Electronic Medical Records: An Inquiry into Promoting Their Adoption within the American Health System

Amir Satvat
MBA/MB Candidate in Healthcare Management and Biotechnology
University of Pennsylvania
bsatvat@aol.com

Abstract
Purpose - Despite the establishment of many early centers of EMR use in the 1970s and 1980s and an accompanying first wave of technological and health innovation, the widespread use of, and innovation in EMRs since the 1980s has been largely limited to government hospitals and visionary health organizations. It is estimated that EMR use is only about twenty, ten and five percent in the United States hospital sector, physicians’ offices and amongst clinics, respectively. Technology adoption rates are particularly low amongst smaller physician practices (three percent adoption) where there are prohibitive technology implementation costs. The reasons for this slowdown in adoption are many, but research conducted amongst three key interest groups (health providers and managers, politicians, and citizens) seeks to reveal the different barriers restricting EMR growth, to understand how EMR adoption could be encouraged and to gauge whether increased EMR adoption would be of net qualitative and financial benefit and to whom.

Method - This study examines barriers to EMR technology adoption as perceived by three identified interest groups in the United States. These barriers are reviewed within a scenario analysis of four strategic frameworks evaluating factor influence on interest group opinion and actions. The study’s conclusion is a set of strategic recommendation as to what actions, developments and outcomes could accelerate EMR technology development within the United States. Guiding insights and background related to the history of EMR technology, its adoption and its benefits and costs are also provided when aiding the analysis.

Limitations – This technology evaluation is grounded in largely qualitative analysis, buttressed by quantitative information and financial facts. As a result, a great deal of judgment is used in weighting the influence of various factors on EMR purchase and adoption decisions. This is a challenge faced in valuing many technologies that serve a community purpose equal to or much larger than pure economic benefits.

Findings - The final weighed scenario analysis of the likelihood of EMR adoption in the next fifteen years, let alone by President Obama’s stated deadline or 2014, suggests that, at least currently, there is an extremely gloomy horizon for the technology. The most likely scenario involves an unfavorable impact from emerging technologies and public policy forces and diffusion and adoption forces and only a neutral impact from innovative financial strategies forces. EMR technology faces a rocky road to adoption, inhibited most by a lack of public will to fund EMR system purchases, a lack of training and operational support for centers of care and an information asymmetry related to the value of EMR systems for the American health system. There are, however, several courses of
quite actionable interventions that could be effective in increasing the chances for EMR adoption. EMR systems can pay for themselves but these large payoffs only occur with high rates of system wide adoption, and also only if systems are largely compatible and conversant with one another.

**Implications for research, practice and/or society** – This study provides a significant literature review of EMR adoption research as well as providing new insights and context to the most significant technology decision in many inpatient and outpatient settings. The discussion and analysis leading to the paper’s conclusions is valuable reference for any country, health system, center of care, provider, lawmaker, policymaker or citizen interested in understanding the arguments underlying EMR and health care IT decisions.

**Keywords** – Electronic Medical Records, Health Care IT, Technology Adoption, Comparative Effectiveness, Health Care Savings

**Author’s Acknowledgements**
Thank you to the Ford Motor Company for this generous fellowship and the opportunity to conduct this research. This project could not have reached completion without the help and guidance of several special individuals. Thank you to Dr. Paul Schoemaker for your help, classroom instruction and advance on strategic frameworks and topic selection. Thank you to Sok Be for your help in course administration and in highlighting other research within the field that was illuminating.

**Most of all, thank you to Jessica Leight for your advice and constant inspiration: I dedicate this paper to you and your eternal, inspiring efforts to improve the global human condition.**
Introduction and Study Overview

In the late 1960s, an entrepreneurial physician, Larry Weed, had a radical idea: what if patient information was recorded electronically instead of on paper, facilitated by an automated system that would organize and utilize patient records for improved patient care (Weed, L.L., 1969)? Weed’s concept of electronic medical records (EMRs) would transform medicine, introducing the concept of the Problem Oriented Medical Records (POMR) into worldwide medical practice. These innovative ideas became the basis of the POMR project at the University of Vermont, a collaborative physician/IT effort leading to the first automated EMR in 1967 (Engelbart, D., 1986). The POMR project’s key objectives were the development of a system providing useful and prompt patient data to doctors, allowing rapid databasing for epidemiological and medical and business auditing purposes. A year later, the Mayo Clinic began developing similar EMR systems. Three years later, in 1970, the Medical Center Hospital of Vermont adopted electronic medical records for the first time. Touchscreen technology was used and drug information and patient/drug interactions, dosages and other data were added. Diagnosis and treatment plans for many common illnesses were created. In the 1970s and 1980s, EMR systems were refined further by research and academic groups, with several notable systems developed at Harvard (COSTAR) and Duke (The Medical Record). Some early adopters bought into EMR technology and spread word of its virtues. Health experts excitedly proclaimed the victory of digital health over antiquated analog methods. Then, unexpectedly, technological adoption and progress in EMRs slowed to a sluggish crawl.

Barriers to Technology Adoption

Despite the establishment of many early centers of EMR use in the 1970s and 1980s and an accompanying first wave of technological and health innovation, the widespread use of, and innovation in EMRs since the 1980s has been largely limited to government hospitals and several visionary health organizations. It is estimated that EMR use is only about twenty, ten and five percent in the United States hospital sector, physicians’ offices and amongst clinics, respectively (Jha, A.K., 2009). Technology adoption rates are particularly low amongst smaller physician practices (three percent adoption) where there are prohibitive technology implementation costs (Jha, A.K., 2009). The reasons for this slowdown in adoption are many, but research conducted amongst three key interest groups (health providers and managers, politicians, and citizens) reveal the different barriers restricting EMR growth.


<table>
<thead>
<tr>
<th>Barrier</th>
<th>Reasons for Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>High initial cost and uncertain financial benefits</td>
<td>The high up-front financial costs of implementing EMRs are a primary barrier to their adoption. This barrier is compounded by uncertainty over the size of any financial benefits that may accrue over time. In most practices, up-front costs range from $16,000 to $36,000 per physician. Some practices incur additional costs (in the form of decreased revenue) from seeing fewer patients during the EMR adoption.</td>
</tr>
</tbody>
</table>
transition period. Financial benefits vary greatly, from none in practices that make few work practice changes and retain paper processes to more than $20,000 per physician per year in the few practices that eliminate most paper processes.

