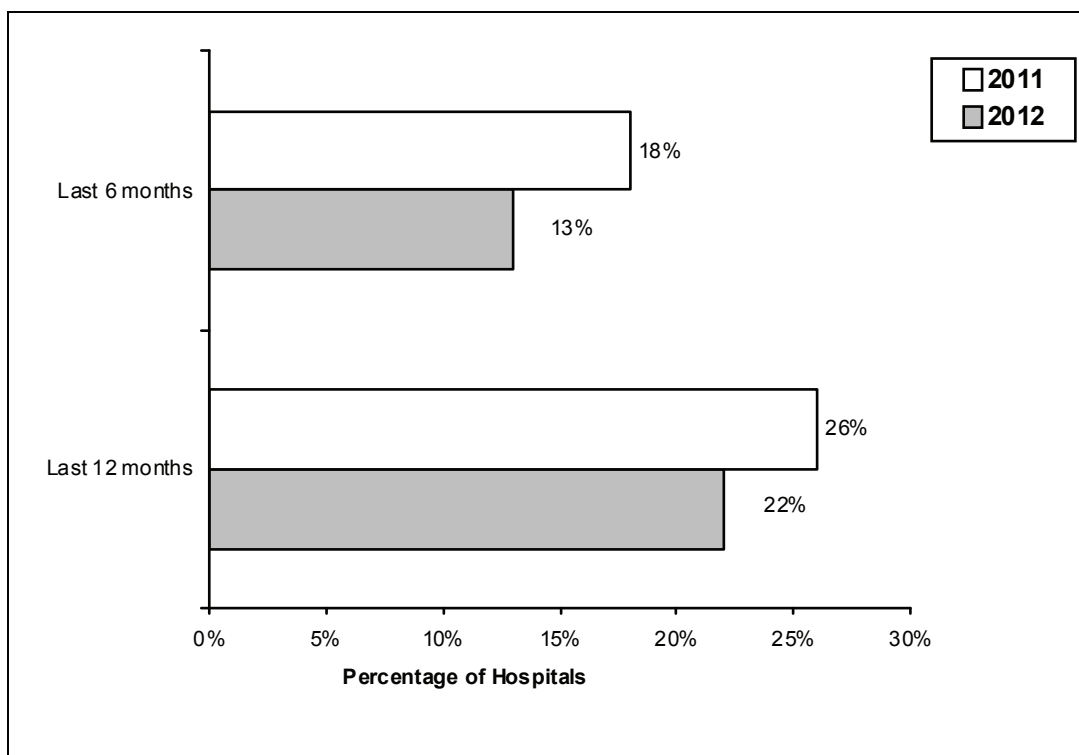
Furthermore, the HIMSS survey revealed the top concern for hospitals regarding security of computerized medical information was the compliance with HIPAA and CMS regulations. See corresponding figure below.

Figure 6-6

Top Concerns -- Security of Computerized Medical Information, 2011 and 2012
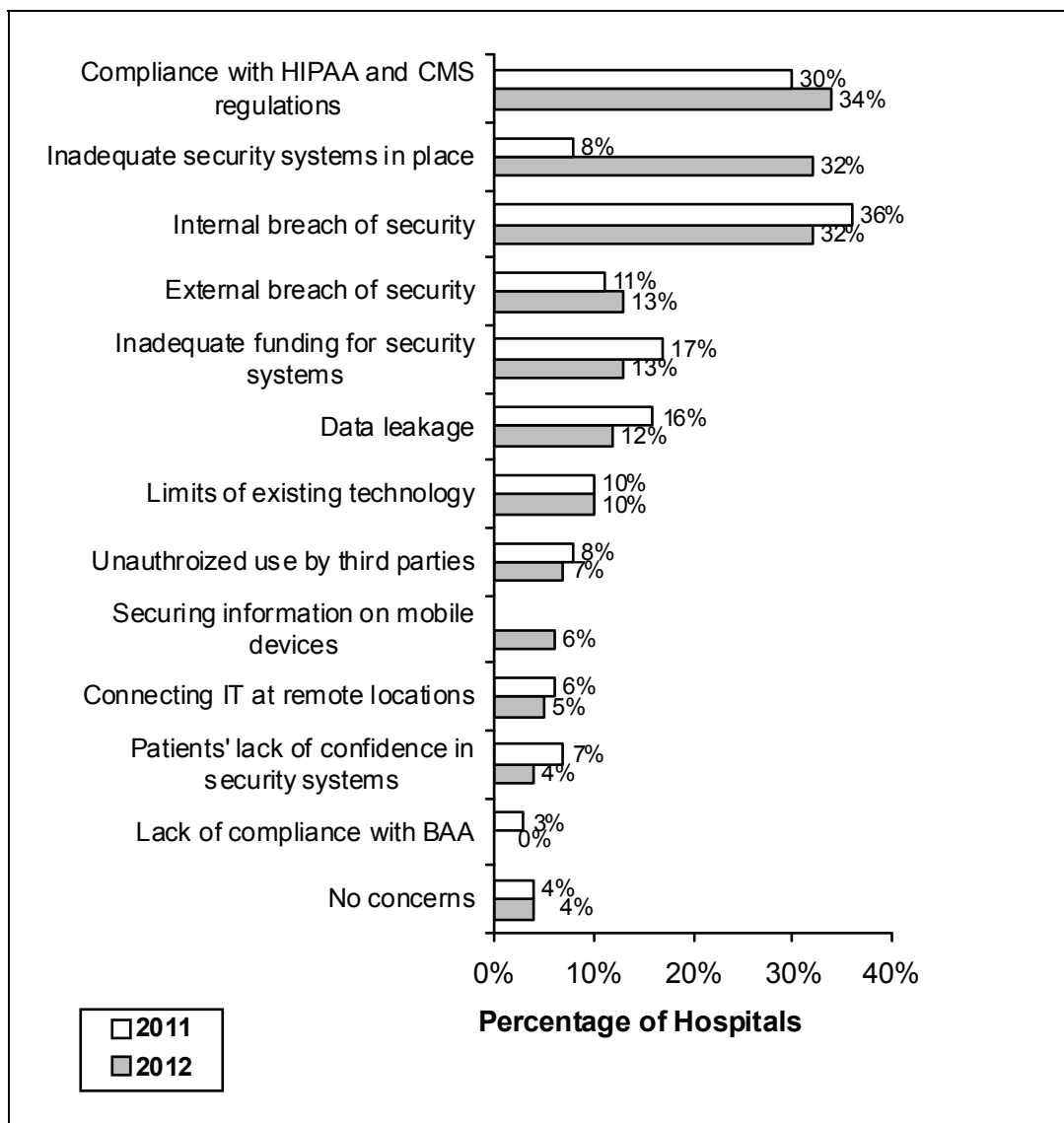
Source: HIMSS 2012

Patient Privacy and Cloud Technology

One of the major concerns with entering patient information into tablets and using fully digital patient records is the risk of outside access to data. Patient confidentiality is an important

segment of the healthcare system and it is covered by the Health Insurance Portability and Accountability Act of 1996 (HIPAA) and the subsequent final regulation, the Privacy Rule, published in 2000. The Privacy Rule: protects all "individually identifiable health information" held or transmitted by a covered entity or its business associate, in any form or media, whether electronic, paper, or oral.

One popular method of improving digital health information security requires holding sensitive data on a central computer system and allowing devices to access the data with encrypted access accounts. The data doesn't "move" to the devices but is stored and protected centrally.

Cloud computing is a newer model of using off-site systems to perform storage and computing resources. The technology allows more users to access data in more places but it also allows users to share resources of the cloud infrastructure. It can be thought of as more of an "elastic" model with flexible usage capabilities. The cloud system is more a pay-for-use model and less of an IT investment with a traditional depreciation schedule. The advantages can include shared costs, shared resources, and greater start-up speed.

FCC Rules for Medical Wireless Communication

In May 2012, several companies with wireless medical devices announced their support of the U.S. FCC's actions allocating protected spectrum for certain medical device communication. The specific networks will be referred to as Medical Body Area Networks (MBANs). These devices, such as wearable sending units, transmit vital signs or other patient information for record keeping and patient monitoring.

The companies working in this area are enthusiastic about this effort because the current devices that record data from patients are often wired, or do not have a protected spectrum. The removal of a wired devices can: increase mobility during care, make it easier for patients in a home or aid environment, reduce infection rates, and improve care by increasing the level of monitoring. GE Healthcare and Philips Healthcare have been primary advocates for this FCC ruling.

System Compatibility

Numerous organizations are working on developing standards for EMRs, wireless transmission of data, and all other aspects of healthcare IT. For the mobile device industry to reach its full potential in the health industry, equipment, applications and electronic medical records will have to be compatible.

System compatibility comprises two aspects: integration and interoperability. The Health Information and Management Systems Society (HIMSS) define integration as follows:

"Integration is the arrangement of an organization's information systems in a way that allows them to communicate efficiently and effectively and brings together related parts into a single system."

HIMSS defines interoperability as follows:

"Interoperability is the ability of health information systems to work together within and across organizational boundaries in order to advance the effective delivery of healthcare for individuals and communities."

HEALTHCARE EFFICIENCY

The U.S. Healthcare Efficiency Index (USHEI) provided by an independent advisory council, reports that the U.S. Healthcare system is 43% efficient. The international Organization for Economic Co-operation and Development (OECD) reported that the money that various governments have to spend on healthcare, due to the rising rates of healthcare, must be spent more efficiently in order to simply maintain.

Some countries have a healthcare system that is more efficient than others. Japan, Australia, South Korea, and Iceland are several countries that are considered more efficient in healthcare. The U.S., Denmark, Greece, Slovakia, and others have what are considered inefficient systems. Healthcare efficiency is considered a system that widely and efficiently uses each dollar spent on healthcare.

A significant focus of the U.S. Government and the healthcare industry is to move from paper-based system to an electronic system. The use of mobile devices may provide program developers with more options that healthcare workers can integrate easily into their workflow. A

big part of the easy integration is that healthcare workers are using smartphones for personal use, which reduces the apprehension that can come from learning a new system. Integrating personal use devices with an existing network, while security measures are met, can provide health facilities with an avenue for faster electronics integration.

The American Medical Association (AMA) has identified four strategies to address rising health care costs and to gain efficiency:

- reduce the burden of preventable disease,

- make health care delivery more efficient,

- reduce non-clinical health systems costs that do not contribute to patient care, and

- promote value-based decision-making at all levels.

Case Studies[9]

OVERVIEW

The use of tablet PCs, specifically the iPad, are changing the way health staff access and record patient information. Several hospitals and health clinics around the world have found the iPad and similar tablets to be highly desirable as kiosk centers, including kiosks for imaging departments and patient information desks. The use of tablet PCs in patient rooms has also increased—In many European countries tablet PCs are being installed as patient kiosk centers, allowing for menu requests, nurse interaction, and media options.

Tablet computers have been chosen for medical use in various clinics and hospitals or hospital networks. Apple Computer has made several case studies available describing the solutions used by some of its clients including Ottowa Hospital, Mayo Clinic, HCA Healthcare, and Siemens. Fujitsu, Samsung and other manufacturers are also launching competitive products hoping to reach new buyers.

Some of the medical clients using tablet computers have chosen to develop apps in-house or outsource the development of their own customized apps. An increasing number of equipment vendors are also choosing to deliver software (including desktop software or apps) with the devices they sell. Essentially a medical provider has several software options on the market, and if they aren't satisfied with what's available, they could potentially create their own.

Device users can use other medical apps available through online marketplaces like iTunes or the Android market if the devices operate on that particular operating system. For example, a device like the iPad can process Apple-based apps (like Epocrates), operate hospital-

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[9] Case studies often reported by devices manufacturers. Details of the benefits of the systems however are reported by the medical institutions.

based devices with proprietary apps (like mobile cardiology patient monitors) or handle custom apps.

Physicians reported using medical tablet software to help explain complex conditions or surgical procedures to patients at the bedside. They liked the large tablet screens and detailed imagery available specifically for medical professionals.

When pairing tablets with a custom electronic medical record (EMR) or electronic health record (EHR), physicians reported improved patient contact and time savings.

Mayo Clinic and Apple, Inc.

Mayo Clinic has reported using iPhones, iPads, and iPad Minis for advancing its level of patient care. It has chosen to develop custom apps for upwards of 15,000 devices that operate using Apple Inc's operating system, iOS. The inclusion of mobile systems like this reportedly improve communication among providers and care for patients. The basis for this mobile system was secure patient data transfer for providers to better deliver patient care. This is basically an EMR system.

The main software system used by Mayo Clinic is called Synthesis Mobile. It's essentially a powerful app that integrates internal systems and helps physicians make changes to patient orders digitally. It also helps show patients test results more efficiently. The use of this mobile system with Synthesis Mobile saved an estimated one hour per day per physician.

Other mobile apps developed by Mayo Clinic include Ask Mayo Expert, and the Mayo Clinic Patient app. Patients can use the Mayo Clinic Patient app to access their EMR and exchange messages with providers.

Administrators of the Mayo Clinic reported that the iOS system offered the security that was needed to provide a safe system for patient records. It allowed for centralized data storage with only mobile access so confidential data isn't stored on devices, it's just accessed by the devices. The clinic's IT team developed the apps.

Ottowa Hospital - Apple, Inc.

The Ottowa Hospital was established in 1998. It has 12,000 employees and is headquartered in Ottowa, Canada. The Ottowa Hospital launched a new advanced process of better patient interaction using iPads and custom apps. The hospital is using several thousand devices throughout its healthcare facility.

The hospital developed several apps including an app called the Clinical Mobile App for use on the Apple iPad. Physicians can use the system in multiple ways. The technology allows users to add photos to EMRs, communicate progress or a diagnosis with patients, access patient information, view images, and order clinical tests or prescriptions. Physicians report saving considerable time each day accessing patient data. They said the use of the iPads and the custom app allows them to see patients more during a workday due to having information more readily available. Hospital IT personnel reported that developing software for the iOS system was not time consuming, they were launching new systems in only a few days or weeks.

Hewlett-Packard and Sharp Healthcare

Hewlett-Packard and the Chief Medical Information Officer and hospital intensivist with Sharp Healthcare released a case study involving the use of HP's Slate 500 Tablet PC. The Slate 500 was replaced by the updated Slate 2 in November 2011. The Slate 2 costs $700 to $850 depending on options such as internal memory size, and operating system.

