

An Analysis of the Benefits of Technology Implementation in the Healthcare Industry

**Kevin Devine
Department of Accountancy
Xavier University, Cincinnati, Ohio**

**Priscilla O'Clock
Department of Accountancy
Xavier University, Cincinnati, Ohio**

An Analysis of the Benefits of Technology Implementation in the Healthcare Industry

Abstract

The healthcare industry has been slow to implement or upgrade healthcare information technology (HIT) due to perceived barriers, which include prohibitive cost and lack of benefits derived. Most of the research studies that have reported successful implementation of HIT have been limited to a few large hospitals or integrated groups. At a time when information technology (IT) is of increasing importance, IT decisions can be enhanced with a better understanding of the benefits provided. This paper summarizes case data from healthcare providers of diverse size and function and provides testimony to the quantitative and qualitative benefits they have received from investment in HIT.

Introduction

The health care sector has lagged the industrial sector when it comes to implementing efficient Information Technology (IT) infrastructures.¹ While the healthcare sector has come under increasing pressure to reduce overall costs, healthcare providers have been slow to implement, install, or upgrade to the latest IT systems.² Although the health care industry generally uses less IT than other industries, surveys indicate that providers are increasing their investments.^{3 4 5}

Healthcare is, and remains, one of the most pressing challenges facing our nation (and the world) in the 21st century. One source of the problems confronting the healthcare industry is lack of communication. A research study conducted over a ten year period reported that lack of communication is responsible for 66 percent of medical errors.⁶ Almost any discussion related

¹ Thouin, M. and J. Hoffman (2008) "The effect of information technology investment on firm-level performance in the health care industry", *Health Care Management Review*, January-March, 33(1), pp. 60-68.

² Byrne, C., L. Mercincavage, E. Pan, A. Vincent, D. Johnston, and B. Middleton (2010) "The Value From Investments in Health Information Technology at the U.S. Department of Veteran Affairs", *Health Affairs*, April, 29 (4), pp. 629-638.

³ Goldzweig, C., A. Towfigh, M. Maglione, and P. Shekelle (2009) "Costs and Benefits of Health Information Technology: New Trends from the Literature", *Value in Health Care*, January, 27, pp. 282-293.

⁴ Greenwalt, D. and S. Riney (2007) "Measuring IT benefits – Let us count the ways", *Healthcare Financial Management*, February, 61(2) pp. 86-92.

⁵ New York-Presbyterian Hospital/Weill Cornell Medical Center/Weill Cornell Medical College. "Electronic health records shown to improve the quality of patient care." *ScienceDaily*, 9 October 2012. Available at: <http://www.sciencedaily.com/releases/2012/10/121009111202.htm>

⁶ Griffin, F. (2013) "Sixty-two Percent of Healthcare CEOs Concerned about the Availability of IT Skills", *Health Tech Zone*, March 26, Available at: <http://www.healthtechzone.com/topics/healthcare/articles/2013/03/26/331845-sixty-two-percent-healthcare-ceos-concerned-the-availability.htm>

to improving healthcare, whether it implicates reducing costs or improving patient safety and satisfaction, usually has technology as a core component. Technology, in and of itself, will not solve the problem, but used appropriately will contribute to the transformation of healthcare, as it has transformed many other industries.

A potential explanation for the health care industry's lag in adopting advanced IT systems is due to a failure to understand and appreciate the benefits that can be derived. Recommendations by the Healthcare Information and Management Systems Society (HIMSS) to the Obama administration and the 111th Congress indicated:

Health Information Technology (HIT) is not the sole solution for broad-scale healthcare reform. Rather, HIT provides a mechanism to achieve the intent of healthcare reform: improving access to and the quality of healthcare, while lowering costs, empowering consumers in the healthcare decisions, and ensuring the privacy and security of personal health information.⁷

Frequently HIT has been touted as having the potential to facilitate vast improvements in patient care, in efficiency, quality, and safety of medical care.^{8 9 10 11} Porter and Lee suggest that in order to solve current problems in the healthcare industry there must be a shift in goals. Currently goals focus on improving access to healthcare, reducing costs, and increasing profits through increased volume of services. They propose the shift must be to a goal of patient value. To accomplish this objective a value agenda is proposed with emphasis on integrated practice units, measurement of outcomes and costs per patient, movement to bundled payments for care cycles, integrated delivery across facilities and expanding services geographically.¹² These five agenda items must be fully supported by an efficient, effective, and transparent health information technology system. Further, this system should integrate patient health records, treatment outcomes, and accurate cost information. Porter indicates that cost information utilizing time-driven activity based costing is most appropriate to enable health care providers to truly understand their costs.^{13 14}