| High initial physician time costs | Interviewees report that most physicians using EMRs spend more time per patient for a period of months or even years after EMR implementation. The increased time costs result in longer workdays or fewer patients seen, or both, during that initial period. |
| Technology | Most respondents or their colleagues consider even highly regarded, industry-leading EMRs to be challenging to use because of the multiplicity of screens, options, and navigational aids. Problems with EMR usability—especially for documenting progress notes—cause physicians to spend extra work time to learn effective ways to use the EMR. These substantial initial time costs are an important barrier to obtaining benefits, as greater burdens on physicians' time decrease their use of EMRs, which lowers the potential for achieving quality improvement. Although vendors are slowly improving EMR usability, most vendor interviewees doubt that any "silver bullet" technology (for example, voice recognition, tablet computers, or mobile computing) will dramatically simplify EMR usage. Designing easy-to-use software for knowledge workers is a challenge that spans the software industry beyond health care. |
| Difficult complementary changes and inadequate support | EMR hardware and software cannot simply be used "out of the box." Instead, physician practices must carry out many complex, costly, and time-consuming activities to "complement" the EMR product. Across industries, such complementary changes have been found to be critical for generating benefits from new technology. These complementary changes exact a great deal of time from physicians—especially physician EMR champions in solo/small-group practices—for months or even years after implementation. EMR champions in small practices spend much time arranging for EMR installation, receiving and assisting with EMR training, and encouraging EMR use among their colleagues and staff. These physician champions also have to patch together and deploy technical support from various software, hardware, networking, and service vendors when technical glitches occurred. Both champion and non-champion physicians have to work with their staffs to summarize and enter patient data from existing paper charts into the EMR. All physicians spend substantial time customizing their own visitor disease-specific electronic forms and documentation shortcuts to speed visit documentation. Moreover, physicians have to redesign their workflow (how they work in the exam room) and office workflow (who performs which tasks). |
As a general rule, larger physician groups can implement complementary changes more easily than smaller groups because large groups tend to have stronger organizational resources such as management expertise, experience with past process changes, financial resources, leadership, and information systems support staff. As a result, large groups provide more internal technical and personnel support for complementary changes. Despite these advantages, interviewees from large groups report that many of their physicians still have to invest substantial additional time to make needed changes. For solo/small-group practices that lack much internal support, physicians bear a much greater time burden after initial EMR implementation.

| Inadequate electronic data exchange | The lack of adequate electronic data exchange between the EMR and other clinical data systems (such as lab, radiology, and referral systems) negatively affects adoption. Having parallel electronic and paper-based systems force physicians to switch between systems, thereby slowing workflow, requiring more time to manually enter data from external systems, and increasing physicians’ resistance to EMR use. Furthermore, with fewer data in the EMR, there is less opportunity for electronic interventions to improve quality, and reduce the ability to perform internal analyses or to report performance externally for quality report cards or performance incentive programs. A lack of electronic data exchange is most problematic for solo/small-group physicians. For example, physicians in most solo/small-group practices cannot view any electronic lab results within their EMR, view hospital data or exchange any data with their practice management systems. Some labs or hospitals refuse to set up data exchange; less often, practices fail to make necessary programming changes in their own EMRs because vendor or internal IT support is lacking. In contrast, larger groups tend to have in-house lab and practice management systems that exchange data with their EMRs, and have the leverage to obtain the cooperation of hospitals and other external data producers for electronic data exchange. Large groups also have the IT staff to program any necessary data exchange interfaces. |
| Lack of incentives | EMR use could be increased through financial rewards for quality improvement and for public reporting of multiple measures of quality performance. Yet few health professionals or managers report any financial incentives for quality, and none reported public reporting of their quality performance compared with that of other physician practices. The few practices that operated under substantial financial incentives for quality improvement intensified their uses of EMR and reaped sizable financial rewards. |
| Physicians’ attitudes | Most EMR champions are positive, "can-do" attitude professionals whose approaches toward solving EMR-related problems are vital to getting other physicians to use EMRs. These physicians—innovation |
"early adopters"—are willing to bear initial financial and time costs to generate benefits. In contrast, non-champion physicians tend to be less positive toward EMRs and more easily discouraged by usability problems. Without exhortation and support from physician champions, these physicians tend to remain lower-level EMR users. As a result, practices without physician EMR champions may flounder in their efforts to generate quality or financial benefits from EMRs.

For politicians and citizens, resistance to EMR is equally diverse, with a persistent and widespread misunderstanding of the technology and its benefits still in place. The following table summarizes these factors.

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Security and Privacy</td>
<td>Privacy, confidentiality and security of electronic medical records and internet-based communication are important concerns.</td>
</tr>
<tr>
<td>Legal</td>
<td>IT presents new legal challenges: privacy of identifiable health information, reliability and quality of health data, and tort-based liability. Also, there are public concerns regarding data confidentiality, security, ownership, patient identifiers, and electronic signatures.</td>
</tr>
<tr>
<td>Healthcare Settings</td>
<td>The health care industry structure is diverse and highly decentralized making more difficult the adoption of IT systems. Also, the vast majority of U.S. physicians are located in solo/small-group practice making EHR adoption more difficult. As a result, policymakers and the public find it hard to mandate universal adoption across the health system.</td>
</tr>
<tr>
<td>Stakeholder Support</td>
<td>Alignment of health care providers, the public, vendors, payers, and governments are needed to accelerate EHR adoption and to build a national system of computerized health information and sharing. Finding this adoption against the lobbying of various interest groups stops policymakers from passing sufficient wide-scale EMR mandates.</td>
</tr>
<tr>
<td>Consumer Acceptance</td>
<td>Consumer acceptance, technological access and computer literacy are additional IT adoption barriers.</td>
</tr>
<tr>
<td>Privacy</td>
<td>Health care consumers are very concerned with access, content and dissemination of private information.</td>
</tr>
</tbody>
</table>

This study examines barriers to EMR technology adoption as perceived by three identified interest groups in the United States. These barriers are reviewed within a scenario analysis of four strategic frameworks evaluating factor influence on interest group opinion and actions. The study’s conclusion is a set of strategic recommendation as to what actions, developments and outcomes could accelerate EMR technology development within the United States. The next section, selection of appropriate frameworks, will set up the subsequent scenario analysis, focusing on EMR purchasers.