Sharp Healthcare wanted to try a small mobile tablet PC that enabled users to access EMRs at the hospital care level. The HP 500 is similar in size to the Slate 2. They are both around 9" by 6" with a depth of .6".

The Slate tablet runs Windows 7 operating system (OS), in either professional or home versions, which is a more robust system compared to some mobile platforms using a mobile-based OS. It also uses Intel Atom processors which are used in a variety of smaller mobile devices. The Sharp Healthcare case study used the devices to operate several software and connectivity solutions including:

- Windows 7 Professional

- Microsoft Office

- Microsoft OneNote

- Cerner EMR Medical Dragon (verbal dictation)

- Adobe Connect

With the Slate tablets a physician can hold a video conference call, verbally dictate information to a medical record, access medical records anywhere on the hospital system, and create documents using Microsoft (MS) Office. An advantage with using a Windows-based operating system is full functionality with other Windows software.

A tablet has some limitations with speed and hard drive/RAM capacity compared to laptops and desktops, but the Sharp Medical Chief Information Officer reported tablet computing sped up response time and offered a strong suite of connection options.

Queens Pediatrics - Fujitsu Tablets

Queens Pediatrics in New York adopted a patient health record system using Allscripts Enterprise EHR and Allscripts PM with Fujitsu tablet computers. Queens Pediatrics serves approximately 1,800 patients a month using two offices in a single building. In 2010, Queens Pediatrics started looking into electronic patient records and it chose an Allscripts solution based on its connection with North Shore-Long Island Jewish Health System. The challenges of previous options involved using fixed computers, or laptops in each room or cart-based computers. The small room size and inconvenience of larger, less mobile options, prompted the use of tablets.

At the launch of the new system the pediatric center chose only six tablets for its physicians. The nurses continued to use existing laptops. Both users however could access data at home after hours with either device to better handle patient calls or other emergencies.

After implementing the solution Queens Pediatrics reported that it had improved its documentation process overall, had better access to information and found the information to be more accurate.

Fujitsu has had systems put in place at other healthcare centers including:

- Emory Orthopaedics & Spine Center

- Hospice of Michigan

- LifePath Hospice and Palliative Care

- Saint Clare's Hospital

- Provena Health

- The Hospice of the Florida Suncoast

Motion Computing

Motion Computing, Inc. offers a range of medical-grade tablets designed specifically for the unique healthcare environment. Company tablets feature:

- touch and pen input,

- magstripe and barcode readers,

- advanced Intel processors like the i7 vPro,

- solid-state drives,

- Wi-Fi,

- Gorilla Glass displays,

- a full sealed chassis with integrated handle,

- built-in cameras (including front-facing),

- USB 3.0 connections,

- 3-year warranties,

- docking station (accessory),

- embedded mobile broadband,

- hot swap batteries,

- auto disinfection system (accessory)

- RFID reader, and

- optional smartcard or fingerprint readers

Some of these available options like the RFID reader, solid-state drives, barcode scanners, and mobile integrated broadband aren't offered with standard consumer tablet computers. Many of even the newest consumer tablets do not even offer a USB port. Motion Computing's medical systems are designed for the variety of uses in the medical industry.

Motion Computing has chosen to use Microsoft Windows based operating software, which will not operate some of the apps found through the Android or iOS systems. However Motion Computing has some apps available in forms, security, and productivity. For example, its Motion Medical Dictionary is a 250,000 word medical dictionary app.

The company has released information in a variety of case studies. Respondents from these studies reported: time savings in documentation; improved medication administration; significantly less paper usage; increased patient satisfaction; a decrease in the number of

medication errors; increased productivity; a significant reduction in overall protocol submission times; and increased compliance with legislation.

Ford Motor Company and Motion Computing

Tablet PC developers are continuing to find innovative uses for their tablets. In one example, Ford Motor Company is considering the use of Motion Computing's CL900 Tablet PC and Windows Cloud Technology to connect drivers with health in one easy step. Drivers, through voice and touch commands, input health and behavioral data while driving. These systems are compatible with medical peripherals such as oxygen sensors and glucose monitors.

St. Clair Hospital and Hewlett Packard

St. Clair Hospital in Pittsburgh, Pennsylvania uses Hewlett Packard Pocket PCs to help control medication administration. The system uses bar codes and Radio-frequency identification (RFID) to reduce errors. Medication errors have been reduced by approximately 5,000 per year since the technology was implemented. St. Clair Hospital dispenses roughly 1.3 million medications annually. The hospital has estimated their cost savings related to the reduction of medication errors at about $500,000 per year.

Infectious Disease Clinical Research Program (IDCRP) and Sahara Slate Tablet PC

The Sahara Slate Tablet PC is offered by TabletKiosk, a California-based mobile computer technology company. The IDCRP, a division of the Department of Defense (DOD), joined forces with TabletKiosk in 2013 to improve the investigation of infectious diseases in the military. The research under the IDCRP is conducted at 18 military medical facilities and 12 research sites around the globe.

The tablets are to be used for paperless clinical trials which is estimated to reduce trial time by 50% and significantly reduce errors. The previous trials required about 20,000 paper forms which contributed to a tedious, and time consuming process overall.

Researchers are using digitized forms to collect information using Mi-Forms Designer. Forms are loaded onto TabletKiosk's Sahara Slate PC i500 Tablets, running Windows 7 Pro. The Sahara Tablets feature 12.1" screens, pen input, wireless, and wired connectivity options and more.

The Whole Child Pediatrics P.S.C. and Motion Computing

The Whole Child Pediatrics needed a solution for moving from a paper records system to a new Electronic Medical Records solution. Installing some type of EMR system in multiple patient rooms was a large task the clinic needed to tackle. In August 2010, Whole Child Pediatrics center purchased several of Motion Computing's C5 Medical Clinic Assistant Tablet PCs. Each member of the clinical staff and each health provider were equipped with one of these tablets, at a cost of roughly $1,700. The implementation of these tablet PCs allowed staff to have a mobile means of processing patient documentation right in the exam room and easily run the clinic's EMR system and other essential applications. The clinic has since met its goal to seamlessly integrate a functional EMR system, streamline patient care, and reduce costs over the long-term.

C H A P T E R   E I G H T

Competitor Profiles

OVERVIEW

The companies described below are among those providing tablets specifically designed to meet the needs of the health industry. Some tablets are medical-grade specific and designed for the highly sterile environments in the health setting. Other tablets are less medical-specific but meet the needs of the health provider and are equipped with functions and features used in the health setting.

The once niche area of healthcare tablets has become a highly competitive segment of the industry, booming just after the iPad launch which took many professional industries by storm.

APPLE, INC.

Company Overview

Established in 1977, Apple has grown into a leading global computer and smartphone manufacturer. The company designs, develops, manufactures, and markets mobile communication devices, personal media products, computers, music players, software, networking solutions, and software applications.

Table 8-1

Corporate Details for Apple, Inc.

Company Details	Description
Company Address	1 Infinite Loop
	Cupertino, CA 95014
Country	USA
Phone	408-996-1010
Fax	408-996-0275
URL	www.apple.com
Employees	63,000
Fiscal Year End	September

Source: Company Website

Performance Review

Apple's fiscal year end is September. Sales for 2012 increased by 45% over 2011 to $157 billion. For the 2011 year, total sales increased by 66% to $108 billion. For the fourth quarter of 2012, revenues of $36 billion increased 27% year-over-year.

For the first quarter of 2013, Apple sold 48 million iPhones representing a 30% unit increase year-over-year. For the same period, it also sold a record 23 million iPads, a 49% unit

increase year-over-year. The iPad and the iPhone are both handheld devices that can operate a variety of healthcare related software tools that may be useful to healthcare centers. Additionally, the developers that wish to launch new programs can use devices like the iPad and iPhone as a platform to connect health providers in new ways.

Table 8-2

Financial Details for Apple, Inc 2008-2012 ($millions)

Financial Details	2008	2009	2010	2011	2012
Total Revenues	$37,491	$42,905	$65,225	$108,249	$156,508

Source: Company financial statement

Figure 8-1

Apple's Revenues 2008-2012 ($millions)
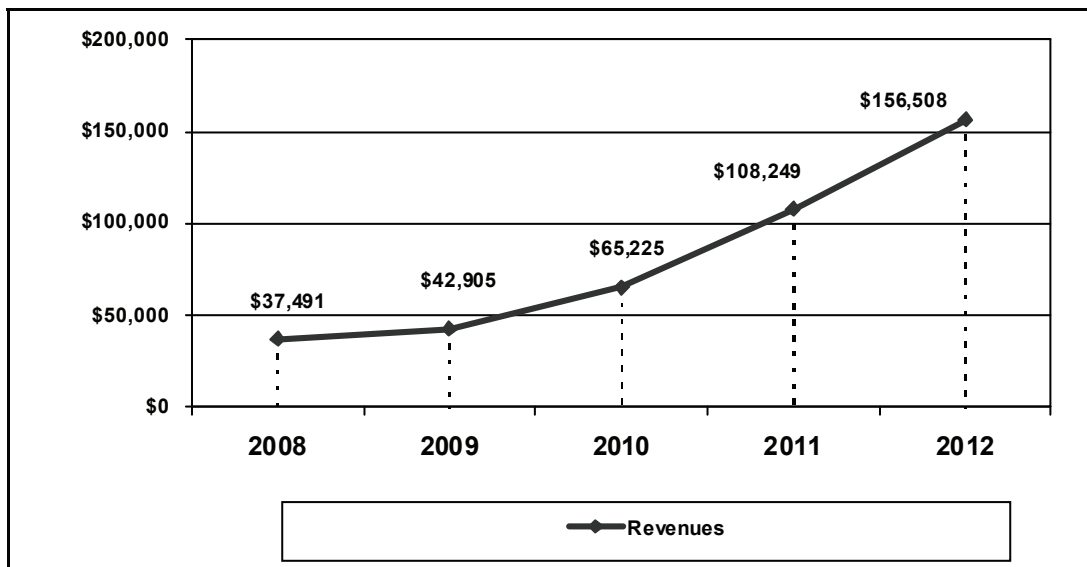
Source: Kalorama Information

Growth Strategy

Following the passing of Apple co-founder and CEO, Steve Jobs, many investors and consumers wondered about the future of the company. Tim Cook, the former COO, has stepped into the CEO position and Apple's face has only slightly changed for the time being.

Overall, Apple has made a name for itself in developing engaging devices like personal music players, computers, smartphones, and software. One of its strong points is software. Apple leverages its ability in software development to create fun, interactive systems for its users. In 2013, Samsung lost a patent case against Apple for using similar "bounce" features in its competing software. Pairing strong software development with sleek hardware, visually appealing displays, and strong marketing have created the Apple brand. Company sales have grown significantly for the past several years due to a design and development focus that puts Apple's products on the "must-have" list for many kids and adults.

Similar to Google's Android system, Apple offers third-party developers the ability to launch applications for Apple devices that can be purchased through the iTunes, iBookstore, or the Mac App Store. This strategy helped create a comprehensive portfolio of software available for the users of Apple products. The Apple-based software programs and third-party apps are popular; the company launched the Mac App Store in January 2011, and by December of 2011, had 100 million downloads.

Apple has also embraced the cloud computing/storage concept. In October 2011, Apple launched iCloud. With the iCloud system, Apple operating system (OS) devices and Windows-based systems offers users the ability to access their data from different devices.

New Developments

Apple continues to place an emphasis on the design of its products with an increasing level of research and development. Over the past four years, research and development expenditures have tripled, increasing to $3.4 billion in 2012.

Figure 8-2

**Apple-funded Research and Development Expenditures 2008-2012
($millions)**
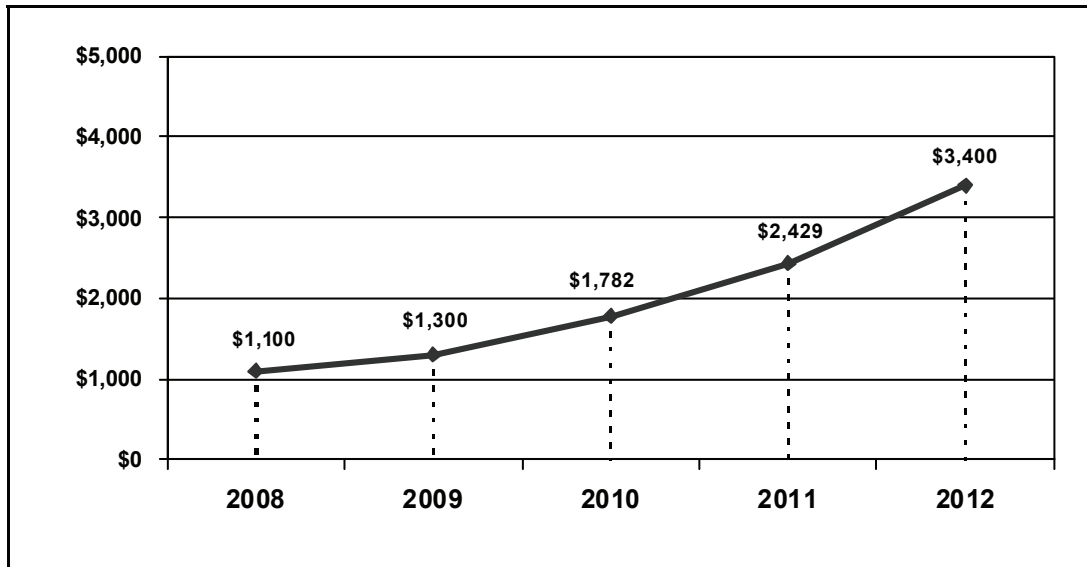
Source: Company financial report; Kalorama Information

Locations

Apple is based in California, but it owns or leases 13 million square feet of building space primarily in the U.S. Other company facilities are located in Europe, Canada, Japan, and Asia-Pacific.

The company's reporting segments are based primarily on geographic regions or the sales outlets. Major country sales regions include: the Americas, Europe, Japan, Asia-Pacific and Retail. The Retail division is based on sales from Apple retail stores located in 13 countries.