⁷ Healthcare Information and Management Systems Society (2009, December) "A Call for Action Enabling Healthcare Reform Using Information Technology: Recommendations for the Obama Administration and the 111th Congress", Available at: <http://himss.files.cms-plus.com/HIMSSorg/2009CalltoAction/HIMSSCallToActionDec2008.pdf>

⁸ Goldzweig, et al, 2009

⁹ Lee, E. (2013) "5 Ways Technology is Transforming Health Care", Forbes, January 24, Available at: <http://www.forbes.com/sites/bmoharrisbank/2013/01/24/5-ways-technology-is-transforming-health-care/>

¹⁰ O'Malley, A. (2011) "Tapping the Unmet Potential of Health Information Technology", *The New England Journal of Medicine*, March 24, 364, pp. 1090-1091.

¹¹ Porter, M. E. and T. H. Lee (2013) "Providers must lead the way in making value the overarching goal", *Harvard Business Review*, vol. 91, no. 11 (October) pp. 51-70.

¹² Ibid

¹³ Ibid

¹⁴ See Kaplan, R. S. (2014) "Improving value with TDABC", *Healthcare Financial Management*, vol. 68, no. 6 (June) pp. 77-83,

Adoption and implementation of HIT has been hindered by several barriers. Primary concerns flow from financial and time perspectives, insufficient computer skills, concerns about confidentiality, apprehension about change, and lack of awareness of potential benefits.¹⁵ Typically cost is referred to as the biggest impediment to implementation but this financial concern can be attributed to a misalignment of costs and benefits.¹⁶

Financial incentives to spur investment in HIT were provided by the American Recovery and Reinvestment Act of 2009.¹⁷ Congress provided \$19.2 billion for health information technology, including \$17.2 billion in financial incentives to physicians and hospitals through Medicare and Medicaid to promote the use of electronic health records and other HIT and \$2 billion in grants and loans. The government has taken an unprecedented leadership role in this area spurred by the potential for significant improvements in quality of care and substantial savings in health care costs. This is a Herculean undertaking as it is estimated that in 2009 approximately 17% of U.S. Physicians and 8-10% of U.S. hospitals had a basic electronic health record system. In addition, far fewer have the comprehensive systems that would allow them to fully realize the benefits of the technology.¹⁸

Due to the Affordable Care Act (ACA) it is anticipated that there will continue to be a significant transformation in Medicaid, particularly in the eligibility and enrollment areas. The Health Information Technology for Economic and Clinical Health Act provides incentives for providers to adopt electronic health records (EHR). In order to avoid penalties, Medicare and Medicaid providers must document meaningful use of EHR by 2015.¹⁹ ²⁰ Medicaid in 2020 may look very different than it does today and the use of HIT will play a substantial role in that transformation.²¹ The benefit of EHR is likely maximized when combined with an information system that can also track specific treatment and patient outcome information.

¹⁵ Naylor, K., P. Kudlow, F. Li, and K. Yuen (2011) "Improving healthcare with information technology, *UWOMJ*, Spring, 80 (1), pp. 17 – 19.

¹⁶ U.S. Department of Health and Human Services (2011) "Barriers to HIT Implementation", Agency for Healthcare Research and Quality, July: Available at: <http://healthit.ahrq.gov/health-it-tools-and-resources/health-it-costs-and-benefits-database/barriers-hit-implementation>

¹⁷ American Recovery and Reinvestment Act (2009) H. R. 1, 111th Congress, Available at: www.govtrack.us/congress/bills/111/hr1

¹⁸ Steinbrook, R. (2009) "Health Care and the American Recovery and Reinvestment Act", *TheNew England Journal of Medicine*, March 12, 360(11), pp. 1057-1060.

¹⁹ American Recovery and Reinvestment Act (2009) H. R. 1, 111th Congress, Available at: www.govtrack.us/congress/bills/111/hr1 , Title XIII.

²⁰ Wang, T. and S. Biedermann (2013) "Solve the puzzle of electronic health record implementation budgeting", *The Health Care Manager*, January-March, 2013, vol. 32, No.1, pp. 43-48.

²¹ Brown, J. (2012) "Can Technology Cure Healthcare's Future?", November 2, Available at: <http://www.govtech.com/Can-Technology-Cure-Healthcares-Future.html>

One of the barriers to HIT implementation is a failure to recognize the benefits that can be derived. Much of previous health care research in this area has been limited to large hospital studies. The preponderance of favorable empirical evidence comes from a few large organizations.²² In order to provide evidence of HIT benefits to a broader spectrum of health care providers this paper analyzes case reports of health care partners of diverse size and function. Testimonials from healthcare providers that have implemented HIT or upgraded their systems are summarized. The results provide substantial support for the benefits associated with increased IT implementation and the benefits derived flow from both qualitative and quantitative factors, across providers and networks of varying diversity and size. The “good news” reported in the cases may serve to facilitate the removal of uncertainty surrounding the benefits. This uncertainty has been perceived as a significant barrier to expanded implementation of health care information technology.