**Framework Selection**

The selection of pertinent strategic frameworks is a vital step in developing tools for meaningful technology analysis. EMR systems are of value to a wide range of
organizations, including hospitals, clinics and physicians’ practices. Many of these organizations differ significantly in the size, scope of services and complexity of systems they demand. Thus, the best frameworks for an analysis of EMR adoption are those that match the dynamics of EMR consumers and their purchase and implementation decisions. While many criteria are important to EMR consumers in determining their technology needs, five factors are most significant, usually judged in three phases:

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 2</td>
<td>Compatibility and Compliance</td>
</tr>
<tr>
<td>Phase 3</td>
<td>Practice Sustainability</td>
</tr>
<tr>
<td></td>
<td>Fit-to-Process (Work-Flow, Coding, Population Management, Pay-for-Performance)</td>
</tr>
<tr>
<td></td>
<td>Implementation Ease</td>
</tr>
</tbody>
</table>

A brief definition of these criteria is useful. Cost is usually considered first. For many smaller healthcare organizations, budgeting allows either for no EMR implementation or fairly limited systems. If an organization deems the cost of a new system excessive, purchase considerations are generally terminated. While the “costs” of a new EMR system are mostly evaluated with respect to revenues, expenses and cash flows, improvements in health service standards also guide purchase decisions (Nieburgal, D., et al., 1993). Because EMR systems serve the administration of healthcare, traditional financial analyses such as ROI are considered alongside factors such as enhanced efficiency, “cleaner” medical records and patient care. Still, a base financial analysis is most important, particularly for smaller medical practices. A medical group will often look at its expected revenues for the year and annually amortize and depreciate leasing or purchase expenses for hardware and network equipment. Contract and servicing fees must also be considered. This calculation yields the net present value on the EMR investment. However, the NPV “book” returns on EMR systems often do not match up with cash flows from the investment, particularly in the short-term. Thus, especially in smaller and medium-sized health care organizations, professionals often block EMR implementation because short-term drains on cash affect their personal financial earnings. Furthermore, many administrators and providers are often skeptical that EMR improvements to patient value, while important, might ever materialize in the form of increased cash flows rather than in qualitative improvements in patient care.

If cost is not an immediate obstacle or the potential for product customization to budget availability exists, organizations start to consider compatibility and compliance. Compatibility and compliance standards require that providers only operate EMR systems that are certified according to Compliance with Certification Commission for Health Information Technology (CCHIT) standards, as maintained by the United States Department of Health and Human Services (DHHS). If the organization chooses to take advantage of government incentives for EMR purchase reimbursement, the EMR must also conform to requirements of the American Recovery and Reinvestment Act of 2009 (ARRA). CCHIT and ARRA ensure that EMR systems have passed a thorough inspection of functionality, operability and security at live sites. ARRA requires a slightly higher standard of compliance, adding a “meaningful use” requirement, currently defined as the ability to “capture data, report on health information, track key clinical conditions
and improve performance and health outcomes (http://www.himss.org/EconomicStimulus/).” Organizations also focus on EMR compatibility with their own legacy and existing Practice Management Systems (PMS), particularly with regard to integrating old technology into new systems. A good EMR without a competent PMS for patient registration, tracking and coding is a potential waste of money. Anticipating this concern, many vendors have already started selling integrated EMR/PMS systems to meet consumer demand.

If cost, compatibility and compliance needs are met, organizations look to an EMR system’s ability to match suitability, Fit-to-Process and implementation ease needs. Practice suitability refers to an EMR’s ability to fit, as well as possible, a healthcare organization’s unique size, scope and practice needs. Smaller practices do not need many luxurious EMR features such as disease management analysis and patient education material document databases. Larger practices need much sturdier IT workhorses. Fit-to-Process criteria include compatibility in work-flow, coding, population management and Pay-for-Performance factors. In evaluating impacts on work-flow, EMR systems often change interactions between office staff, providers, diagnostic labs and other vendors and service providers. Continuity or improvement of work-flow processes will improve chances of EMR adoption. Coding compatibility is important in that EMR systems without the ability to assist in correct ICD-9, DRG and other billing selections lack an important component of meaningful use. Population management, long seen as a superfluous bell-and-whistle of EMR systems, is now an in-vogue and clinically-proven asset in managing treatment quality and patient outcomes. An EMR system’s functionality in providing clinical guidance and patient management tools to providers is more likely to gain adoption. Finally, Pay-for-Performance capture is an essential part of an EMR system. With an increasing number of clinical measures considered for payer bonuses, an EMR system without such functionality can take significant revenue away from healthcare organizations.

Having summarized the five key factors affecting EMR consumer decisions, four frameworks are highlighted from the book “Wharton on Managing Emerging Technologies” and matched to the five decision criteria. All four of these frameworks are justified and chosen to assess the potential for EMR adoption in the health industry.

The remainder of this section will summarize four potential frameworks for EMR adoption analysis, justify their use and highlight the selected frameworks’ fit with EMR adoption processes.

Four Potential Frameworks

The following frameworks best match the five key criteria driving EMR technology adoption:

<table>
<thead>
<tr>
<th>Decision Criteria</th>
<th>Relevant Framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>Scenario Planning</td>
</tr>
<tr>
<td>Compatibility and Compliance</td>
<td>Scenario Planning</td>
</tr>
<tr>
<td>Practice Suitability</td>
<td>Diffusion and Adoption</td>
</tr>
<tr>
<td>Fit-to-Process</td>
<td>Emerging Technologies and Public Policy</td>
</tr>
<tr>
<td>Implementation Ease</td>
<td>Innovative Financial Strategies</td>
</tr>
</tbody>
</table>
The frameworks are discussed in an order reflecting their logical application in understanding EMR technology adoption.

**Framework 1: Innovative Financial Strategies**

The innovative financial strategies framework highlights ways in which non-traditional companies, those not utilizing traditional equity or debt-raising pathways for capital, can raise money in establishing non-traditional sources of present or future profit or profit expectation. Innovative financial strategies are most common in fields such as biotechnology, where the literal absence of revenues requires companies to show the potential for research milestones or future profits in order to secure capital. However, innovative finance is a widely applicable strategy for unproven or profit-deficient technologies.

Recently, alternative financing has moved beyond traditional solutions such as derivatives, convertible debt and revenue and asset securitization to areas such as employee profit-sharing schemes and government grant securitization. Under these schemes, companies might implement capital projects that are unaffordable and profit negative upfront, locating funding in either white knight, governmental or employee sources. Those who fund such arrangements agree to a proof of concept in revenue improvement or cost reduction, willing to accept a portion of future profit streams in exchange for no upfront profit-sharing. Innovative financial strategies provide a useful framework for thinking about non-traditional ways to make temporarily profit-deficient technologies successful.

Innovative financial strategies is an important framework for EMR technology in that it suggests ways to locate unconventional funding, allowing capital expenditures for new systems that would otherwise not occur (Miller, R.H., et al., 2004). A major disincentive for EMR technology implementation is the lack of a short-term payback period. In ambulatory clinics, for example, break-even profitability is usually not achieved for five years (http://www.himss.org/content/files/jhim/20-1/focus_2.pdf). Particularly in clinics and smaller medical practices, where corporate-level profitability cannot easily absorb capital expenditures for a new EMR system, clinic and practice providers are likely to reject profit-negative EMR systems with the expectation that upfront expenses will hit their income and newfound revenues will stay with organization heads. This is an even more likely scenario if the providers are salaried at a flat level. These barriers to EMR financing decisions have been compounded by the recent financial crisis. Banks often aided group practices and health systems with EMR financing. Sometimes lease financing came from EMRs themselves, with banks as a third-party financing partner. However, many banks have now reclassified EMRs as unsecured loans, making new EMR credit lines or lease facilities more difficult or impossible to obtain for health providers and health systems. Banks have become increasingly uneasy with the lengthy times needed for EMR integration and the potential for practices and health systems to abandon EMR use if they run into operational challenges, don’t like their EMR systems or face unexpected financial challenges. In such scenarios, EMR providers find themselves short on anticipated revenues and the bank is left holding bad debt.