BARCO NV

Company Overview

Barco is a global technology company that develops visualization solutions for industries such as healthcare, defense & aerospace, digital cinema, entertainment and virtual reality. Products, like healthcare tablets, are developed to increase productivity and efficiency. Headquartered in Belgium, Barco employs 3,900 personnel, and is active in around 90 countries.

Table 8-3

Corporate Details for Barco NV

Company Details	Description
Company Address	Pres. Kennedypark 35
	BE-8500 Kortrijk
Country	Belgium
Phone	+32 (0)56 23 3211
Fax	+32 (0)56 26 2262
URL	www.barco.com
Employees	3,900
Fiscal Year End	December

Source: Company Website

Performance Review

Barco reported growth between 2009 and 2012 but it had a significant jump in 2011 to $1.5 billion in sales. Total fiscal year 2012 sales remained close to 2011 figures. For 2012 strong company segments included avionics, digital imaging, healthcare, and digital sound technology.

Entertainment led the way in 2012 in sales by company division. There are five company segments and entertainment accounted for 41.5% of total sales.

Healthcare products, the third-largest division, accounted for 17.8% of sales. This division reported record sales of around $260 million in 2012 based on existing technologies in diagnostic imaging.

Table 8-4

Financial Details for Barco 2008-2012 ($millions)

Financial Details	2008	2009	2010	2011	2012
Total Revenues	$1,070	$890	$1,095	$1,450	$1,470

Source: Company financial statement

Figure 8-3

Barco's Revenues 2008-2012 ($millions)
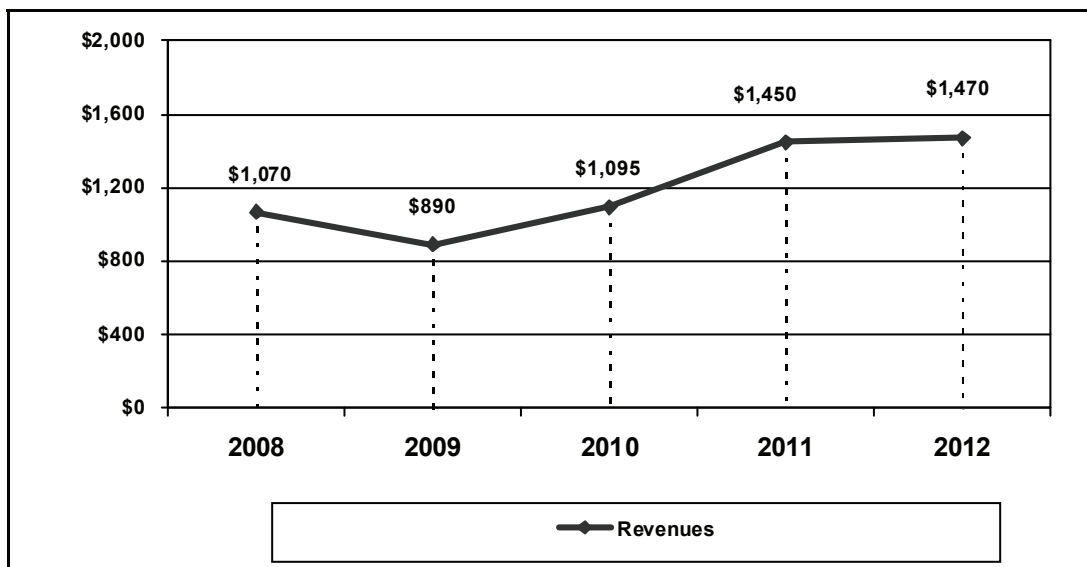
Source: Kalorama Information

Growth Strategy

Barco has reported reorganizing its business structure in digital imaging solutions. The company is working on advancing technologies through improved integration and collaboration. It is expanding its focus towards more end-to-end systems.

New Developments

In 2012, Barco acquired JAOtech, a leader in interactive patient care. The acquired technology essentially combines patient entertainment and clinical workflow solutions through one, shared terminal. This acquisition marks only part of the company's growth efforts in healthcare. It is now focusing more on expanding to new healthcare segments and growing in healthcare efficiency technologies.

Barco was selected by 'Union des Groupements d'Achats Publics (UGAP) to supply medical displays provider to public hospitals in France. The company also has 15,000 bedside terminals installed in UK hospitals.

Figure 8-4

**Barco-funded Research and Development Expenditures 2009-2012
($millions)**
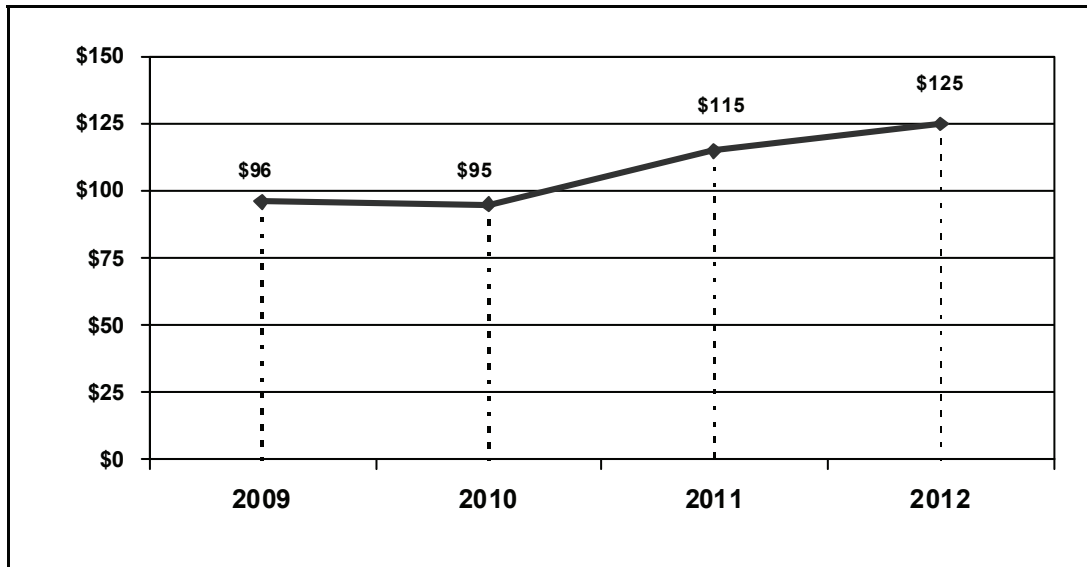
Locations

Barco operates facilities in Europe, North America and Asia Pacific. In Australia, it operates Barco Systems, Pty., Ltd. There are multiple locations in countries across Asia including China, Hong Kong, Taiwan, Japan, South Korea, Malaysia, Singapore, and India. In Europe specific locations can be found in Germany, France, Belgium, Denmark, Spain, Italy, Russia, Sweden, the Netherlands, the U.K., Poland, and Norway. In the Americas, company businesses can be found in the U.S., Canada, Mexico, Brazil, Argentina, and Columbia.

CYBERNET MEDICAL

Company Overview

Cybernet Medical of Cybernet Systems Corporation is a medical technology products company with a focus on advanced EMRs, kiosks, patient monitoring systems, and medication compliance products. Cybernet Systems is a research and development innovator specializing in medical, commercial, and defense systems.

Table 8-5

Corporate Details for Cybernet Systems Corp.

Company Details	Description
Company Address	3885 Research Park Drive
	Ann Arbor, MI 48108
Country	USA
Phone	734-668-2567
Fax	734-668-8780
URL	www.cybernet.com
Fiscal Year End	private company

Source: Company Website

Growth Strategy

Cybernet is a focused company with a strategic line of medical systems for healthcare efficiency. Its MedStar system features technology that collects and sends patient information for use in a web-based management system. It was developed to be a more efficient way to monitor early health risks from home patients. MedStar was launched in 2001 but was made available throughout the U.S. in 2006. Peripheral devices such as scales and blood pressure cuffs are also used to collect data and compatible accessories are offered by the company. The system may be used for pharmaceutical development as well.

The MedStar Care Terminal (CT) is a touch-screen device for biometric data collection. It serves as a interface for patients and does not require a mouse or keyboard. The company offers the system or stand-alone software which will run with a compatible laptop, tablet, or desktop computer. The CT system features customizable device support such as with USB, serial, or Bluetooth connection. It can connect to a server through Wi-Fi, cellular 3G, Ethernet, standard phone lines, or via satellite. Cybernet is focused on simple but feature-rich medical devices for home and professional use.

DELL, INC.

Company Overview

Dell, Inc. is a leading computer device technology and infrastructure company with a range of systems in networking, computer devices (tablets, desktops, and laptops), storage, servers, peripherals, software, and services. Products and services are offered in consumer, small and medium business, government, and large enterprise segments.

Table 8-6

Corporate Details for Dell

Company Details	Description
Company Address	1 Dell Way
	Round Rock, TX 78682
Country	USA
Phone	512-338-4400
Fax	512-728-3653
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.

Table 8-7

Financial Details for Dell 2008-2012 ($millions)

Financial Details	2008	2009	2010	2011	2012
Total Revenues	$61,101	$52,902	$61,494	$62,071	$56,940

Source: Company financial statement

Figure 8-5

Dell's Revenues 2008-2012 ($millions)
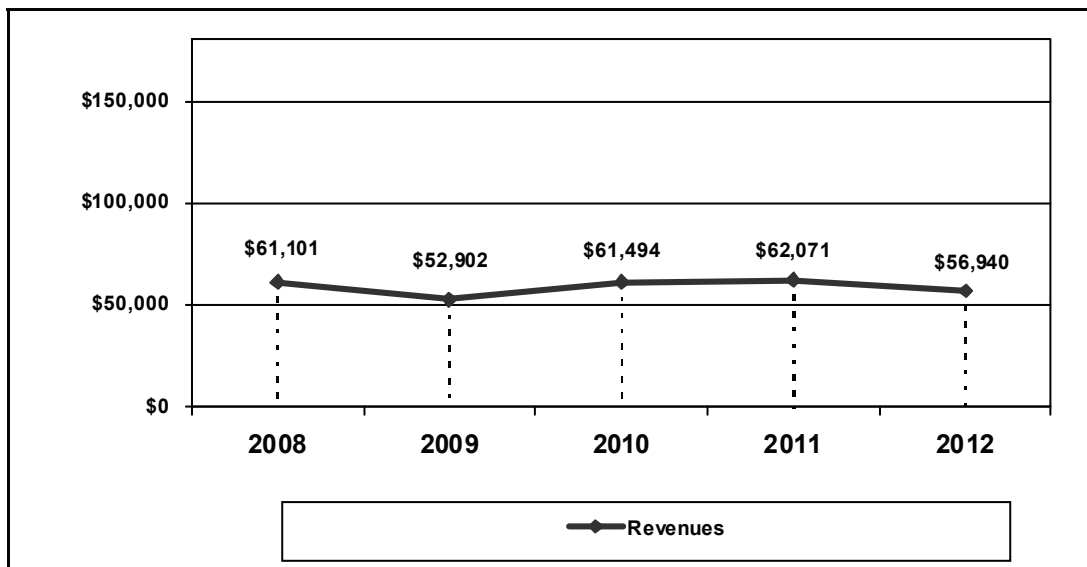
Source: Kalorama Information

Growth Strategy

Dell has been transitioning over the past several years into an end-to-end solutions provider. In fiscal 2012, it began reaching this goal by acquiring 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.

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.

New Developments

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.

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. The new tablets and convertible devices are Microsoft Windows based.

Figure 8-6

Dell-funded Research and Development Expenditures 2008-2012 ($millions)
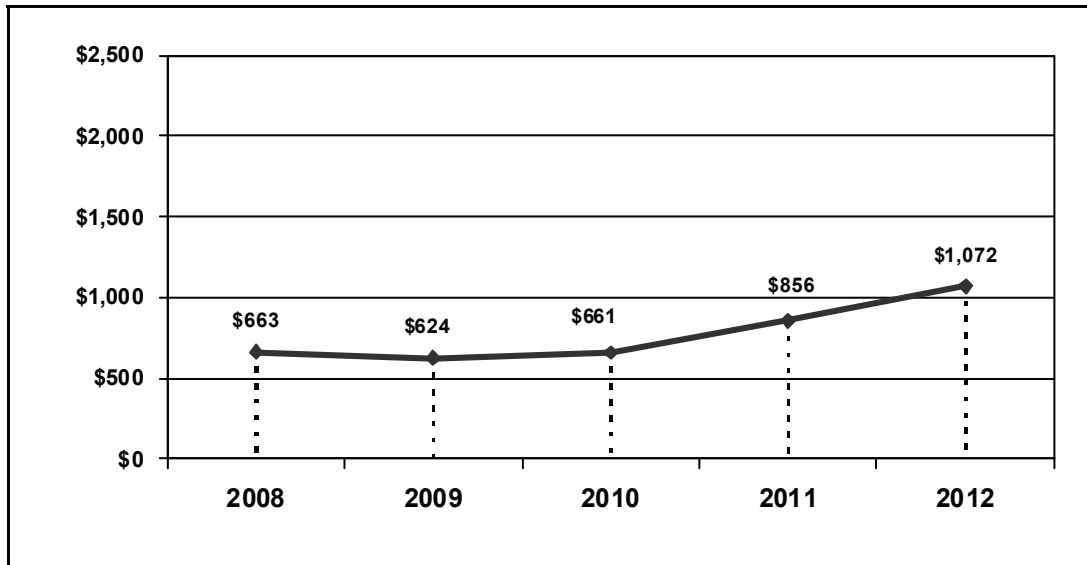
Source: Company financial report; Kalorama Information

Locations

Dell owns or leases 20 million square feet of building space, almost half of which is in the U.S. It owns 49% of the facilities it uses and leases the reminder. Company headquarters are located in Texas along with the company's other principle offices.

In 2012 and 2013 Dell continued the building of a new business center in Coimbatore, India. Dell India is the company's largest employee base outside of the United States. It has had a presence in India since 1996 with the incorporation of Dell Computer India Private Ltd.

FUJITSU LTD.

Company Overview

Fujitsu is a leading Japanese company with a global presence in technology solutions. It serves clients in a wide range of industries and product areas such as medicine, research, networking, cloud systems, efficiency, and automation. There are around 170,000 employees working for Fujitsu providing support for customers in 100 countries.

