

THE COMPUTERWORLD HONORS PROGRAM

CASE STUDY

LOCATION:
*Pittsburgh, Pennsylvania,
United States*

YEAR:
2006

STATUS:
Laureate

CATEGORY:
Medicine

NOMINATING COMPANY:
IBM Corporation

ORGANIZATION:

UPMC

PROJECT NAME:

UPMC Enterprise Transformation Project

Summary

Information technology plays an ever-increasing role in the delivery of quality health care. As doctors, nurses, and other caregivers continue to rely more and more heavily on information technology, an efficient and robust technological infrastructure is vital to improving the quality of health care and ultimately saving lives. In 2004, the federal Department of Health and Human Services established the National Coordinator for Health Information Technology to provide leadership for the “nationwide implementation of an interoperable health information technology infrastructure to improve the quality and efficiency of health care and the ability of consumers to manage their care and safety.” In line with this national initiative, UPMC has embarked on an eight-year journey to showcase the possibilities of such a health care system for the future. Our information technology infrastructure will be overhauled to a state-of-the-art system through a revolutionary partnership with IBM. UPMC and IBM will leverage combined expertise to invest in strategic information technologies for the future of health care. “We have learned from painful experience that technology infrastructure can seriously disrupt the patient care process. We hear consistently from our doctors, nurses, and other clinicians that speed and stability of these systems are as essential as they are with other aspects of patient care.” - Dr. G. Daniel Martich, M.D., Vice President & Associate Chief Medical Officer, UPMC

Introductory Overview

Medical care is now delivered by teams of professionals, causing medical information to be increasingly disparate and decentralized - from patient records, to test results, to images and more. The delivery of quality care hinges on getting the right information to the right person at the right time. The consequences when the information delivery systems fail are chilling: according to the Institute of Medicine, as many as 44,000 to 98,000 patients die as a result of medical errors in U.S. hospitals each year, and most of those errors are due to systematic problems, not poor performance by individual providers. UPMC has been on the forefront of developing health care technology to manage medical information to ensure it is delivered quickly and accurately. The centerpiece of UPMC’s next-generation information technology for health care is eRecord, an electronic patient record that encompasses clinical applications, a patient portal,



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emergency room automation, and paperless reporting. Dr. David Brailer, National Coordinator for Health Information Technology in the federal Department of Health and Human Services, said that UPMC is “a current living example of the positive business case for [electronic health record] adoption.” UPMC has also implemented other systems for computerized management of medication orders and prescriptions and communications between referring physicians and inpatient care. UPMC has been consistently recognized nationally for our accomplishments in health information technology, such as ranking fifth overall in InformationWeek’s 2004 list of innovative IT organizations and first in the health care industry. These innovations in technology for managing, accessing, and using information by health systems, hospitals, physicians, and patients will continue to improve the quality and efficiency as health care moves forward. But advances in health care applications require advances and growth in the infrastructure and personnel to support them, while the investment in applications leaves scant budget to be invested in infrastructure. There is not enough money, space, or people to support the demand for systems. The end result is an infrastructure that is aging, extremely complex, and incapable of meeting the basic expectation of being there when and where the physician and the patient need it. No one wants to have an emergency when their hospital has its systems down for maintenance. Dr. Gene Wiener, Chief Medical Officer of Children’s Hospital of Pittsburgh, says, “The accessibility and accuracy of patient information and decision support provided to caregivers is vital to achieving the benefits of the EMR [Electronic Medical Record]. Clinicians must be able to trust that the EMR will be available anywhere, anytime as reliably as turning on the lights or water.” The infrastructure required to meet that kind of demand is only achievable through sophisticated systems architecture built with the most advanced technology. Ensuring a high-availability technology infrastructure translates directly into patient safety. UPMC had to find a way to do more with less. It’s no longer enough simply to make incremental improvements to maintain the status quo. UPMC is addressing these challenges head-on not only by completely reengineering its technology infrastructure needed to manage this information effectively, but also by innovatively funding strategic initiatives that will spawn health care products and services for the future. In a one-of-a-kind partnership with IBM, UPMC has embarked on an eight-year journey to change the way information technology is applied to health care, the Enterprise Transformation Project. The Enterprise Transformation Project addresses two major, innovative components. The first is a complete overhaul of the technology infrastructure, and the second is a major investment in strategic research that will result in the development of medical technologies and information systems to advance health care. The process began in April 2005, when UPMC and IBM partnered to form a joint development agreement. This \$352-million project is radically transforming UPMC and will provide the health care industry with the technology solutions necessary for addressing the increasingly critical issues of health care quality and cost. UPMC’s technology infrastructure will be completely re-engineered to an on-demand environment that is geared to innovation, yet adaptable and flexible to meet ongoing business needs and growth. UPMC’s technology transformation will re-envision the technical infrastructure as an environment based on the principles of on-demand computing. This technology infrastructure allows UPMC to build the systems to share patient information throughout the enterprise. The systems developed to address these issues will be widely applicable to other health care organizations and will foster the national health care agenda. IBM and UPMC will invest in strategic initiatives involving the development of medical technologies and information systems to address specific patient care and public safety initiatives in areas such as electronic patient records, biosecurity, and information-based medicine. UPMC and IBM will work in partnership to