Using a financial strategies framework, organization heads could consider alternative arrangements that would raise organizational buy-in for EMR system
purchases. One such scenario is an employee revenue sharing plan aimed at distributing documented savings from EMR implementation and its effective use to employees. Another idea is a direct and transparent employee cost-sharing for EMR purchases by offering an ownership stake in equipment purchases and their resulting revenues. Extended the framework to external financiers, investors could discount health centers’ EMR systems but keep a portion of documented cost savings over a period of time. For government financing, further savings (beyond ARRA) on EMR system costs could be offered for documented improvements in health outcomes and organizational efficiency. For EMR manufacturers and servicers themselves, sales could increase if there was no upfront charge for system use, with costs transferred to lease agreements or contract-service models for system usage, similar to a cloud computing model.

An innovative financial strategies framework fits with EMR technology and facilitates in identifying new funding pathways, allowing EMR technology purchases for many new consumers, particularly those who are risk-averse or capital-poor. These unconventional pathways are superior to traditional financing methods in a time of tightened lending for unsecured loans from both banks and EMR companies themselves.

Framework 2: Diffusion and Adoption

Diffusion and adoption is a dual-process framework that articulates ways in which new products or ideas reach market acceptance, defined as not only the actual concept spread itself (diffusion) but also the ways in which individual mindsets change to accept a new concept (adoption). Rates of diffusion and adoption are also of great interest in giving timeframe and context to concept spreading. Three sub-theories within diffusion and adoption are of great interest: Everett Rogers Diffusion of Innovations, Crossing the Chasm and technology-driven models.

The Everett Rogers Diffusion of Innovations divides product consumers into five categories along the spectrum of adoption readiness. These categories are innovators, early adopters, early majority, late majority and laggards. The ability for a producer to capture consumers in the five categories of adoption and the changes necessary to move consumers in untapped categories of adoption to purchase bias is of great informative value, while often quite difficult to determine. Crossing the Chasm is a model developed by Geoffrey Moore that focuses on the transition points between adoptions in the Everett Rogers model’s categories. Geoffrey Moore suggests that the most difficult transition phase is the achievement of adoption by an early majority after early adopters. Technology-driven models quantify the role of technology in affecting diffusion through factors such as ease of use and implicit technology value to consumers.

Diffusion and adoption is an important framework for EMR technology in its ability to pinpoint current stage of adoption. The Everett Rogers diffusion model provides five categories for consumer adoption of a technology or product. In examining EMR technology, it is clear that adoption is stuck at an early adopter stage. The innovator stage for EMR technology was over thirty years ago, when EMR systems were first developed. Starting in the 1970s, hospitals and practitioners slowly adapted to using digital records, largely in the form of mainframes, databases and tape backup systems. However, since the time of early adoption, despite significant improvements in underlying technology, transition to an early majority of adopters has stalled. EMR system uptake has stalled due to three key reasons. First, EMR systems are much more complicated than traditional
resource control or human resources systems already in place in most medical groups. Their complex operational integration, involving technology process training for staff, is too much for most medical groups. Second, the government has performed poorly in creating subsidies and standards to encourage uniform EMR implementation across the country. Third, the medical community has exacerbated the government’s failings by failing to encourage EMR vendor development of common features and system compatibilities across all products. The barriers to adoption mentioned in the first section of this study also significantly affect EMR uptake.

Even after thirty years, fewer than 10 percent of hospitals, as of 2006, have a fully integrated EMR system. Furthermore, in the United States, only 20.4% of office-based physicians reported using EMR systems in 2008 that were minimally functional (Smaltz, D., et al., 2007). Moore’s Crossing the Chasm model illustrates that the struggle for EMR technology is taking this key step from early adopter to early majority adoption readiness. The technology-driven model suggests that a first area for investigation into EMR adoption difficulties is the underlying technology itself. This could be accomplished by gauging the strengths and weaknesses that EMR system consumers see in existing EMR products, learning what portion of EMR system adoption problems tie to the products themselves.

The diffusion and adoption framework illustrates that EMR technology lies in the early adopter stage of its adoption cycle and suggests some areas for initial investigation, relying on other strategic frameworks to further explain why adoption progress has stalled.

.Framework 3: Emerging Technologies and Public Policy

Public policy frameworks allow a robust examination of the influence that policymakers and regulations have on industry formation tied to emerging technologies, from encouraging and allowing the development of revolutionary innovations to inhibiting the deployment of successful ideas. This framework is largely qualitative, helping companies to gain insights into future public policy action by focusing on past lessons related to government intervention. Because the exact moments of governmental impact are very difficult to predict in an industry, anticipating regulation requires an examination of public policy’s impact on technology at a number of stages and through a number of channels. These channels include institutional infrastructure, research infrastructure, government directives, standard setting, government regulation and government subsidies.

Institutional infrastructure captures the ways in which government creates and maintains legal and public institutions that encourage or discourage innovation. Research infrastructure includes the ways in which the government provides assistance for basic research and its dissemination through institutions and their publications. Government directives include more interventionist government policies aimed at encouraging or protecting commercial development of existing or well-understood technologies. Standard setting reflects the government’s role in establishing standards through edict rather than allowing traditional market forces such as firms and patent holders to make such determinations. Government regulation includes direct oversight and restrictions on industry activities. Government subsidies are often the most interventionist policies, as the government often tries to champion a technology by overcoming initial or lasting
economic non-justification for a product or idea. Examining these areas of policy influence and their past and current effects on emerging technology creates a much better understanding of the nature and timing of likely policy changes in an industry.

Examining the impact of public policy on EMR technology is vital, given the high level of regulation on EMR systems, the significant flows of public funds into the health system (46%) (http://apps.who.int/whosis/database/core/) and the potential for variations in government incentives for EMR implementation (such as ARRA). Institutional infrastructure affects EMR implementation in that initiatives by organizations such as the Agency for Healthcare Research and Quality (AHRQ) in Comparative Effectiveness Research (CER) seek to increase visibility for better data collection and analysis in American healthcare. While such efforts have still earned modest attention in the United States, Canadian and European efforts in CER started with similarly modest research projects (http://apps.who.int/whosis/database/core/). President Obama’s current $1.1B CER project, granted to organizations such as AHRQ, could provide a greater institutional infrastructure for EMR justification. Research infrastructure ties into institutional infrastructure benefits of CER. If primary research into comparative effectiveness gained further traction, organizational interest in data collection would increase due to greater data value for CER analysis and health standard improvements.