Table 8-8

Corporate Details for Fujitsu

Company Details	Description
Company Address	Shiodome City Center
	1-5-2 Higashi-Shimbashi
	Minato-ku, Tokyo 105-7123
Country	Japan
Phone	+81-3-6252-2220
Fax	+81-3-6252-2783
URL	www.fujitsu.com
Employees	170,000
Fiscal Year End	March

Source: Company Website

Performance Review

Fujitsu reported sales of approximately $53 billion for 2012 a decrease of 5.4% from 2011. This decline was attributed to generally lower spending around the globe. Between 2008 and 2012, company revenues have fluctuated at around $50 to $55 billion.

Table 8-9

Financial Details for Fujitsu 2008-2012 ($millions)

Financial Details	*2008*	*2009*	*2010*	*2011*	*2012*
Total Revenues	$47,000	$50,000	$53,000	$56,000	$53,000

Source: Company financial statement

Figure 8-7

Fujitsu's Revenues 2008-2012 ($millions)
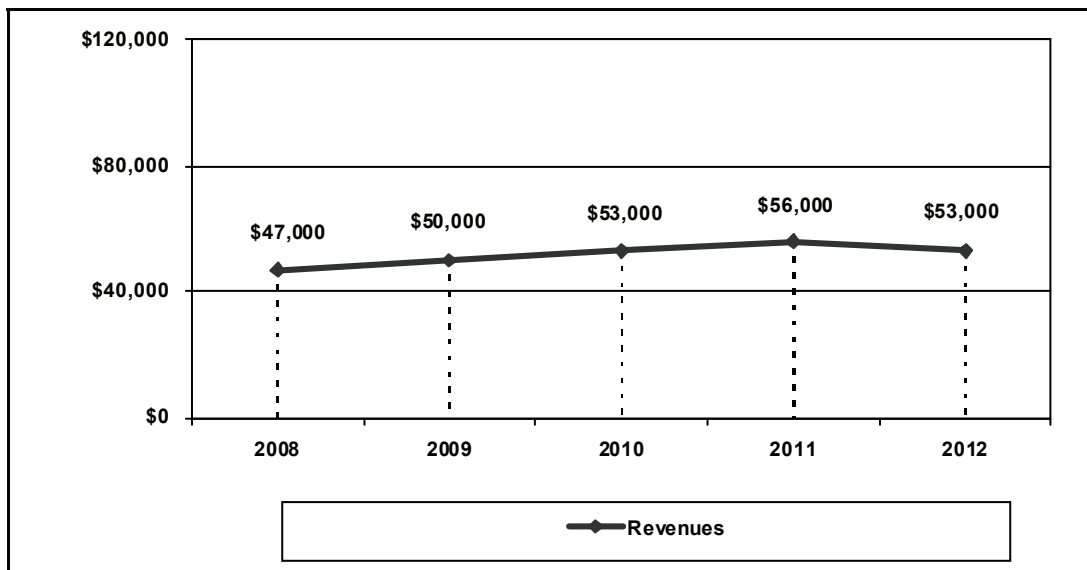
Source: Kalorama Information

Growth Strategy

Fujitsu has noted five broad areas of research for future focus. It is working in:

- human centric computing

- cloud fusion

- manufacturing innovation

- intelligent society

- green datacenters

The major focus of each of these areas involves improved efficiency, knowledge, infrastructure management, off-site data processes (cloud systems), and improved manufacturing.

New Developments

In February 2013, Fujitsu announced the new Arrows Tablet computer Q582/F a water-resistant tablet for enterprise customers. It also features a wireless high-speed connection method, called Xi ("crossy"). The tablet operates on Windows 8 and uses the Intel Atom processor.

In late 2012, Fujitsu Laboratories of Europe Limited, Fujitsu Asia Pte Ltd and the National University of Singapore (NUS) announced the new joint research program called the Body Sensor Network for Disease Management and Prevention-Oriented Healthcare. The program is focused on an entire body sensor network for patient monitoring and cloud integration. It is to be used in the home or hospital and would connect to a patient's health provider's computer after processing in a "Health Cloud." Abnormalities would be highlighted so caregivers would be alerted of any problems.

Figure 8-8

**Fujitsu-funded Research and Development Expenditures 2008-2012
($millions)**
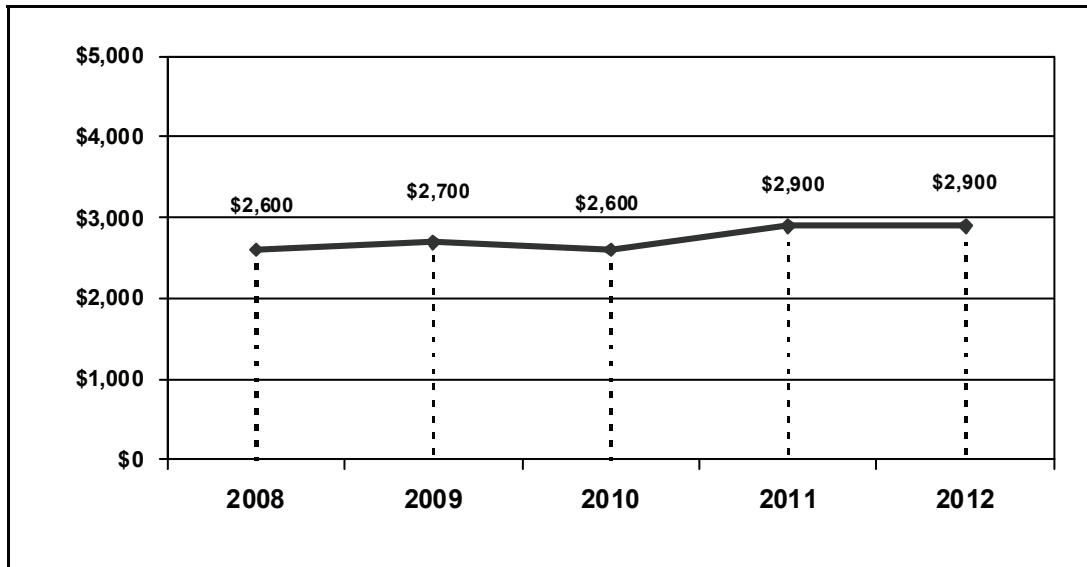
Source: Company financial report; Kalorama Information

Locations

Company headquarters are in Japan but Fujitsu also has locations in Europe, North America, the Middle East, Asia, Central America, South America, Africa, and Australasia. Customers are served in 100 countries total.

HEWLETT PACKARD COMPANY

Company Overview

Incorporated in 1947, Hewlett Packard has grown into leading provider of personal computers, large enterprise systems, printers 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 businesses, governments, education centers, and healthcare facilities.

Table 8-10

Corporate Details for Hewlett Packard

Company Details	Description
Company Address	3000 Hanover Street
	Palo Alto, CA 94304
Phone	650-857-1501
Fax	650-857-5518
URL	www.hp.com
Employees	331,800
Fiscal Year End	October

Source: Company Website

Performance Review

Total company sales decreased by 5% in 2012 compared to approximately 1% growth in 2011. Both international and domestic sales declined in 2012. Lower consumer demand for products and services contributed to sales declines. Software sales increased due to the acquisition of Autonomy in October 2011.

Table 8-11

Financial Details for Hewlett Packard 2008-2012 ($millions)

Financial Details	2008	2009	2010	2011	2012
Total Revenues	$118,364	$114,552	$126,033	$127,245	$120,357

Source: Company financial statement

Figure 8-9

Hewlett Packard's Revenues 2008-2012 ($millions)
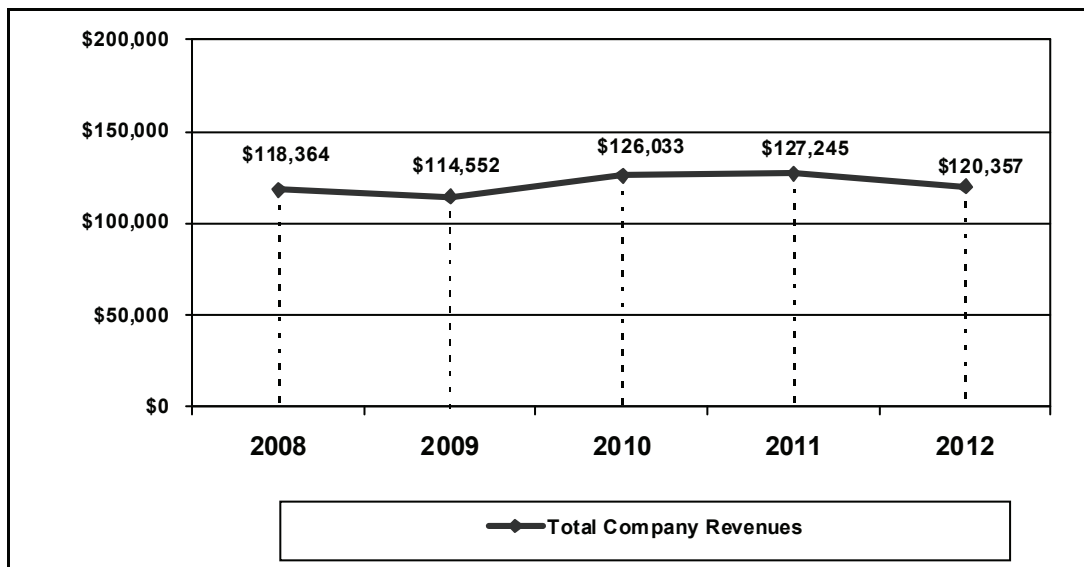
Source: Company financial statements; Kalorama Information

Growth Strategy

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, hyperscale computing infrastructure, and software-as-a-service.

In 2013 HP announced new innovations in its ConvergedCloud portfolio for hybrid cloud environments. It expects growth in cloud computing and more specifically in a hybrid cloud infrastructure with open standards.

New Developments

In June 2013, HP announced the Bureau of TennCare, Tennessee's Medicaid program, signed an $88 million agreement for HP to continue as the state's facilities manager for two more years. The state is moving to a more flexible and sustainable system to help improve responsiveness. This is just one of several state-level Medicaid contracts granted to HP.

Figure 8-10

HP-funded Research and Development Expenditures 2008-2012 ($millions)
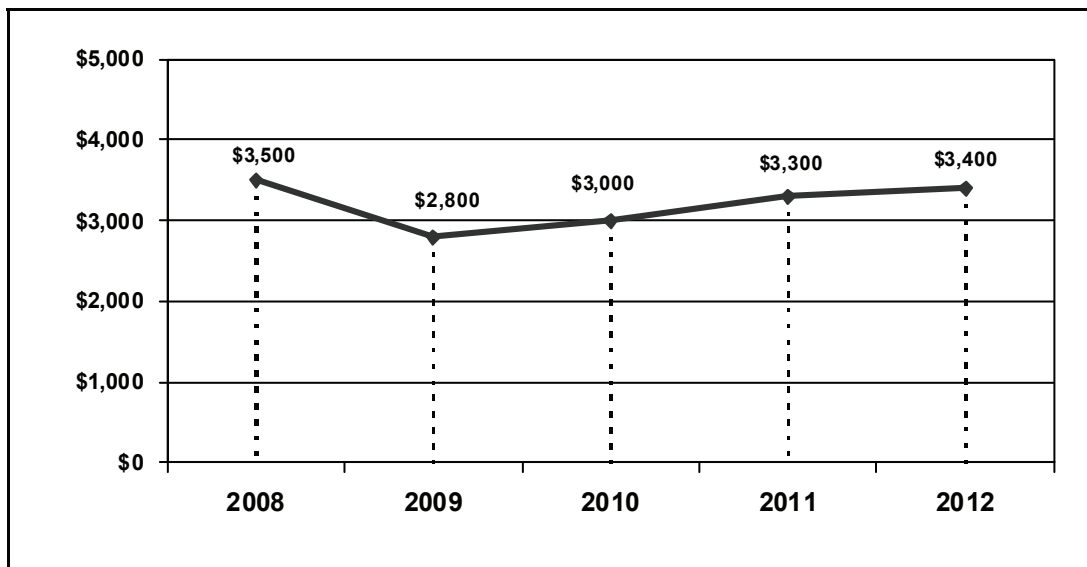
Source: Company financial report; Kalorama Information

Locations

Headquartered in Palo Alto, California, HP sells products in more than 170 countries on six continents. Major locations in North America can be found in Canada and the U.S. In Europe, geographic headquarters are located in Switzerland. In Asia-Pacific, regional headquarters are in Singapore and Tokyo, Japan.

Product development and manufacturing activities are located in centers across the U.S., Europe, Israel, and Asia-Pacific.

LENOVO GROUP LIMITED

Company Overview

Lenovo is an information technology company developing, manufacturing, and marketing a variety of devices for home and professional use. Its portfolio includes smartphones, tablets, PCs, peripherals, servers, workstations, and more.

Lenovo was founded in 1988 with the incorporation of Legend Holdings in Hong Kong. The company later changed its name to Lenovo after the acquisition of the personal computing division of IBM which helped Lenovo reach new markets and growth. Today, Lenovo is one of the leading global providers of computer technology.

Table 8-12

Corporate Details for Lenovo Group

Company Details	Description
Company Address	No. 6 Chuang Ye Road, Shangdi
	Information Industry Base
	Haidian District
	Beijing
Country	China
Phone	86-10-58868888
URL	www.lenovo.com
Employees	35,026
Fiscal Year End	March

Source: Company Website

Performance Review

Lenovo reported 2012 (fiscal year ending March 2013) revenues of $34 billion, an increase of 15% over 2011. Sales from China accounted for the majority of total company sales at 43% for both 2011 and 2012. Sales generated by customers in North America accounted for 15% of total sales for both years.

The biggest product groups in terms of revenues for 2012 and 2013 were notebook computers, followed by desktops, other products, and mobile internet and home products.

Strong growth products included tablets which produced sales growth of 74% for the first part of 2013.