Microsoft Dynamics partnered with hundreds of health care providers, both domestic and global, in implementing IT into their processes. This paper summarizes the solutions that were provided by IT, for a cross-section of these health care entities. The cases reported the size of the health care provider, the type of system that was installed, and the benefits that were obtained by the entity’s investment in technology.

The remainder of this paper is divided into four sections. The first section provides a brief summary of the systems implemented; the second section describes the sample firms and is followed by a section summarizing the results of benefits from IT implementation across software systems and healthcare provider size. The paper concludes with a summary of the analysis and the limitations of the study.

Summary of Software Systems

The Microsoft Dynamics software products that were implemented in these cases included Great Plains (GP), AX, NAV, and CRM. Of these systems, GP, AX, and NAV are accounting systems; GP is a fairly standard system while AX and NAV are customizable. A Customer Relationship Management (CRM) system, which is not an accounting information system, was also discussed in the cases that were analyzed. CRM produces more management accounting information beyond cost containment.

Great Plains is a financial accounting system for small to mid-sized businesses. The software has applications for financial management, human resource management, manufacturing planning, supply chain management, field service, business intelligence, collaboration, compliance, and IT management.

AX is an enterprise resource management (ERP) system that moves beyond managing the administrative dimensions. In addition to tracking general ledger, payroll, and HR, the software includes operational functionality for manufacturing, distribution, public sector, and service industries. AX has the ability to capture information about work flow and process together with transactional information to develop analytics of process effectiveness and process optimization.

²² Goldzweig, et al, 2009

NAV is a system that delivers comprehensive functionality that makes it easy to adapt and connect with independent software vendors. It is designed to simplify and streamline business processes across the entire organization in order to improve control, increase margins, and enable profitable growth.

CRM is a system that can easily be customized to manage and enhance the value of relationships that are vital to success. It is an effective tool for managing employees, suppliers, distributors, vendors, and other critical stakeholder relationships. The software has the capability to deploy customizations either in the entity's data center or in the cloud.

Sample Firms

Data from 50 cases were analyzed. Twenty-five of the health care providers were domestic; five are European, two from Israel, eight from Australia/New Zealand, three from India, one each from Canada, United Arab Emirates, Uganda, and Bangladesh, and three that serve international markets. The size of health care providers included in this case analysis was extremely diverse. Size of the entity is measured in terms of number of employees. Of the 50 cases analyzed, 12 had 500 or fewer employees; 18 with between 500 and 2,500; 7 with over 2,500 and less than 10,000; 13 with 10,000 or more. The number of employees ranged from 12 to 47,000. The 50 cases analyzed covered an eight year span from 2006 through 2013.

Summary of Benefits from Investment in IT

The majority of the health care providers installed either CRM or CRM with AX (35 entities). Three contracted for AX, CRM, and Great Plains; two used AX and Great Plains; two used AX and NAV; three used AX only; four used only NAV; and one used only Great Plains. The software system(s) implemented cross-referenced by size of the health care provider is presented in Table One. The largest providers utilized primarily CRM or a combination of AX and CRM. Smaller healthcare providers also use this combination but, to a lesser extent. The smaller providers have been more likely to implement the less robust GP and NAV.

TABLE ONE
Number of Health Care Providers that Utilized Software System(s) by Size of Entity

HC Provider Number of Employees	Software System Utilized							GP
	AX, CRM, & GP	AX & CRM	AX & GP	AX & NAV	AX	NAV	CRM	
Less than 500 (12)*	1	3	1	1	1	1	4	
500 to 2,500 (18)	1	3	1	1	1	3	7	1
Over 2,500 and less than 10,000 (7)		3					4	
10,000 or more (13)	1	7			1		4	
TOTALS	3	16	2	2	3	4	19	1

* Number of firms in each size category

The results of implementing the software, as reported by the health care providers, were extremely positive. In several of the cases, benefits reported by the health care provider extended beyond the original reason for investing in IT systems or upgrades. The outcomes associated with the IT implementation reported by the health care providers in this sample were of both a quantitative and qualitative nature.

Quantitative results included cost reduction, improved billing efficiency, improved payables, reduced cycle time, and overall time saving. Qualitative outcomes included improved medical decision support, better physician/patient decision making, increased security of data, flexibility for growth, increased efficiency of operational processes and enhanced competitive advantage. In addition, increased productivity was reported in terms of ease of operations, increased reliability, ease of data transfer, improved mapping of processes, improved workflow, and improved patient support and customer service.