Government directives, particular at the Center for Medicare and Medicaid Services (CMS) include efforts to tie clinical data to benchmark payments for healthcare organizations. However, even for top performers, CMS still only offers a five percent bonus on total revenues for meeting and exceeding benchmarks (http://www.healthimaging.com/index.php?option=com_articles&view=article&id=18438:cms-touts-success-of-three-hospital-projects-issues-nearly-50m-in-incentives). Further incentives would greatly increase EMR system implementation. Standard setting and government regulation could affect EMR adoption if minimum standards were established for EMR systems at centers of care. This is already established in portions of the Veteran’s Administration (VA) system. However, for private centers and most non-profit hospitals and clinics, incentives are provided for EMR system purchases while mandates remain absent. Government subsidies are already in place for purchasers of EMR systems. However, many exceptions for funding exist, most related to meeting meaningful use standards under ARRA.

Using the emerging technologies and public policy framework ensures awareness of the effects of government and public decisions on EMR adoption and their changing impacts as new laws and policies are passed and enacted. We can analyze these impacts most effectively by examining Gerald Faulhaber’s ten lessons from the Internet’s development and see how each applies to the EMR adoption experience.

<table>
<thead>
<tr>
<th>Faulhaber’s Lesson</th>
<th>Lesson Learned</th>
<th>EMR Relevance</th>
<th>Relevance Score (1-10, 10 is Highest)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson One</td>
<td>Government plays a powerful role in shaping the development of a new technology in its earliest research stage.</td>
<td>Even relatively small subsidies for EMR systems in the ARRA have significantly increased health system interest in</td>
<td>10</td>
</tr>
<tr>
<td>Lesson Two</td>
<td>Withdrawal of government support for a research effort as it gets closer to commercialization is strongly resisted by the beneficiaries of that support (be they universities, scientists, not-for-profits, or private-sector firms).</td>
<td>This is not relevant in that government support for EMR development was nonexistent.</td>
<td>1</td>
</tr>
<tr>
<td>Lesson Three</td>
<td>Government as coordinator can help manage the transition from public (research and education) to private (commercial). Everyone will complain.</td>
<td>The government could play a vital role in coordinating EMR system standards for both non-profit hospitals and other centers of care and for-profit hospitals, clinics and physician practices. The government deserves significant criticism for not building common standards, subsidizing implementation and encouraging adoption.</td>
<td>7</td>
</tr>
<tr>
<td>Lesson Four</td>
<td>Public concern about the effect of new technologies on social mores may lead to demands for political solutions to limit these impacts. These solutions often have unintended consequences.</td>
<td>Early public concern over the ethical implications of having personal health information stored and shared online, largely an unfounded concern, helped cripple early EMR adoption efforts.</td>
<td>8</td>
</tr>
<tr>
<td>Lesson Five</td>
<td>Both commercial and governmental interests will seek a legal/political response to disruptions created by the technology to their way of doing business. Such responses</td>
<td>Medical lobbies worked very hard to stop forced adoption of EMR, given cost burdens and the challenge for older providers and administrators to adopt to new electronic</td>
<td>7</td>
</tr>
<tr>
<td>Lesson Six</td>
<td>A new technology which is highly valued by all may lead to political demands for “universal service” from low-income and/or high-cost constituents, which is likely to result in some form of government intervention.</td>
<td>Low-income and/or high-cost constituents are not generally aware of the implications of EMR adoption for their health. They are still more focused on basic care.</td>
<td>2</td>
</tr>
<tr>
<td>Lesson Seven</td>
<td>Dominant firms can often make the mistake of treating customers poorly, which can lead to a political demand for intervention by regulators.</td>
<td>This is not relevant to the EMR case.</td>
<td>1</td>
</tr>
<tr>
<td>Lesson Eight</td>
<td>If a new technology threatens to lead to a single firm gaining a dominant market position, government may intervene to control this “natural monopoly,” either through regulation or antitrust.</td>
<td>This is not relevant to the EMR case.</td>
<td>1</td>
</tr>
<tr>
<td>Lesson Nine</td>
<td>If the technology leads to firm dominance in a bottleneck market, there will be a political demand for government to limit the dominant firm’s ability to vertically integrate.</td>
<td>This is not relevant to the EMR case.</td>
<td>1</td>
</tr>
<tr>
<td>Lesson Ten</td>
<td>Regulations that appear to promote competition or policy objectives for emerging technologies can have unintended side effects or even the opposite effects.</td>
<td>This is not relevant to the EMR case.</td>
<td>1</td>
</tr>
</tbody>
</table>
**Framework 4: Scenario Planning**

Scenario planning is a popular strategic framework for anticipating varied decisional outcomes. The framework attempts to describe a process flow starting with exogenous forces and ending in a scenario blueprint and memorandum document containing narratives, themes and warnings that guide decision-makers. Typically, the scenario’s skeleton is built from an understanding of STEEP forces: social, technological, economic, ecological and political/legal. These forces impact scenario drivers within four categories: basic trends, drivers of change, key uncertainties and rules of interaction. Given that the most common key uncertainties are typically driven by stakeholders or technologies, creating a comprehensive outline of stakeholders and technologies is often very helpful in ensuring all drivers are considered for a framework. In the driver stage, parameters for the decision and its encapsulating project are also outlined, including time frame and scope. Once the various scenarios are outlined, they are laid out on a scenario grid, illustrating various outcomes as driven by different conditions. The summary of all gridded scenarios is the scenario blueprint and the memorandum captures the key takeaways from the scenario blueprint in more digestible and, often, simplified language.

Scenario planning can also incorporate systems analysis and thinking, a related but somewhat different discipline of organizational studies and behavior. In systems thinking, scenarios are outlined but not in single, terminating interactions. Rather, a scenario map attempts to recognize many factors that can combine in complex and both repeating and changing interactions to create unexpected future outcomes and feedback loops. Combining the systems thinking approach to scenario planning with traditional decisional outcome frameworks allows the inclusion of outcomes and factors that often would be ignored, such as rapid value shifts, unexpected regulation or innovations and untraditional insights into future industry trends. The combination of systems thinking with scenario planning allows for more believable and accurate articulations of causality between system factors and decisional outcomes, a planning hybrid known as structural dynamics.