Table 8-13

Financial Details for Lenovo 2008-2012 ($millions)

Financial Details	*2008*	*2009*	*2010*	*2011*	*2012*
Total Revenues	$14,900	$16,604	$21,594	$29,574	$33,873

Source: Company financial statement

Figure 8-11

Lenovo's Revenues 2008-2012 ($millions)
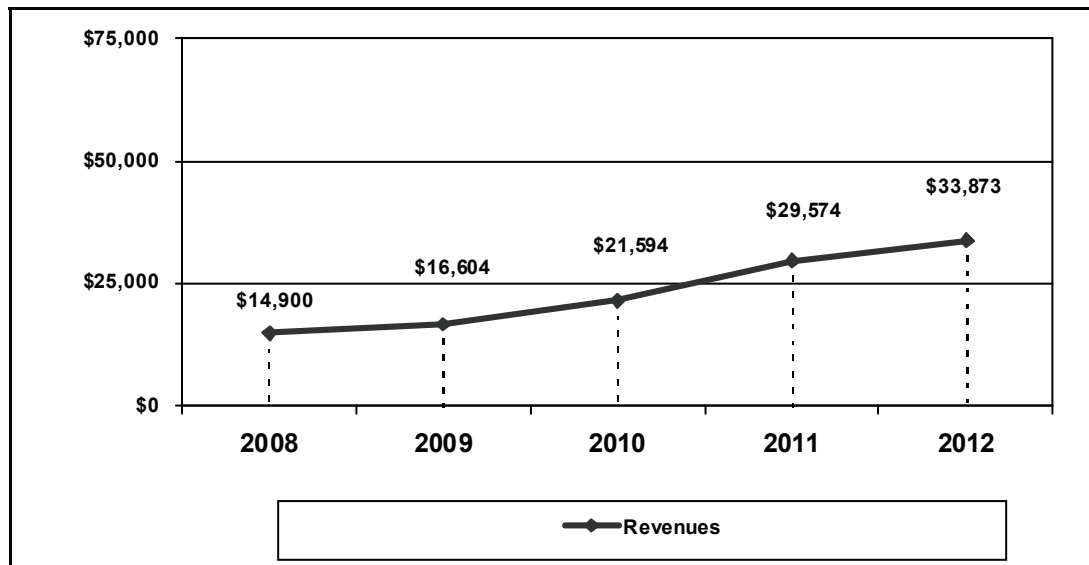
Source: Kalorama Information

Growth Strategy

Lenovo is reaching consumers with targeted product development and geographic expansion in four major product areas: PCs, tablets, smartphones and TVs. Product development centers are located in China, the U.S. and Japan to aid in developing key products for global buyers. The company reported strong leadership positions in the Russian and Indian PC markets as well as increased its share in other emerging countries.

Lenovo is working to develop new technologies that reach its target consumers in areas like mobile internet devices, notebook computers (convertibles, touchscreen laptops), PCs and displays. For example, In January 2013, Lenovo announced its new "table" PC. An all-in-one touchscreen tablet computer that also serves as a desktop computer but with a relatively large screen. This isn't the only PC of this type available but it has one of the largest screens to date.

Through internet and brick-and-mortar establishments Lenovo offers consumers a wide range of products at generally competitive prices.

New Developments

Lenovo has joined the list of leading IT providers to purchase technologies in cloud computing with the 2012 acquisition of Stoneware, a U.S. company. Other acquisitions were completed recently for consumer technologies, and server and storage solutions.

Figure 8-12

**Lenovo-funded Research and Development Expenditures 2008-2012
($millions)**
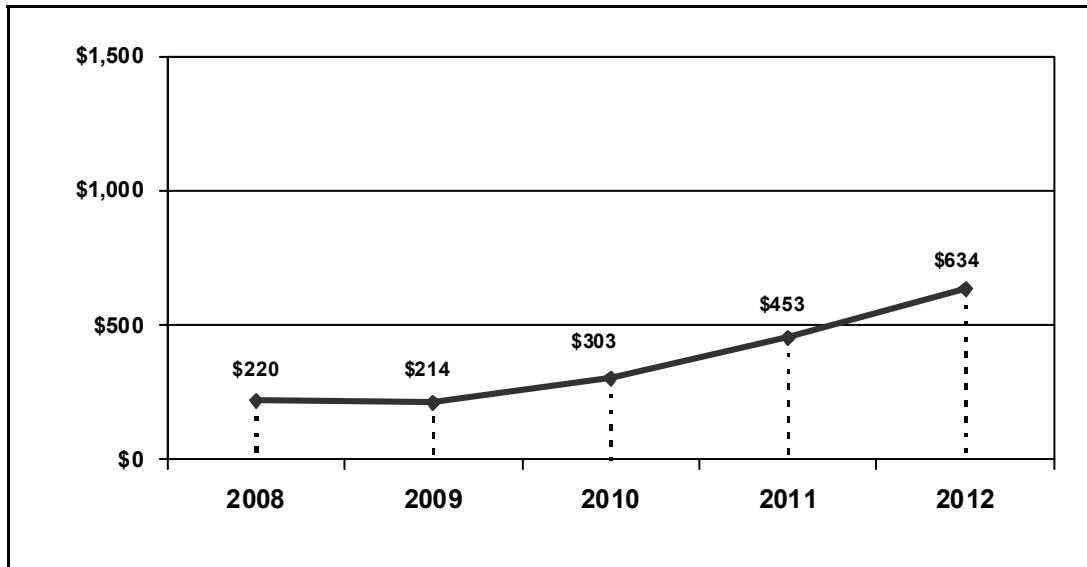
Source: Company financial report; Kalorama Information

Locations

Lenovo has significant research centers in Yamato, Japan; Beijing, Shanghai and Shenzhen, China; and Raleigh, North Carolina. It has major geographic headquarters in the U.S., China, and Singapore. Sales offices can be found in Paris, North Carolina, Beijing, and Singapore. Manufacturing centers are located in the U.S., China, India, and Mexico.

MOTION COMPUTING, INC.

Company Overview

Motion Computing is a U.S.-based computer technology provider with an emphasis on professional tablet PCs and mobile technologies. To date, it has developed devices specifically for use in healthcare, retail, field service, and construction.

Table 8-14

Corporate Details for Motion Computing

Company Details	Description
Company Address	8601 RR 2222
	Building II
	Austin, TX 78730
Country	USA
Phone	512-637-1100
Fax	512-637-1199
URL	www.motioncomputing.com
Fiscal Year End	private company

Source: Company Website

Growth Strategy

Motion Computing has a very focused portfolio of professional computing products and services. It has added new and improved tablets and appears to work closely with its business partners in developing products to meet specific needs.

New Developments

In June 2013, Motion Computing launched a new tablet PC, the CL910, with a 16% weight reduction, a 50% brighter screen, and 180 degree viewing angle. In August 2012, the

company launched the next-generation F5t and C5T tablets for healthcare providers and other professionals.

MOTOROLA SOLUTIONS, INC.

Company Overview

In 2011, Motorola split into Motorola Mobility and Motorola Solutions with the Solutions business retaining more business-oriented devices and services. Motorola's history includes significant mobile communication innovation such as the 1983 invention of the cell phone and it continues to offer similar devices from both remaining entities.

Motorola Mobility, acquired by Google, Inc., is focused on smartphones, accessories, home devices, home phones, modems and software/apps. Google is to operate Motorola Mobility as a separate business.

Motorola Solutions serves customers in business and government including sectors like healthcare, transportation, manufacturing, hospitality, warehouse, energy, education and more.

Table 8-15

Corporate Details for Motorola Solutions

Company Details	Description
Company Address	1303 East Algonquin Road
	Schaumburg, IL 60196
Country	USA
Phone	847-576-5000
Fax	847-576-5372
URL	www.motorolasolutions.com
Employees	22,000
Fiscal Year End	December

Source: Company Website

Performance Review

Motorola Solutions reported sales growth of 6% overall for the 2012 fiscal year. The company reports sales in two major business units, Enterprise and Government. Government sales totaled $6 billion, with an increase year-over-year of 12%. Government sales increased in

all regions. Enterprise sales decreased 5% compared to 2011. Enterprise sales account for approximately 30% of all company sales. Enterprise sales increased in Asia but decreased elsewhere.

Table 8-16

Financial Details for Motorola 2008-2012 ($millions)

Financial Details	2008	2009	2010	2011	2012
Total Revenues	$7,861	$6,947	$7,617	$8,203	$8,698

Source: Company financial statement

Figure 8-13

Motorola's Revenues 2008-2012 ($millions)
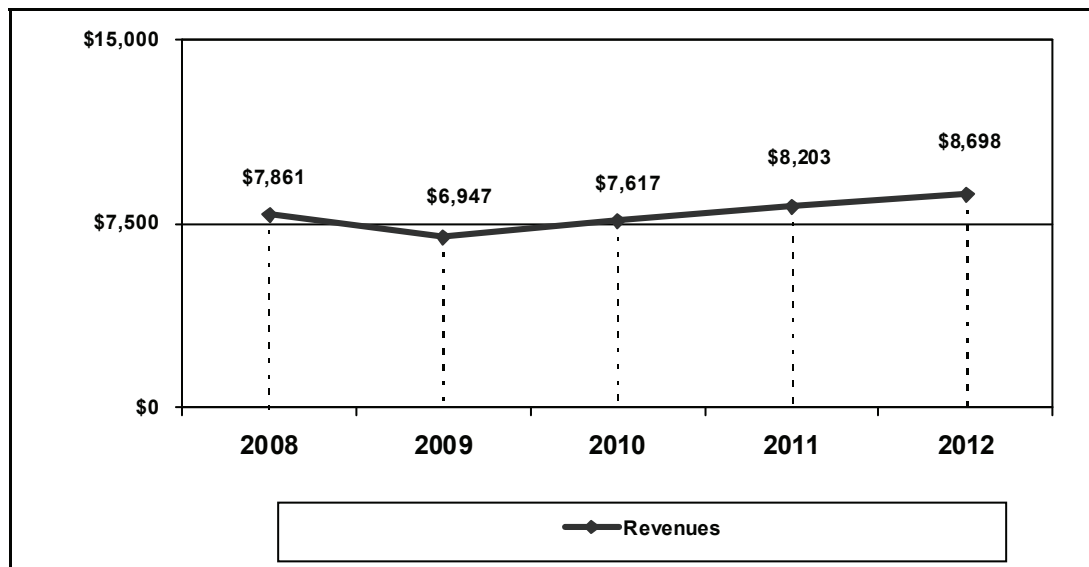
Source: Kalorama Information

Growth Strategy

Motorola's enterprise strategy is to offer its clients enhanced mobility solutions, real-time asset visibility, and engage "smart" consumers. Research and development in the following areas will assist in these efforts:

- developing advanced devices,

- enhanced information capture and analysis,

- adaptive networking,

- integrated voice and data communications,

- applications, and

- service

Motorola's healthcare provider product portfolio includes systems for asset management, blood transfusion verification, specimen collection, remote monitoring, RFID, wireless healthcare broadband, medication administration, clinician communication, and identity management.

New Developments

Motorola R&D has completed internal developments and targeted acquisitions for enhancing its product lines. In 2012, Motorola acquired Psion plc, a handheld device technology company based in the U.K. to enhance its existing enterprise solutions line.

Figure 8-14

**Motorola-funded Research and Development Expenditures 2008-2012
($millions)**
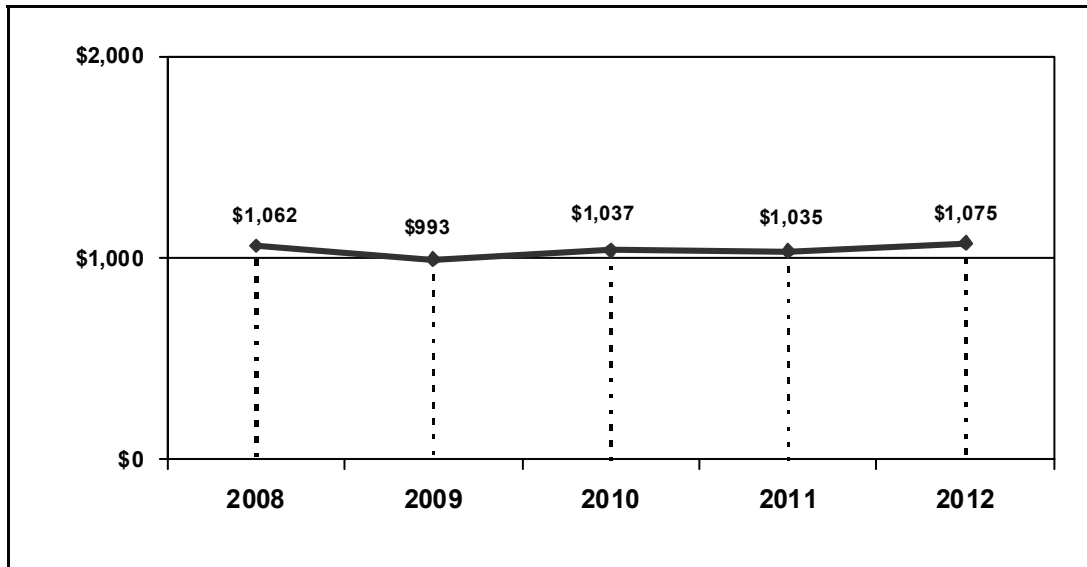
Source: Company financial report; Kalorama Information

Locations

Motorola operates manufacturing facilities and sales offices in the U.S. including its Illinois headquarters. It also has facilities in other countries around the globe but the majority are in North and South America. The company has 227 leased facilities and 19 owned facilities. The top five facilities used for manufacturing and distribution are located in Malaysia, Mexico, Germany, Illinois, and China.

PANASONIC CORPORATION

Company Overview

Headquartered in Japan, Panasonic is a leading global electronic and electric device company with a diverse portfolio of products for professional and home use. Some of its systems include audio/video equipment, digital cameras, automotive components, batteries, energy technologies, industrial solutions, household appliances, and more.

Table 8-17

Corporate Details for Panasonic

Company Details	Description
Company Address	1006 Oaza Kadoma
	Kadoma-shi
	Osaka 571-8501
Country	Japan
Phone	+81-6-6908-1121
Fax	+ 81-6-6908-2351
URL	www.panasonic.com
Employees	331,000
Fiscal Year End	March

Source: Company Website

Performance Review

Company revenues for 2012 decreased by 7% year-over-year. Disappointing sales were reported in both international and domestic segments. The sluggish electronics industry in Japan, including low sales of flat-panel TVs, were attributed to the lackluster results.