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commercialize these solutions to offer leading-edge technology to health care systems across the field. Initially, the two organizations will jointly invest \$50 million for these initiatives, with a total possible joint investment of \$200 million throughout the life of the contract. The products resulting from these strategic initiatives are expected to have great commercialization value because of their wide applicability to other health care systems. This partnership with IBM will create a strategic alliance to capitalize on UPMC's strengths in health care technology to achieve numerous objectives, such as (1) investing in, developing, utilizing, and marketing health care solutions that improve patient care and research at UPMC and are valuable to other health care providers; (2) showcasing the future of health care information systems; (3) controlling costs and using resources more efficiently; and (4) positioning UPMC as a proactive, flexible, adaptable enterprise capable of responding quickly to changing and expanding needs for information technology and new innovations.

Benefits

The transformation of technological infrastructure at UPMC will enable seamless and secure sharing of patient data across applications and multiple locations, providing caregivers with immediate access to the information they need to deliver the best possible patient care. The strategic initiatives research will develop new tools and systems to further improve care and reduce costs. By planning for the long term and committing resources over the eight years of the project, UPMC will be able to fund the transformation of the infrastructure using the existing budget, without any new allocations. And because of the streamlining of processes and technologies, infrastructure spending will be reduced by 15 to 20 percent when the project is completed. With IBM, the project has also allowed UPMC to set aside \$50-million in development funds for strategic initiatives.

Throughout the infrastructure transformation, UPMC will be working with IBM to harden the tools and processes to develop a marketable package. All large organizations are challenged with simplifying their computing environments and identifying repeatable best practices for managing and migrating applications. During the transformation, UPMC will refine, validate, and package tools and processes as solutions that will be sold to other organizations and generate revenue for UPMC. Through this project, UPMC also has the opportunity to gain insight into better tools and solutions that facilitate interoperability among systems and software applications. Interoperability provides health care organizations access to appropriate, secure, integrated clinical information to enable improvements in the quality of care, development of personalized medicine, and decreased cost. This will establish UPMC as a center of evidence for interoperability, and UPMC will evaluate the opportunity to provide a hosted interoperability application service and create a development factory to build new components.

The Importance of Technology

The technology transformation adopts the paradigm of on-demand computing, which re-envision technology infrastructure as a utility like water or electricity, available on demand, whenever necessary. Technologies such as virtualization and autonomic computing will facilitate the consolidation and ease of management for UPMC's technology infrastructure. They ensure that the technology infrastructure is robust, minimizing downtime and enhancing disaster recovery and high availability capabilities. This technology transformation will re-engineer all aspects



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of UPMC's technology infrastructure, including organization, processes, software, and hardware. Servers and operating systems will be consolidated, resulting in a reduction of the size of the main data center by two-thirds. The current 786 servers and 40 storage configurations at the main data center and three other locations will be consolidated to just 305 servers and two storage configurations, and the number of operating systems will be reduced from nine to four. Hardware, including servers, storage, desktops, laptops, and printers, will be completely refreshed on a rolling three-year basis. New management practices based on worldwide process standards ITSM and ITIL (IT Service Management and IT Infrastructure Library) will increase efficiency and facilitate compliance with Sarbanes-Oxley, HIPAA, and other regulatory requirements.

Originality

The most visionary aspect of the Enterprise Transformation Project is UPMC's completely new model for the relationship between customers and technology vendors. As Bob Evans wrote in an InformationWeek editorial about the project, the partnership "gives UPMC an unprecedented opportunity to create a new health care model for the twenty-first century." The project shares risks and rewards between vendor and customer, encompassing future products that will be developed jointly and sold by IBM, with profits to be shared. This project sets a new standard for how a vendor-customer relationship is defined. It clearly prioritizes innovation and challenges all industries to stretch their vision and commitment beyond the bounds of what is conventionally safe or comfortable. "Innovation today is about applying breakthrough technology and thinking to solve the most complex problems facing business and society, and clearly, in health care, there are a range of issues where innovation can play a major, transformational role. UPMC has established itself as an industry leader in the application of technology to health care problems, in such areas as telemedicine, electronic health records and patient-safety related bar-coding, and we look forward to partnering with them to create a unique laboratory for the development of technology solutions that can transform the health care industry." - Nick Donofrio, IBM Executive Vice President, Innovation and Technology.

There are many innovative aspects of the Enterprise Transformation Project including a reengineered state-of-the-art infrastructure, standardization of hardware and operating systems, continual technology refresh, operational efficiency and savings, and committed funds to form a joint investment pool for the development of new solutions - all without increasing funding. The infrastructure required to meet the demands of today's health care rivals anything that is necessary to support Wall Street or the most modern manufacturing plant. UPMC is developing architectures and processes that will enable health organizations to afford this kind of infrastructure.