Scenario planning integrates insights gathered from the other three frameworks, providing organizational structure and a multiple outcome approach to understanding EMR technology adoption and diffusion. Also, the scenario planning framework makes the analysis of EMR technology “complete” by evaluating factors and stakeholders not considered by the other three frameworks. Social factors such as physician and citizen attitudes towards EMR and their implementation are considered. Technological factors such as EMR system quality and improvement complement issues raised in the diffusion and adoption framework. Economic considerations for EMR system cost are evaluated with great breadth, complementing subsidization and financial consideration in the innovative financial strategies framework. Politic and legal factors are largely pulled from the emerging technologies and public policy framework.

The scenario planning framework evaluates all these forces and their impact on basic trends, drivers of change, key uncertainties and rules of interaction, using diffusion and adoption insights to maintain a timeframe of reference and systems thinking and structural dynamics to capture loops of intersystem impact.

Scenario planning is an essential framework that organizes the other strategic frameworks in understanding EMR adoption and diffusion. Because the next section of
the paper is devoted to a full scenario analysis of EMR technology, further specifics on scenario details are spared for now.

**Summary of Framework Selection**

My inquiry into the current and future states of EMR adoption lent itself to a framework analysis approach. After choosing four candidate frameworks with high relevance to EMR adoption from “Wharton on Managing Emerging Technologies,” I justified each framework as a guide for further examination. The four frameworks chosen were diffusion and adoption, emerging technologies and public policy, innovative financial strategies and scenario planning. These frameworks are most relevant in understanding the dynamics in the EMR system industry and they will help greatly in evaluating the commercial potential and success for both EMR technology and the individual firms producing the technology.

**Scenario Planning with Other Integrated Framework Forces**

In analyzing the likelihood of EMR technology adoption in the United States, I will consider the impact of three forces on the pace of adoption. These three forces are based on the three supporting frameworks of emerging technologies and public policy, diffusion and adoption and innovative financial strategies. The potential favorability of impact of each of these forces on technology adoption is considered in three situations: high likelihood, medium likelihood and low likelihood. “High likelihood” is weighted at 60% probability, “medium likelihood” is weighted at 30% probability and “low likelihood” is weighted at 10% probability. Twenty-seven final scenarios result and outcomes with highest likelihoods are reviewed. A figure depicting the organizing scenario framework for the analysis of adoption likelihood is presented below.
Emerging Technologies and Public Policy (Impact Analysis: Favorable 10%, Neutral 30%, Unfavorable 60%)

Faulhaber’s lessons from the internet’s development suggest four key factors affecting public policy decisions and their potential impact on EMR technology adoption. First, the government’s role in shaping the development of EMR technology is decisive. Second, the government’s coordination of public support in managing public and private party complaints and oppositions to EMR technology is vital. Third, public concern over the value and impact of EMR technology has the potential to stop adoption in its tracks. Fourth, industry and non-profit lobbies will attempt to stop EMR technology adoption due to cost and business disruption concerns. In the case of EMR technology, all of these forces have impeded adoption in the past and are likely to continue as such in the future. Thus, in assessing the impact of Emerging Technologies and Public Policy forces on EMR technology adoption, there is a 10% likelihood of favorable impact, a 30% likelihood of neutral impact and a 60% likelihood of unfavorable impact.

EMR technology has long been seen as a means of achieving health quality improvement and greater cost controls. In the past ten years, President Bush signed a memorandum declaring a goal of total EMR technology adoption across inpatient and outpatient settings by 2012. At the same time, he signed an executive order establishing an Office of the National Coordination (ONC) for Healthcare IT (ONCHIT, 2005). Compromising with hard-right legislators in the Congress, the order placed a strong emphasis on cost, benefit and outcomes proof in justifying EMR expenses. At the same time, many public and private initiatives were put in place to promote EMR adoption,
including community-focused efforts by AHRQ and physician-focused initiatives such as the Doctor’s Office Quality-Information Technology (DOQ-IT) program. Several standards-focused initiatives were also established under the Medicare Modernization Act (MMA).

In more recent years, President Obama signed two major initiatives aimed at increasing EMR technology adoption. First, his $1.1B CER project, allocated to organizations such as AHRQ and passed under ARRA, offered incentives for EMR adoption but fell short of mandating purchases. Second, the Health Information Technology for Economic and Clinical Health (HITECH), also part of ARRA, allocated approximately $44,000 for each practicing clinician and between two million and ten million for each hospital that qualifies as a “meaningful” use of EMR technology. President Obama pushed back President Bush’s goal of EMR adoption to 2014, citing continued low EMR technology penetration of 10% within hospitals and 20% within physician’s offices (Jha, A.K., et al., 2010, Burt, C.W., et al., 2005).

These efforts are admirable but the achievement of such goals in any reasonable timeframe is hindered significantly by current government policy. EMR technology adoption, as of July, 2010, has been estimated at three percent per year. Even if all EMR incentives doubled this rate, universal adoption would take twenty to thirty years. The insufficiencies of current policy in ensuring adoption are many. First, descriptions of mandatory meaningful use under all current government incentive programs, required to receive funding assistance, are quite formidable. Meaningful use under HITECH, for example, includes establishment of electronic prescribing, health information exchange capabilities and automated reporting of quality performance (Jha, A.K., 2010). These are “challenging requirements that clinicians and hospitals much meet to receive incentive payments (Jha, A.K., 2010).” Second, a majority of United States physicians work in practices with fewer than five physicians and few currently use EMR technology (Burt, C.W., et al., 2006). Physicians in these groups fear “misaligned financial incentives, lack of standardization among EMR applications, and the high turnover of HIT vendors” (Middleton, B., et al., 2005) in addition to worrying that governmental interference in their practices is not in their best interests. Worryingly, meaningful use guidelines also apply to inpatient centers of care. These policymaker ideals are commendable in a vacuum, but quixotic in the context of our healthcare system and current incentive structures. Policymakers imposed a very high bar on technology use on all healthcare providers and settings of care without creating sufficient mechanisms to ensure adoption. As captured well in a recent JAMA opinion piece, “implementing electronic prescribing can be highly disruptive and few EHR systems can currently support exchange of clinical data or automated gathering and reporting of quality measures (Jha, A.K., 2010).” The paltry reimbursements for EMR technology adoption greatly impede progress, along with health provider incompetency in installing and integrating EMR technology into current practice.