Underperforming business segments for 2012 included:

- AVC Networks

- Systems & Communications

- Industrial Devices

- Energy

- Other (Sanyo-related business transfers)

Moderate to good results were seen in the following company segments:

- Automotive Systems

- Eco Solutions

- Appliances

Table 8-18

Financial Details for Panasonic 2008-2012 ($millions)

Financial Details	2008	2009	2010	2011	2012
Total Revenues	$77,500	$80,000	$101,500	$95,000	$88,000

Source: Company financial statement

Figure 8-15

Panasonic's Revenues 2008-2012 ($millions)
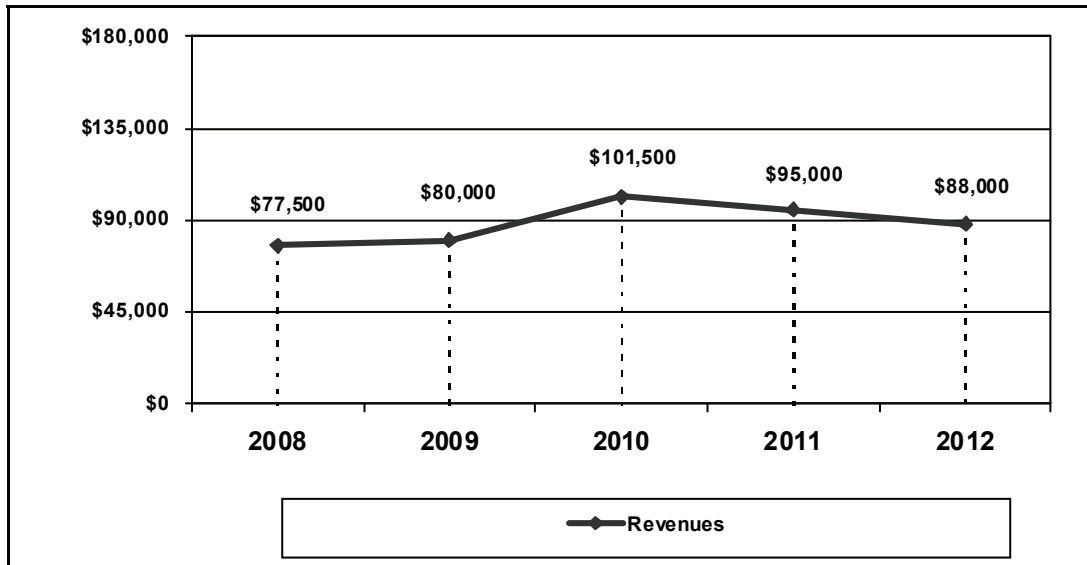
Source: Kalorama Information

Growth Strategy

Amid a tough economic setting and a prior three-year management plan that didn't achieve results as expected, Panasonic has decided to alter its decision making processes and move in a new direction. This is to take shape during 2013. Part of the new plan for fiscal 2014, 2015, and 2016 includes eliminating unprofitable business, improving efficiency, improving its financial position, and enhancing its growth strategy by focusing on customers.

New Developments

In 2013. Panasonic announced the new high-resolution, 4k IPS panel, 20" tablet computer. It features pen-input, 3840 x 2560 pixels (230 pixels per inch), Windows 8 OS, 4GB of RAM, 128GB solid-state drive (SSD), 10-finger multi-touch panel, Wi-Fi, Bluetooth, USB, 5.3lb weight, and 2 hr battery life.

Panasonic has received praise for its more focused tablet lines, Toughpad and Toughbook tablets run Windows 8 and Android operating systems.

Figure 8-16

**Panasonic-funded Research and Development Expenditures 2008-2012
($millions)**
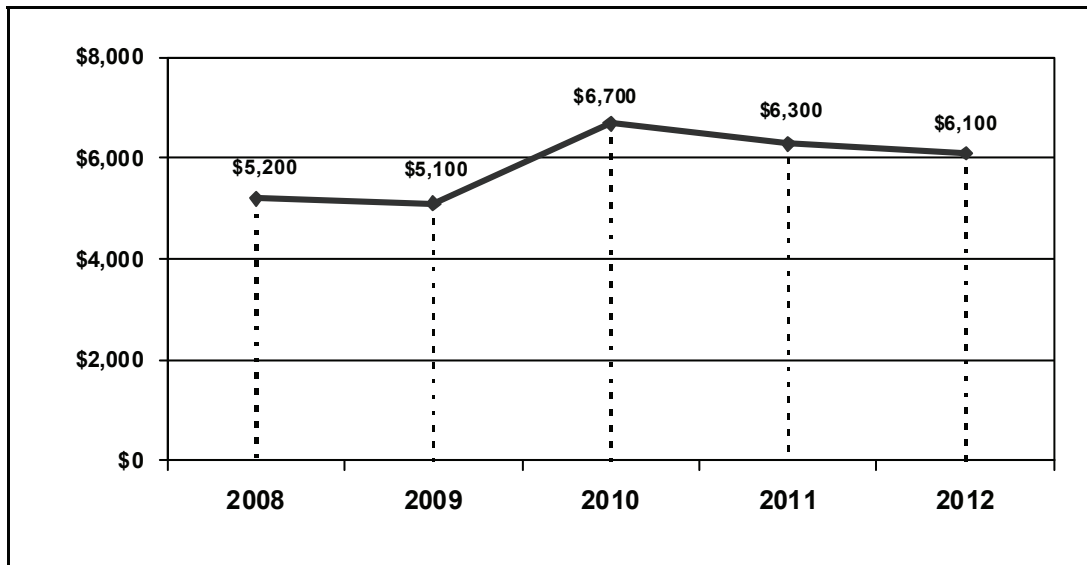
Source: Company financial report; Kalorama Information

Locations

Panasonic's major facilities and offices are located in Japan. Other locations for manufacturing, logistics, procurement, sales, and R&D can be found around the globe. In Taiwan it has a manufacturing facility for electronic components including some used in smartphones. Panasonic owns the majority of its facilities but it leases some business space, primarily for sales offices.

RESEARCH IN MOTION LTD.

Company Overview

Research In Motion (RIM) is a leading global supplier of telecommunications devices, software and services. The Ontario-based company is known for its BlackBerry telecommunications devices. The leading product line from RIM consists of its various smartphones and tablets, which are used by private and professional users. Blackberry solutions are tailored to meet different industry requirements including those in the healthcare sector.

Table 8-19

Corporate Details for Research In Motion

Company Details	Description
Company Address	295 Phillip Street
	Waterloo, Ontario N2L 3W8
Country	Canada
Phone	519-888-7465
Fax	519-888-7884
URL	www.rim.com
Employees	17,000
Fiscal Year End	February

Source: Company Website

Performance Review

Company revenues for 2012 declined sharply to $11 billion primarily due to a significant reduction in device sales. Revenues from devices in 2012 were approximately 50% of device sales in 2011, a decrease of over $7 billion.

Table 8-20

Financial Details for Research In Motion 2008-2012 ($millions)

Financial Details	2008	2009	2010	2011	2012
Total Revenues	$11,065	$14,953	$19,907	$18,423	$11,073

Source: Company financial statement

Figure 8-17

Research In Motion Revenues 2008-2012 ($millions)
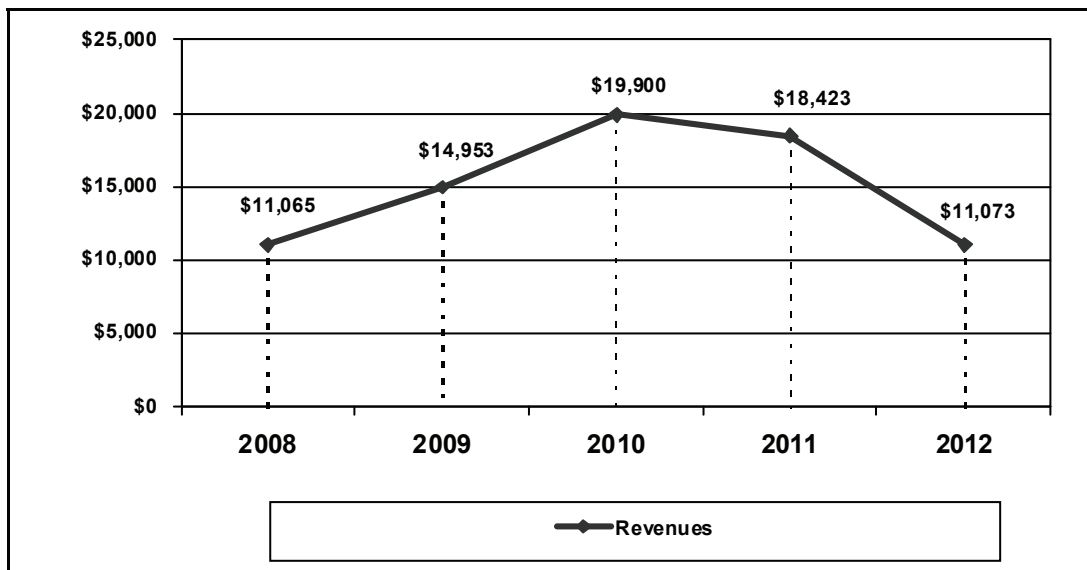
Source: Kalorama Information

Growth Strategy

In early 2013, Research In Motion announced that it would operate around the world under the BlackBerry name. The legal name will not change until shareholders vote in mid-2013.

A big portion of the company's strategy has revolved around motivating new third-party software development, reducing operating costs, partnering with other communications providers, and launching a redeveloped operating system. It launched the new BlackBerry 10 platform and along with new devices in 2013. It has also embraced the idea of cloud-based computing and has launched BlackBerry Business Cloud. .

BlackBerry captured a portion of the market for being one of the first brands to offer smartphones. But now consumers have access to several other technologies such as devices using the iOS (Apple Computer), and Android (Google) operating systems.

New Developments

In fiscal 2013, several new BlackBerry devices were launched including the 4G LTE BlackBerry PlayBook tablet, the BlackBerry PlayBook 4G HSPA, and the 3G Plus BlackBerry PlayBook tablet.

For the home healthcare worker, BlackBerry devices can operate mobile solutions that are designed to make workflow more efficient including the use of applications for remotely monitoring patients, tracking mileage (through global positioning), updating health records, and scheduling.

Figure 8-18

**Research In Motion's Research and Development Expenditures 2008-2012
($millions)**
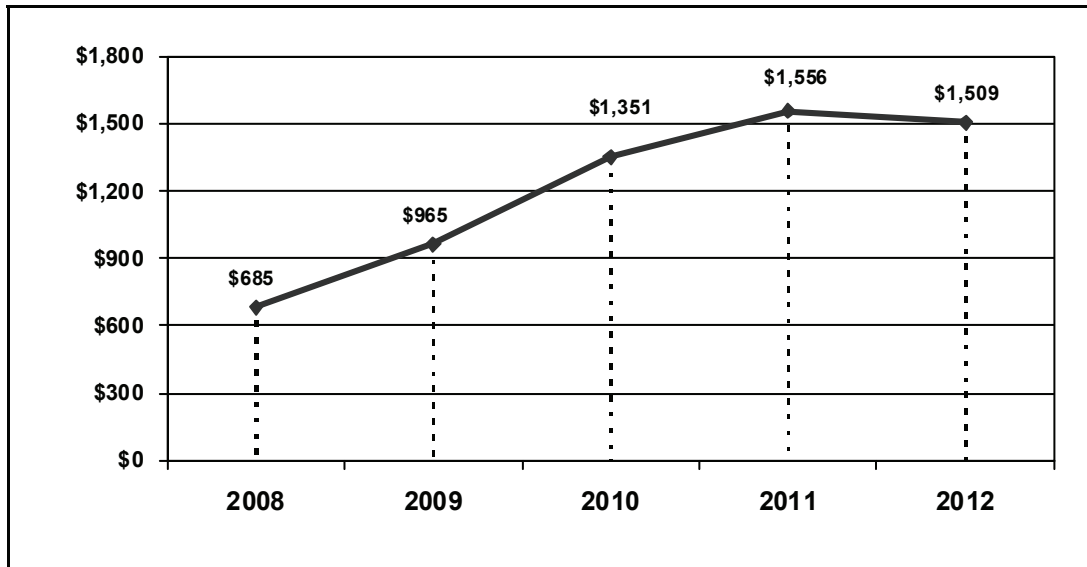
Source: Company financial report; Kalorama Information

Locations

The Ontario-based business has offices in Europe, North America, Latin America and Asia-Pacific. U.S. headquarters are located near Dallas, TX. Specific locations in South and Central America can be found in Brazil, Mexico, Argentina, and Uruguay. In Asia-Pacific, RIM has offices in Beijing, Australia, Hong-Kong, India, Japan, Malaysia, Singapore, South Korea, and Thailand. European headquarters are in Slough, England but it also has facilities in Germany and throughout the rest of Europe.

SAMSUNG ELECTRONICS CO., LTD.

Company Overview

Incorporated in Korea in 1969, Samsung has grown in to one of the largest global appliance and electronics companies. Its product include digital TVs, tablets, smartphones, air conditioners, printers, computers, memory products, LEDs and OLEDs, display systems, and refrigerators.

Table 8-21

Corporate Details for Samsung

Company Details	Description
Company Address	129, Samsung-ro, Yeongtong-gu
	Suwon-si, Gyeonggi-do
Country	South Korea
Phone	+82-2-2255-0114
URL	www.samsung.com
Employees	369,000
Fiscal Year End	March

Source: Company Website

Performance Review

For fiscal 2012, Samsung reported revenue growth of 22% over 2011 to $188 billion. Revenues for 2011 totaled $154 billion. Samsung has a leading position in displays, TVs, and smartphones. The company has achieved a significant 75% revenue growth between 2009 and 2012.