TABLE TWO
 Number of Health Care Providers Reporting Quantitative and Qualitative Benefits
 By Type of System Implemented

Type of Software System(s) Utilized	Improved Medical Decision Support	Better Physician/ Patient Decision Making	Cost Reduction	Increased Security of Data	Improved Flexibility For Growth	Increased Productivity	Improved Efficiency	Competitive Advantage
AX, CRM, & GP (3)*			3	3	1	3	1	
AX & CRM (16)	6	1	13	7	5	10	6	5
AX & GP (2)					2	2	1	
AX & NAV (2)		1	2			2	2	
AX (3)	2	1	2		2	2	3	
NAV (4)	2	2	3	2	1	3	4	
CRM (19)	6	2	7	3	5	17	12	2
GP (1)						1	1	
TOTALS	16	7	30	15	16	40	30	7

* Number of firms reporting this software system or combination of systems

Table Two presents a summary of the benefits, both quantitative and qualitative, as reported by the health care provider. This table provides detail regarding the number of firms that reported benefits derived by type of system installed. Those health care providers that installed a combination of AX and CRM systems reported the widest range of benefits. This finding is not particularly surprising since the AX is an ERP system and CRM is beneficial for managing external supply chain stakeholders. Eighty percent of the healthcare providers reported increased productivity, 60% indicated they experienced improved efficiency and a reduction in costs, while over 30% reported improved medical decision support and flexibility for growth.

Table Three presents the benefits reported across all software platforms by the size of entity. Several of the benefits mentioned were collapsed into a “productivity” factor. With respect to improved productivity, the most frequently mentioned benefit was “time saving”. Of particular interest, the findings reported in Table Three indicated that even the smallest health care providers obtained a wide range of benefits from IT implementation. This finding should be encouraging to those small healthcare providers that are not convinced they would benefit from investment in IT.

TABLE THREE
 Number of Health Care Providers Reporting Quantitative and Qualitative Benefits from IT Systems by Size of Health Care Provider*

HC Provider Number of Employees	Improved Medical Decision Support	Better Physician/ Patient Decision Making	Cost Reduction	Increased Security of Data	Improved Flexibility For Growth	Increased Productivity	Improved Efficiency	Competitive Advantage
Less than 500 (12)**	3	3	8	2	7	10	8	1
500 to 2,500 (18)	6	4	12	8	5	15	12	2
Over 2,500 and less than 10,000 (7)	1		3		3	4	4	2
10,000 or more (13)	6		8	5	1	11	6	2
TOTALS	16	7	30	15	16	40	30	7

*Size in terms of number of employees

**Number of firms in this size category

Summary and Conclusions

Health care costs in the United States and world-wide continue to increase and pressure to control cost has also escalated. Wide spread implementation of HIT provides an opportunity for controlling healthcare costs, improving quality of healthcare, and enhancing patient satisfaction. However, due to uncertainty regarding the benefits of HIT investment, many healthcare providers have been reluctant to invest money and human capital.

Reported benefits of HIT implementation have been primarily limited to large healthcare providers or integrated networks. Relatively little data is available regarding the benefits of HIT in smaller provider networks. This study contributes information regarding HIT benefits for these small and medium size health care providers. Thirty of the 50 cases analyzed were in the small to medium size range.

A limitation of this study relates to the types of software implementation considered. These cases were provided by Microsoft Dynamics, but there are numerous other companies that provide software to the healthcare market.²³ It is expected that similar findings would result by

²³ Vendors that either provide customizable software or provide software specifically for the healthcare market include, for example, Allscripts, Cerner, Epic, McKesson, Meditech, Oracle, and SAP.

analyzing the benefits provided by products from other HIT suppliers. However, the information presented from this analysis of cases should contribute to a reduction in the uncertainty surrounding the extent of benefits associated with HIT implementation, thereby reducing a perceived barrier and encouraging investment in HIT systems in the future.

Effective HIT will integrate cost data with clinical information to enable providers to better understand treatment effectiveness and costs. This information will allow healthcare providers to assess their competitive advantage and strengths; valuable information in environments basing reimbursement on outcomes. Healthcare entities that resist adoption and implementation of integrated HIT systems will find themselves at a competitive disadvantage as new reimbursements schemes are implemented as a result of increased pressures applied by government, insurers, employers, and patients. Combining sophisticated electronic records and information exchanges with superior cost capturing systems presents healthcare organizations with opportunities to attain significant positive results. These results may include improved operating efficiency, improved cost control, enhanced customer satisfaction and perhaps, most importantly, an increase in the quality of health care delivered.