If the impact of public policy on EMR technology adoption is to be positive and accelerative, one or both of two changes in law need to take place. First, Congress needs to mandate EMR technology adoption along a reasonable, but speedy, timetable. Second, and much more importantly, Congress needs to increase funding for technology purchases, training and operational help within settings of medical care. With knowledge of how to implement EMR technology still in its infancy, most EMR transitions will be
poorly executed with serious consequences (Chaudhry, B., et al., 2006). This is particularly worrisome in that poorly designed or implemented EMR systems can cause as much harm as good (Koppel, R., et al., 2005, Han, Y.Y., et al., 2005). One potential solution is “to create systems [that] monitor errors from EMRs and their implementation, [using the] data to improve future systems (Sittig, D.F., et al., 2010).” Upgrading payment systems to further reward caregivers for quality and efficiency without draconian punishments and removals of funding assistance could also help raise adoption. Without a reduction of insurmountable barriers to funding assistance for EMR technology, an increase in incentives that boost buy-in potential from patients and those caring for them and a mandate for systems adoption, public policy’s impact on EMR adoption will remain a slow prodding towards a twenty to thirty year adoption cycle.

Diffusion and Adoption (Impact Analysis: Favorable 10%, Neutral 30%, Unfavorable 60%)

The Diffusion and Adoption model and its impact on EMR technology adoption centers on an examination of the Everett Rogers Diffusion of Innovations model, the transition points between categories of adopters within that model and the role of technology in affecting diffusion through ease of use, implicit technology value and other factors. In the case of EMR technology, a perception of uncertain value for the technology and the inability to cross into an early majority stage of diffusion and adoption significantly handicap the technology’s spread. Thus, in assessing the impact of Diffusion and Adoption forces on EMR technology adoption, there is a 10% likelihood of favorable impact, a 30% likelihood of neutral impact and a 60% likelihood of unfavorable impact.

In looking at the technology itself, purchasers are understandably confused because of high variance amongst available EMR systems. A literature review suggests an extremely “heterogeneous set of definitions, standards, and functional models for EMR technology (Brailer, D.J., et al., 2003).” Specifically, Brailer and Tersasawa cite over ten different terms used to refer to EMR technology as well as over fifty functional aspects to consider in purchasing an EMR system (Wang, S.J., et al., 2003). Furthermore, the variety of functional models within EMR are staggering and difficult to sort through, despite efforts by the Healthcare Information and Management Systems Society (HiMSS), Health Level Seven (HL7), Gartner, and the Institute of Medicine (IOM) to provide guidance to care providers (Wang, S.J., et al., 2003). Many experts classify EMR systems in three categories based on functionary clusters: “basic (documentation and viewing), intermediate (very basic e-prescribing and decision support), and advanced (more sophisticated order entry and decision support) (Wang, S.J., et al., 2003).” Troublingly, many care providers only see true value in purchasing an advanced system, but do not feel the benefits exceed the staggering costs. Additionally, experts believe it will take over ten years before advanced systems will be accessible to smaller centers of care (Wang, S.J., et al., 2003). This fundamental lack of excitement amongst care providers for EMR systems that they can actually afford differs from traditional theories that tepid technology growth is primarily age or technology-expertise related (http://www.kevinmd.com/blog/2010/12/physician-barriers-emr-acceptance.html). While it is shocking to note that, in a recent CDC study, “only 7.6 percent of physicians older than 65 used some form of EMR, compared with 47 percent of physicians younger than
even younger, technically-savvy physicians are waiting for powerful EMR systems that they will not consider affordable for over a decade. Finally, even for those care providers who overcome concerns over inherent cost and technological value in EMR systems, further worries over the ambiguous and contradictory evidence-based impact of EMRs on safety, effectiveness, and efficiency are stifling. (Miller, R., et al., 2004) There is considerable uncertainty as to the ability of current-generation EMRS to generate desired positive outcomes, as heavily modulated by system “levels of functionality, usability, and integration with workflow processes (Wang, S.J., et al., 2003).” Finally, it has been shown that physicians’ realizations of benefits are dependent on their reimbursement schemes for purchasing and implementing EMR technology. All of these uncertainties, related to both the benefits of EMR systems and their realization, deter care provider adoption (Overhage, J.M., et al., 2001).

Another avenue for encouraging EMR technology adoption would be to identify early adopters and their characteristics in either motivating such individuals to encourage adoption amongst their peers or to alter adoption-related traits in increasing individual propensities to purchase EMR systems. Identifying such traits is challenging but the literature suggests several factors most common amongst early adopters. A table, below, summarizes these factors and their descriptions (Burt, C.W., et al., 2005, Casalino, L.P., et al., 2003, Gans, D., et al., 2005, Wang, S.J., et al., 2003, Kane, C.K., 2004, Audet, A.M., et al., 2004).

<table>
<thead>
<tr>
<th>Early Adopter Trait</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice Size</td>
<td>Propensity to adopt an EMR was strongly correlated with increased practice size. Burt and Sisk found that practices of 10 to 19 physicians were more than twice as likely to use EMRs when compared with solo practitioners. Some authors associate this with economies of scale that may be achieved in larger practices. Others suggest that access to capital and credit may be a more significant issue for smaller practices. This is a significant finding given that approximately 75 to 80 percent of physicians work in practices with nine or fewer physicians.</td>
</tr>
<tr>
<td>Ownership Structure</td>
<td>Burt and Sisk divided ownership structure into three categories: physician owned, HMO owned, and others, such as hospital owned. They found very strong correlations between adoption and ownership structure, with physician-owned practices being much less likely to adopt than practices in the other two categories. There is a correlation between practice size and ownership, with HMO-owned practices and those in the “other” category being significantly larger than physician-owned practices.</td>
</tr>
<tr>
<td>Compensation</td>
<td>Salaried physicians were more likely to adopt, although salaried physicians are also more likely to work for HMOs and larger practices.</td>
</tr>
<tr>
<td>Specialty</td>
<td>Different studies produced different results depending on the manner of specialty classification and methods of analysis. After excluding radiologists, pathologists, anesthesiologists, and dermatologists, Audet found that multi-specialty practices were more likely to adopt an EMR.</td>
</tr>
</tbody>
</table>
than were primary care practices. When Burt and Sisk compared primary care and specialty practices, broadly defined, no differences in adoption behavior were noted. However, when behaviors were examined at the level of physician-specific specialties, Burt and Sisk found that proceduralists such as orthopedic surgeons, cardiologists, and otolaryngologists had the highest EMR use rates, while pediatricians, psychiatrists, and dermatologists had the lowest use rates.

| Age       | Burt and Sisk found that physicians over 60 years of age were less likely to adopt, although Audet did not find a correlation with age. |

The characteristics of physicians and places of practice captured in this table are extremely valuable in showing the non-modifiable nature of altering these factors in encouraging adoption of EMR technology. While useful from a descriptive point of view, “they do not provide policy makers with significant ‘levers’ to influence adoption behavior (Audet, A.M., et al., 2004). That is why diffusion and adoption is most likely to have an unfavorable or neutral effect on encouraging EMR technology adoption.