Table 8-22

Financial Details for Samsung 2008-2012 ($millions)

Financial Details	2008	2009	2010	2011	2012
Total Revenues	$112,200	$107,200	$133,400	$154,049	$187,754

Source: Company financial statement

Figure 8-19

Samsung's Revenues 2008-2012 ($millions)
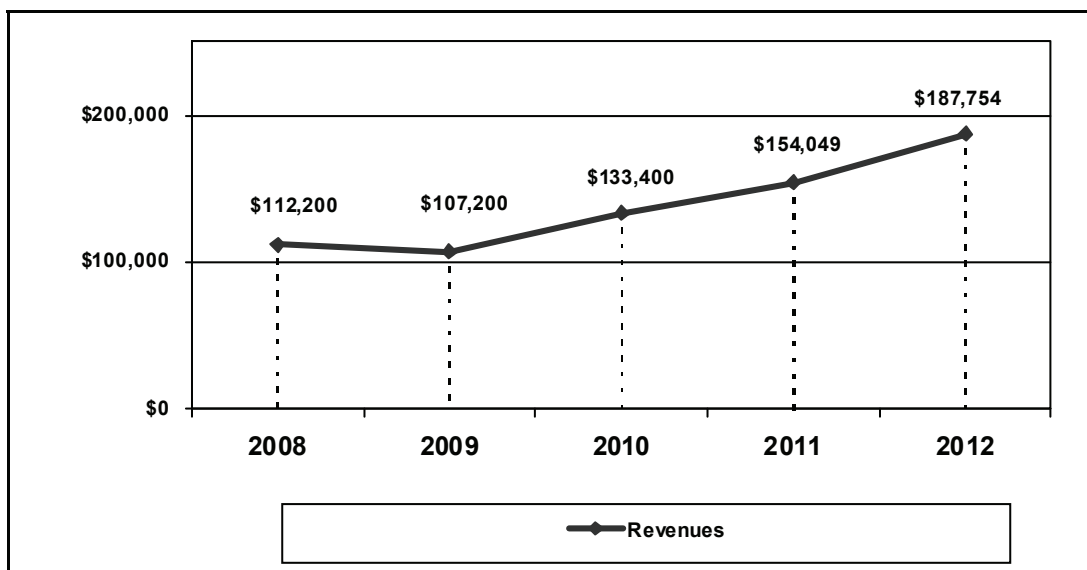
Source: Kalorama Information

Growth Strategy

Samsung has built a reputation for making high quality displays including TVs and now more recently smartphones and tablets. It targeted the desirable Apple brand of mobile

technologies and Apple has since filed patent infringement lawsuits in response. In 2013, a Japanese court ruled that Samsung infringed on certain patents held by Apple. More specifically the court determined the Samsung's mobile software displayed movement and visual effects that infringed on Apple's products. In August 2012, a jury in the U.S. awarded Apple over $1 billion in damages due to patent infringement for smartphones and tablets. However, Samsung has won several battles against Apple involving tablets and smartphone technology. The U.S. International Trade Commission reported that Apple infringed on some of Samsung's patents and a court in Japan upheld Samsung's synchronization feature patents as well. It's an ongoing battle between two big players in the industry.

Samsung's strategy involves moving into growth markets, targeted product development, and market research. It is also paying close attention to its competitors and developing its own technologies while staying competitive in pricing. Samsung employs over 50,000 R&D personnel equivalent to 14% of its total workforce. It also spends upwards of 9% of total sales revenues on R&D each year.

New Developments

Samsung is looking to develop advanced tablet technologies and has launched new products in 2013. One of them is the ATIV Q tablet that runs both Android and Windows. One of the distinguishing features is its very high resolution (3,200x1,800-pixels) which on a 13" display rivals the Apple Retina displays in pixel density.

Locations

Samsung is headquartered in South Korea but regional headquarters are located around the globe along with numerous other support facilities and offices. There are two North American headquarters, one on California and one in New Jersey. European headquarters are located in the U.K., and Germany. In Asia, regional headquarters can be found in Singapore, China, India, and Japan. In the Middle East, Samsung has a major office in Dubai. Other major regional offices are located in Russia, and South Africa.

SOCKET MOBILE, INC.

Company Overview

Socket Mobile is a mobility device provider with products that may be used for variety of industries, including healthcare. Products offer Bluetooth connectivity and wireless local area network (LAN) options. The company's data collection peripheral devices also work with many third-party products such as smartphones, tablet computers, and other devices. Its data collection products utilize several technologies including laser scanning, 2D and linear barcode scanning, RFID, and magnetic strip readers.

Table 8-23

Corporate Details for Socket Mobile

Company Details	*Description*
Company Address	39700 Eureka Drive
	Newark, CA 94560
Country	USA
Phone	510-933-3000
Fax	510-933-3030
URL	www.socketmobile.com
Employees	50
Fiscal Year End	December

Source: Company Website

Performance Review

For 2012, Socket Mobile reported a net loss and has an accumulated deficit of $60 million. Sales of handheld computers decreased by 37% in 2012, compared to 2011.

Company sales of handheld scanners and related products increased in 2012 by 11% including sales from its Apple-certified barcode scanner.

Table 8-24

Financial Details for Socket Mobile 2008-2012 ($millions)

Financial Details	2008	2009	2010	2011	2012
Total Revenues	$27	$17	$13	$18	$14

Source: Company financial statement

Figure 8-20

Socket Mobile Revenues 2008-2012 ($millions)
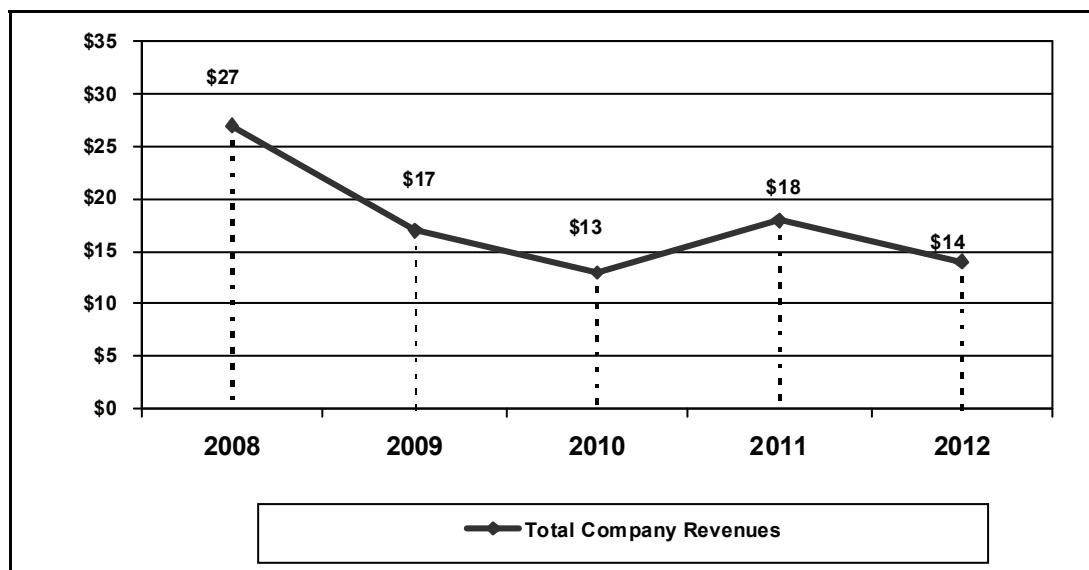
Source: Company financial statements; Kalorama Information

Growth Strategy

The company strategy involves reducing expenses and focusing on products and support for existing customers. The company started offering the SoMo handheld computer line to enable more business mobility solutions. Socket Mobile has a strategic focus on making devices easy-to-use; helping third-party software providers develop applications; and increasing the

capabilities of software. The company marketing strategy has generally centered around business clients for both its handheld computers, and scanners.

Socket Mobile is working with software application (app) developers to better utilize its technology in vertical business environments. The company has devices that may be used with other smartphones including those offered with Microsoft's OS, Apple iOS4, Android, and BlackBerry. Healthcare and hospitality businesses are a key focus of software development and device integration. The close partnership with other device developers is also key to the use of some of these applications. For example, Socket's hand scanner is certified by Apple, Inc.

New Developments

Socket mobile's research and development expenditures were $2.4 million in 2010, $2.9 million in 2009 and $4.5 million in 2008. Approximately 10 people are on the R&D staff.

The next generation SoMo 655 models launched in 2012. The 655 models are made for healthcare, hospitality, security and many other business environments.

Figure 8-21

**Socket Mobile's Research and Development Expenditures 2008-2012
($millions)**
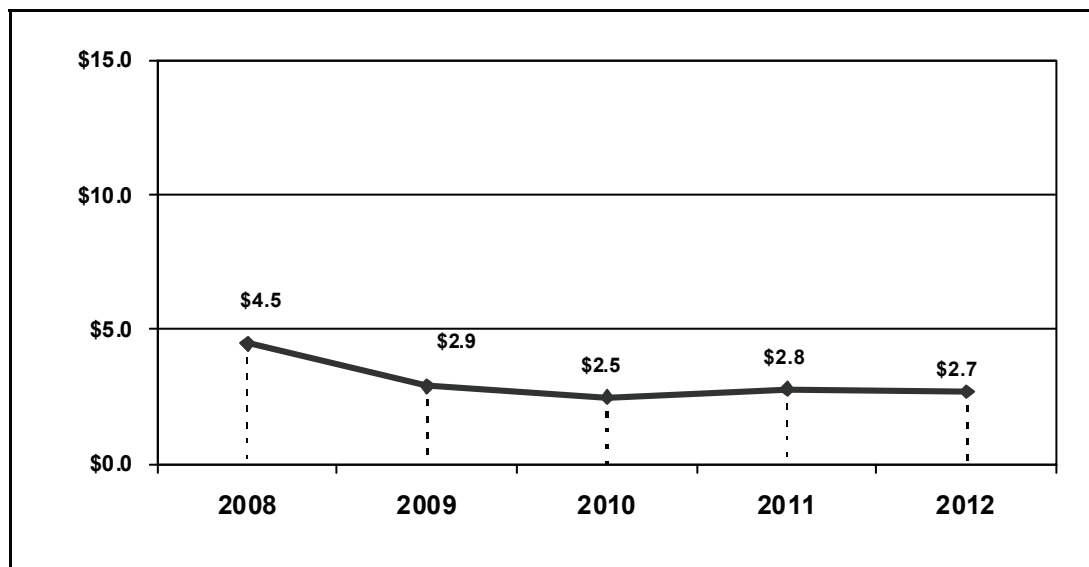
Source: Company financial report; Kalorama Information

Locations

Socket Mobile leases a 37,100 square foot office facility in California expiring in June 2018. The company recently extended the lease from 2012 to 2018. It uses this location for headquarters, manufacturing, and all other segments. Subcontracting of device components are handled by independent third-party manufacturers in North America, China, and Taiwan.

TANGENT, INC.

Company Overview

Tangent is a U.S.-based computer technology company with a range of devices for healthcare and other organizational uses. It offers products in: touchscreen devices, rugged systems, mobile security solutions, e-mail archival, and network security. Specific healthcare products include all-in-one PCs, tablets, mini-PCs, notebooks, servers, carts, medical arms/lifts, peripherals, and thin clients.

Table 8-25

Corporate Details for Tangent

Company Details	Description
Company Address	191 Airport Boulevard
	Burlingame, CA 94010
Country	USA
Phone	650-342-9388
Fax	650-342-9380
URL	www.tangent.com
Fiscal Year End	private company

Source: Company Website

Growth Strategy

Tangent's portfolio contains technologies that are tailored to meet the demands of a variety of business, military or other organizations. For healthcare clients it markets several tablets specifically developed for healthcare environments. Tablets are available with optional upgrades or mounting systems to further expand their uses. Tangent is focusing on diverse organizational products and has made investments in cloud technology and other enterprise support systems to offer the solutions it believes are important going forward.

Locations

Primary company offices are in California but additional service and sales offices are located throughout the U.S., Canada, Europe and China.

VIEWSONIC CORPORATION

Company Overview

ViewSonic is a leader in display systems and related technology including monitors, projectors, tablets, touchscreen PCs, digital signage, digital media players, and photo frames. Company headquarters are in California.

Table 8-26

Corporate Details for ViewSonic

Company Details	*Description*
Company Address	381 Brea Canyon Road
	Walnut, CA 91789
Country	USA
Phone	909-444-8888
Fax	909-468-1240
URL	www.viewsonic.com
Fiscal Year End	private company

Source: Company Website

Growth Strategy

ViewSonic is a competitive computer technology company that develops and markets consumer and business focused products. It currently has three Android tablets and a Windows tablet. Price is a component of ViewSonic's strategy as well, for example the current tablets all sell for an MSRP less than $235.

ViewSonic offers several desktop virtualization systems including zero-client, thin-client, multi-client, and smart touch displays. One of its smart displays, the VSD220 earned PC Magazine's 2012 Technical Excellence Award.

Locations

ViewSonic is based in Walnut, CA but it has a number of international facilities throughout Europe, Asia-Pacific, and the Middle East. There are two U.S. location total, the California headquarters and a second facility in Florida.

The head office in China is located in Shanghai but there are four other locations in China as well. In Taipei, ViewSonic has a regional head office with additional centers in Australia, Singapore, Korea, the U.A.E, and India.

In Europe, company locations can be found in the U.K., Finland, France, Germany, and Russia.

List of Companies

Apple, Inc.
  1 Infinite Lp.
  Cupertino, CA 95014
  408-996-1010

ASUSTeK Computer, Inc.
  No.15, Li-Te Rd.
  Peitou, Taipei,
  Taiwan, R.O.C.
  +886-2-28943447

Barco NV
  Pres. Kennedypark 35
  BE-8500 Kortrijk
  Belgium
  +32 (0) 56 23 3211

Cerner Corporation
  2800 Rockcreek Pkwy.
  Kansas City, MO 64117
  816-201-1024

Cybernet Manufacturing
  5 Holland
  Irvine, CA 92618
  949-600-8000

Cybernet Systems Corporation
  3885 Research Park Dr.
  Ann Arbor, MI 48108

734-668-2567

Dell, Inc.
One Dell Way
Round Rock, TX 78682
512-338-4400

Fujitsu Limited
Shiodome City Center
1-5-2   Higashi-Shimbashi
Minato-ku, Tokyo105-7123
Japan
+81-3-6252-2220

Hewlett-Packard Company
3000 Hanover St.
Palo Alto, CA 94304-1185
650-857-1501

HTC Corporation (formerly High-Tech Computer Corporation)
88 Section 3
Zhongxing Rd.
Xindian District, New Taipei City 231
Taiwan, R. O. C
+886-2-8912-4138

Intel Corporation
2200 Mission College Blvd.
Santa Clara, CA 95054-1549
408-765-8080

Lenovo Group Ltd.
No. 6 Chuang Ye Road, Shangdi
Information Industry Base
Haidian District
Beijing
China
86-10-58868888

LG Group
LG Twin Towers
20 Yeouido-dong,Youngdungpo-gu
Seoul 150-721
South Korea
+82-2-3773-1114

Motion Computing, Inc.
　　8601 RR 2222
　　Building II
　　Austin, TX 78730
　　512-637-1100

Motorola Solutions
　　1303 East Algonquin Rd.
　　Schaumburg, IL 60196
　　847-576-5000

Nokia Corporation
　　Nokia House
　　Keilalahdentie 2-4
　　Espoo, 02150
　　Finland
　　+358 7180 08000

Panasonic Corporation
　　1006, Oaza Kadoma, Kadoma-shi
　　Osaka 571-8501
　　Japan
　　+81-6-6908-1121

Pantech & Curitel Communication, Inc.
　　Peungwha Seocho
　　Bldg. 1451-34,
　　Seocho-Go
　　Seoul 137-070
　　South Korea
　　+82-2-580-5541

Personal Communications Devices, Inc.
　　80 Arkay Dr.
　　Suite 210
　　Hauppauge, NY 11788
　　631-233-3300

Research In Motion Limited
　　295 Phillip St.
　　Waterloo, Ontario
　　Canada N2L 3W8
　　519-888-7465

Samsung Electronics Company, Ltd.
129, Samsung-ro, Yeongtong-gu
Suwon-si, Gyeonggi-do
South Korea
+82-2-2255-0114

Socket Mobile, Inc.
39700 Eureka Dr.
Newark, CA 94560
510-933-3000

Sony Corporation
1-7-1, Konan, Minato-ku
Tokyo 108-0075
Japan
+81-3-6748-2111

Tangent, Inc.
191 Airport Blvd.
Burlingame, CA 94010
650-342-9388

Toshiba Corporation
1-1, Shibaura 1-chome, Minato-ku
Tokyo 105-8001
Japan
+81-3-3457-4511

ViewSonic Corporation
381 Brea Canyon Rd.
Walnut, CA 91789
909-444-8888

Regulatory Authorities and Industry Organizations

4G Americas
1750 - 112th Avenue NE
Suite B220
Bellevue, WA 98004
425-372-8922
www.4gamericas.org

Advanced Medical Technology Association
701 Pennsylvania Avenue, N.W.
Suite 800
Washington, D.C. 20004-2654
202-783-8700
www.advamed.org

Alliance for Telecommunications Industry Solutions (ATIS)
1200 G Street NW
Suite 500
Washington, DC, 20005
202-628-6380
www.atis.org

American Health Information Management Association
233 N. Michigan Avenue

21st Floor
Chicago, IL 60601-5800
312-233-1100
www.ahima.org

American Hospital Association
155 N. Wacker Dr.
Chicago, IL 60606
312 422-3000
www.aha.org

American Medical Informatics Association
4720 Montgomery Lane
Suite 500
Bethesda, MD 20814
301-657-1291
www.amia.org

American National Standards Institute (ANSI)
1899 L Street, NW
11th Floor
Washington, DC 20036
202-293-8020
www.ansi.org

American Telemedicine Association
1100 Connecticut Avenue, NW
Suite 540
Washington, DC 20036
202-223-3333
www.americantelemed.org

Association for Home Care & Hospice
228 Seventh Street
SE Washington, DC 20003
202-547-7424
www.nahc.org

Association of Medical Directors of Information Systems
682 Peninsula Drive
Lake Almanor, CA 96137
530-596-4477
www.amdis.org

Association of Telehealth Service Providers
4702 SW Scholls Ferry Road
#400
Portland, OR 97225
503-922-0988
www.atsp.org

Bluetooth Special Interest Group (SIG), Inc.
5209 Lake Washington Boulevard NE
Suite 350
Kirkland, WA 98033
425-691-3535
www.bluetooth.org

CDMA Development Group (CDG)
575 Anton Boulevard
Suite 440
Costa Mesa, CA 92626
714-545-5211
www.cdg.org

Center for Devices and Radiological Health
U.S. Food and Drug Administration
1350 Piccard Drive
Rockville, MD 20850
800-638-2041
www.fda.gov/cdrh

Center for Telehealth and E-Health Law
1500 K Street NW
11th Floor
Washington, DC 20005
202-230-5090
www.ctel.org

Certification Commission for Healthcare Information Technology
200 S Wacker Dr, Suite 3100
Chicago, IL 60606
312-674-4930
www.cchit.org

Consumer Electronics Association (CEA)
1919 S. Eads Street
Arlington, VA 22202
703-907-7600
www.ce.org

European Telecom Standards Institute (ETSI)
650, Route des Lucioles
06921 Sophia-Antipolis Cedex
France
+33 (0)4 92 94 42 00
www.etsi.org

GlobalPlatform, Inc.
544 Hillside Road
Redwood City, CA 94062
650-260-2389
www.globalplatform.org

GSM Association
Seventh Floor
5 New Street Square
New Fetter Lane
London, EC4A 3BF
UK
+44 (0)207 356 0600
www.gsma.com

Healthcare Information and Management Systems Society
230 East Ohio Street
Suite 500
Chicago, IL 60611
312-664-4467
www.himss.org

Home Care Technology Association of America
228 7th Street SE
Washington, DC 20003
202-230-5093
www.hctaa.org

International Telecommunication Union (ITU)
Place des Nations
1211 Geneva 20
Switzerland
+41 22 730 5560
www.itu.int

JEDEC
3103 North 10th Street
Suite 240-S
Arlington, VA 22201-2107
703-624-9230
www.jedec.org

Medical Device Manufacturers Association
1333 H Street NW Suite 400 West
Washington, DC 20005
202-354-7171
www.medicaldevices.org

National Association of Home Care and Hospice
228 7th St., SE
Washington, DC 20003
202-547-7424
www.nahc.org

Open Mobile Alliance
4330 La Jolla Village Drive
Suite 110
San Diego, CA 92122
858-623-0742
www.openmobilealliance.org

Office of the National Coordinator for Health Information Technology
U.S. Department of Health and Human Services
200 Independence Avenue SW
Suite 729-D
Washington, D.C. 20201
202-690-7151
healthit.hhs.gov

Telecommunications Industry Association (TIA)
1320 N. Courthouse Road
Suite 200
Arlington, VA 22201
703-907-7700
www.tiaonline.org

U.S. Department of Health and Human Services
200 Independence Avenue, SW
Ste. 729-D
Washington, DC 20201
202-690-7151
www.hhs.gov

U.S. Food and Drug Administration
10903 New Hampshire Ave
Silver Spring, MD 20993-0002
888-463-6332
www.fda.gov

Wi-Fi –Alliance
10900-B Stonelake Boulevard
Suite 126
Austin, TX 78759 USA
512-498-9434
www.wi-fi-org

Glossary of IT Terms

- **1xRTT - Single carrier (1X) Radio Transmission Technology.** 1xRTT is the first phase in CDMA's evolution to third generation (3G) technology. 1xRTT networks should allow for greater network capacity (more users; fewer dropped calls) high bit rate packet data transfer.

- **3G wireless - Third generation (3G) wireless.** Third generation wireless is a global framework that is implemented regionally in Europe (UMTS), North America (CDMA2000) and Japan (NTT DoCoMo). 3G is designed for high-speed wireless multimedia data and voice. It plans to offer high-quality audio and video and advanced global roaming, which means users would be able to go anywhere and automatically be handed off to whatever wireless system is available.

- **4G wireless - Fourth generation (4G) wireless.** Fourth generation is successor to 3G and 2G standards. The nomenclature of the generations generally refers to a change in the fundamental nature of the service. The first was the move from analogue to digital (2G), which was followed by multi-media support (3G) and now 4G, which refers to all IP packet-switched networks and increases in data speeds.

- **Analog - Analog transmission uses energy waves to transmit information.** In the case of wireless voice transmission, the sound waves of a human voice are converted directly to specific, continuously variable characteristics of a radio wave. Broadcast and telephone transmission have typically used analog technology.

- **API - Application Programming Interface.** Is how software components interact with each other to perform tasks.

- **ASIC - Application-Specific Integrated Circuit.** Is an integrated circuit customized for a particular use.

- **Bluetooth® -** Bluetooth is a specification for the use of low-power radio communications to wirelessly link phones, computers and other network devices over short distances.

- **CDMA - Code Division Multiple Access.** A method for transmitting simultaneous signals over a shared portion of the spectrum. The foremost application of CDMA is the digital cellular phone technology from QUALCOMM that operates in the 800MHz band and 1.9GHz PCS band. Unlike GSM and TDMA, which divides the spectrum into different time slots, CDMA uses a spread spectrum technique to assign a code to each conversation.

- **Common Criteria Certification -** An internationally approved set of security standards that provide an independent and objective validation of the security of a particular IT solution or product. This certification is accepted by 25 countries under the Common Criteria Recognition Agreement which includes the U.S., Canada, Germany, France and many others.

- **Digital -** A way of processing information by storing it as binary numbers. A digital circuit is either on or off, and a digital signal is either present or absent. Contrast with analog.

- **EMS - Electronics Manufacturing Services.** Is a term used for companies that design, test, manufacture, distribute, and provide return/repair services for electronic components and assemblies for original equipment manufacturers (OEMs).

- **Firewall -** A technological barrier designed to prevent unauthorized or unwanted communications between sections of a computer network.

- **Firmware -** Computer programming instructions that are stored in a read-only memory unit, including flash, ROM, PROM, EPROM and EEPROM, rather than being implemented through software.

- **GPRS - General Packet Radio Service.** An enhancement to the GSM (see below) mobile communications system that supports data packets. GPRS enables

continuous flows of IP data packets over the system for such applications as Web browsing and data access. GPRS differs from GSM's short messaging service, which is limited to messages of 160 bytes in length.

- **GPS - Global Positioning System**. Involves a space-based satellite navigation system to provide locations and other information.

- **GSM - Global System for Mobile Communications.** A digital cellular phone technology based on TDMA that is the predominant system in Europe, but is also used around the world. Operating in the 900MHz and 1.8GHz bands in Europe and the 1.9GHz PCS band in the U.S., GSM defines the entire cellular system, not just the air interface (i.e. TDMA, CDMA). GSM phones use a Subscriber Identity Module (SIM) smart card that contains user account information.

- **HD Video - High-Definition Video.** Includes video displayed at a higher resolution than standard versions.

- **HDI - High Density Interconnect.** A measure of the average amount of circuitry package in a given area of assembly.

- **HSPA - High-Speed Packet Access.** A family of radio interface standards that will improve the speed and accuracy of traffic over cellular networks. HSPA builds on the existing WCDMA technology that has already been deployed to allow carriers to offer better speeds and larger bandwidth intensive services like streaming audio and video.

- **Hybrid PBXs -** Hybrid PBXs support both traditional Time Division Multiplexed (TDM) phones to VoIP, easing the transition from TDM to VoIP.

- **iDEN - Integrated Digital Enhanced Network.** A wireless communications technology from Motorola that provides support for voice, data, short messages (SMS) and dispatch radio (two-way radio) in one phone. Operating in the 800MHz and 1.5GHz bands and based on TDMA, iDEN uses Motorola's VSELP (Vector Sum Excited Linear Predictors) vocoder for voice compression and QAM modulation to deliver 64 Kbps over a 25 kHz channel. Each 25 kHz channel can be divided six times to transmit any mix of voice, data, dispatch or text message. Used by various carriers around the globe, Nextel Communications provides nationwide coverage in the U.S.

- **IPSec - Internet Protocol Security.** Allows for the securing of IP communications by authenticating and encrypting IP packet of a communication exchange from host-to-host.

- **ISP - Internet Service Provider.** A business that supplies Internet connectivity services to individuals, businesses and other organizations.

- **Java -** An object-oriented programming language developed by Sun Microsystems, Inc. Java was designed to be secure and platform-neutral such that it can be run on any type of platform, making Java a useful language for programming Internet applications.

- **LTE - Long Term Evolution.** Is a wireless communication standard of high-speed data for smart phones and data terminals

- **MVS - Mobile Voice Service.** BlackBerry MVS converges office desk phones and BlackBerry® smartphones, extending the same mobility advantages the BlackBerry® Enterprise Solution provides for wireless email and data to voice communications.

- **NFC - Near Field Communication.** Technology that allows smartphones and similar devices to link together through radio communication, when tapping them together, or bringing them into close proximity.

- **PDA - Personal digital assistant.** A hand held portable microcomputer.

- **Packet-Switched Network -** A network in which the data to be transmitted is divided into standard-sized packets, each of which is given the receiver's address. Each of the packets that make up the transmission travels separately; packets do not have to travel in sequence or by the same paths. When all the packets have arrived at their destination, the receiver reassembles them into the original message.

- **QWERTY -** The modern-day keyboard layout on English-language computer and typewriter keyboards. It takes its name from the first six characters seen in the far left of the key board's to prow of letters.

- **ROM - Read Only Memory.** A class of storage media used in computers and other electronic devices. Once data has been written to a ROM chip, it cannot be removed and can only be read.

- **SDK - Software Developers Kit.** A set of software routines and utilities used to help programmers write an application.

- **SMS - Short Message Service.** A text message service that enables short messages of generally no more than 140-160 characters in length to be sent and transmitted from a wireless device and is broadly supported on cellular phones. SMS was introduced in the GSM system and later supported by all other digital-based mobile communications systems.

- **SSL - Secure Sockets Layer.** Protocols that provide security to Internet communications by encrypting the segments of network connections.

- **Virtual pre-load -** An icon or program sent wirelessly to a user's device without the end user initiating the transfer.

- **Wi-Fi - Wireless Fidelity.** A generic term for referring to wireless network components that run on the Wi-Fi Alliances IEEE 802.11 wireless standards. The standard was created so that manufacturers could produce wireless equipment that would be compatible with one another