**Innovative Financial Strategies (Impact Analysis: Favorable 10%, Neutral 60%, Unfavorable 30%)**

The Innovative Financial Strategies model and its impact on EMR technology adoption focuses on finding non-traditional sources and structures for private and public financing. With EMR technology, the traditional payback period and NPV opportunity realization found in seasoned or more-traditional technologies is absent. Payback more often materializes in non-financial value and, in the rare of occasion of financial materialization, over a timeframe of twenty years or longer. In the case of EMR technology, the potential for creating value and encouraging new adoption exists in creative financial structuring. However, the majority of such opportunities are tied to non-profit sources and, thus, the public will. This reliance on taxpayer funding and public approval neutralizes many of the positive opportunities for financial structuring, roadblocks that cannot be sidestepped through private sector avenues due to a lack of proven short-term financial value. Thus, in assessing the impact of Diffusion and Adoption forces on EMR technology adoption, there is a 10% likelihood of favorable impact, a 60% likelihood of neutral impact and a 30% likelihood of unfavorable impact.

Prior to locating financing sources for new EMR systems, a proof of financial value is essential. In looking at cost first, there are several estimates for the expense of implementing EMR systems across the country. Jan Walker and colleagues have estimated the expenses ($28 billion per year during a ten-year deployment, $16 billion per year thereafter) and net savings ($21.6–$77.8 billion per year, depending on the level of standardization) of a national EMR system (Walker, J., 2005). The Patient Safety Institute calculated that the initial expense related to EMR inoperability, not including systems, was $2.5 billion (Walker, J., 2005). Hillestad and colleagues went further, modeling adoption costs for both hospitals and physicians, finding that the cumulative cost, if ninety percent of hospitals and physicians adopted EMR technology, is $98 billion over fifteen years for hospitals and $17.2 billion over fifteen years for physicians (Hillestad, et al., 2005). In comparing this cost to estimated potential annual average efficiency and safety benefits from EMR systems, Hillestad and his colleagues estimated the potential annual cumulative efficiency and safety benefits from ambulatory EMR...
systems during the same period to be $371 billion for hospital systems and $142 billion for physician practice EMR systems, with both values potentially doubled if the health savings produced by chronic disease prevention and management were included (Hillestad, et al., 2005). These figures amount to, conservatively, a 200 to 300 percent return on capital investment. Hillestad also noted, however, that these returns on investment appear much lower and even below required hurdle rate returns of 18% per year for most EMR providers and private financiers if adoption does not reach a majority threshold, due to a loss of massive economies of scale and intersystem operability value (Hillestad, et al., 2005). Other scholars have also assessed the financial value of EMR implementation and calculated more modest or negative returns on capital investment over a similar fifteen year period (http://www.hfma.org/Communities/Forums/CFO/ROI-on-EMR--Elusive-%E2%80%93-or-Illusive-). However, such analyses have differed on a crucial point: the assumption of high-volume systematic buy-in that would occur at once (http://www.hfma.org/Communities/Forums/CFO/ROI-on-EMR--Elusive-%E2%80%93-or-Illusive-).

Without a large-scale push for EMR integration, likely backed by federal dollars due to already deep state shortfalls in basic healthcare funding, let alone healthcare IT funding (http://www.cleveland.com/), such near-total levels of EMR technology adoption cannot be achieved. The for-profit sector has repeatedly stated a lack of interest in commercializing EMR technology on any significant scale due to an inability to monetize over 90% of the savings from EMR systems related to community health improvement (http://www.healthbeatblog.com/). At the federal level, the government has committed to less than 1% of the total funding needed to create a national EMR framework (http://www.healthland.com/). Thus, alternative financing would have to come from the government through some sort of evidence-driven funding and reward system extended to hospitals and physicians. Many cling to hope that public opinion might shift in favor of providing the over $100B in funding needed to implement EMR technology, especially since it carries such a high, positive net present value. However, with a conservative majority in the legislature focused on shaving costs and the phrase “preventing a government takeover of healthcare,” (http://cincinnati.com/) found over 90 times on Speaker John Boehner’s website, non-traditional financing for EMR systems is unlikely to emerge.

Conclusion
The final weighed scenario analysis of the likelihood of EMR adoption in the next fifteen years, let alone by President Obama’s stated deadline or 2014, suggests an extremely gloomy horizon for the technology. There is a 90% overall chance that the impact of three framework forces will be neutral to unfavorable and over a 30% chance that all three forces will be unfavorable. The most likely scenario (21.6% probability) involves an unfavorable impact from emerging technologies and public policy forces and diffusion and adoption forces and only a neutral impact from innovative financial strategies forces. EMR technology faces a rocky road to adoption, inhibited most by a lack of public will to fund EMR system purchases, a lack of training and operational support for centers of care and an information asymmetry related to the value of EMR systems for the American health system. Several courses of action will likely be most effective in increasing the chances for EMR adoption.

First, further study and publication of research related to estimations of EMR value and savings will help to increasingly quantify and cement the known value of EMR technology adoption. Second, the dissemination of this information to more decision makers and citizens will raise a low level of awareness to technology value. Third, a greater public commitment to helping users of EMR technology integrate systems into their practices and centers of care rather than just installing them will help remove administrator and practitioner fears that they will not be able to adapt to new ways of doing business and administering care. Fourth, further investment in decreasing the costs of EMR systems and increasing their power and scale will increase value to purchasers. Fifth, standardization of equipment will increase cross-system synergies and value and provide to purchasers a clearer sense of what they need and what value they are
receiving. Sixth, and most importantly, an effort to increase public support for a mass purchase of EMR systems across the country, ideally at a level of 50% or higher standardization, will help maximize economic value and create a timed mandate for adoption. The outlook for EMR technology adoption is quite bleak at present, but a timely diffusion of healthcare IT in America is possible given greater public education and will.
References
http://apps.who.int/whosis/database/core/core_select_process.cfm?strISO3_select=ALL&strIndicator_select=nha&intYear_select=latest&fixed=country&language=english.
http://content.nejm.org/cgi/content/full/NEJMc0700592 (last access 5/12/10).
CMS touts success of three hospital projects, issues nearly $50 million in incentives.


http://www.hfma.org/Communities/Forums/CFO/ROI-on-EMR--Elusive-%E2%80%93or-Illusive-/

http://www.himss.org/content/files/jhim/20-1/focus_2.pdf.


Nursing Informatics Leadership Response to President’s Information Technology Advisory Committee (PITAC) (2004), ‘The New Health Care: How Information Technology is Transforming America's Health Care System’, available at: http://www.himss.org/content/files/PITAC_Response_FINAL.pdf.


Overhage, J.M., Perkins, S., Tierney, W.M., McDonald, C.J. (2001), ‘Controlled trial of


Weed, L. L. (1969), ‘Medical Records, Medical Education, and Patient Care: The Problem Oriented Record as a Basic Tool’, *Case Western Reserve University Press*.