Success

Restructuring UPMC's infrastructure is enabling many technology solutions that result in better and more efficient patient care, including the eRecord, computerized order entry and prescriptions, physician and patient portals, and interoperability among all these applications. Dr. Martich says, "UPMC is creating the health system of the future - today. It is building a seamless operational and informational network in which each patient gets the right care, in the right way, at the right time, every time. Across the organization, evidence-based practices, a



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commitment to learning and innovation, and operational excellence set the standard for quality and performance. Technical infrastructure, despite being behind the scenes, is a critical component of delivering this vision. "The transformation to new infrastructure has enabled far greater system stability and performance across our eRecord services. We are counting on the developments of the enterprise transformation to provide new levels of high performance, cost-efficient systems." Through projects like the Enterprise Transformation Project, UPMC will truly become a world-class IT organization. This project is supplying the hardware, software, and services necessary to support cutting-edge innovations in health care. UPMC's innovations will garner a competitive advantage among health care providers and will attract patients, physicians, and hospitals to UPMC. The Enterprise Transformation Project will position UPMC as a proactive and adaptable enterprise capable of responding quickly to changing and expanding needs for IT and new innovations. Adopting the on-demand computing paradigm allows UPMC to optimize its technology infrastructure to reduce operating expenses, streamline and simplify expansion and re-provisioning, and minimize downtime. Additionally, it will also be possible to provide medical applications services to outside organizations, leading to possible revenue opportunities. In December 2005, UPMC officially activated the transformation environment. The hub, used by UPMC's 40,000 employees, has been converted to this new architecture, and over 2,500 new desktops have been installed. Six applications have been converted to the new technology (hardware, software, and tools). UPMC has already begun to realize benefits. During a critical period of maximum system loads, the processing power was dynamically adjusted to support these peaks without any degradation in services. In the past, the system would have to be sized in advance to meet these peaks, which only occur a few times annually. Now, overloads can be detected and processors can be added within minutes. System administrators are now provisioning new UNIX environments six times faster than they had prior to the transformation. In one case, 20 UNIX environments were added in three days, when in the past it would have taken 14 to 29 days. Windows servers can be provisioned in 17 minutes, when in the past it would have taken 45 minutes to four hours. In just the past year, 100 UNIX environments have been added, which would have required a dedicated full time employee to support. By consolidating systems and using virtualization technologies, over \$1,200,000 of additional licensing and maintenance fees have been avoided. And these results are being realized even though the transformation is only 25% complete. In addition, since the beginning of the Enterprise Transformation Project, UPMC staff members have received approximately 900 days of training via the classroom, digital video library (DVL), and eLearning. Streamlining practices will enable additional capabilities with the same level of staffing. This project will also standardize policies and procedures for IT management to facilitate regulatory compliance. As a result of the Enterprise Transformation Project, UPMC will be able to provide a broader range of computing services, capacity that adjusts to demand, disaster recovery systems, high availability configurations, and test and training systems with less hardware and technical support than is achievable with traditional technology and procedures. Health care requires fast, highly available systems at a price point that is currently unachievable. UPMC with IBM is developing the blueprint for the architecture and processes that will make it possible for organizations across the industry. Beyond the transformation of the technology infrastructure, UPMC will advance technology applications to benefit patient care and improve the utilization of research information. This will be accomplished through the joint development fund and with other vendors and partners. A current initiative is the building of a Strategic Biodefense Emergency Operations and Communications System (SBS). On January 26, 2006, UPMC received \$8.5



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million through the House Appropriations Subcommittee on Defense to make Pittsburgh a model for the rest of the nation in the event of large-scale bioterrorist attacks, pandemics, or other major emergencies that could result in serious public health consequences. The SBS will help synthesize and organize data from disparate sources to efficiently connect and provide up-to-the-minute information to local health care providers, the National Guard, and local governments to determine the best possible distribution plan for scarce medicine and supplies and the most rational use of hospital beds and staff. The SBS will also include a vital public information component to share critical information with the citizens of the region and innovative training programs for first responders. In another strategic project, UPMC is creating a biosimulation platform for improved detection of select agent outbreaks and the reduction of adverse drug reactions. This project would combine the computational experience of IBM Life Sciences with UPMC's domain expertise in computational biology to research mathematical models for illness and the software and the infrastructure necessary to support such modeling systems. The UPMC and IBM partnership is providing many more opportunities than could have been achieved individually. This partnership has been and will continue to be highly visible in showcasing new technology solutions. The health care and IT industries are looking to UPMC to see the future of health care. Strategic initiatives are underway that will improve patient care and research at UPMC and will be valuable to other health care providers. Numerous parties within the health care industry, as well as in others such as pharmaceuticals and technology, have contacted UPMC regarding the project and are interested in how UPMC's experience can assist them in pursuit of their information technology goals.

Jocelyn Benes-Stickle, VP Quality and Performance Improvement at Children's Hospital of Pittsburgh, says, "Our partners in the Information Services Technology group understand the clinician's needs and the critical role they play in patient care to reliably deliver these services twenty four hours a day, seven days a week. We don't think about technology and infrastructure. We just expect it to be there."

Difficulty

UPMC biggest challenge in this project is managing the size and complexity of the technology transformation. To minimize risk, UPMC has developed a modular approach. As each component is executed, it is evaluated to develop best practices. These best practices and lessons learned are carried forward to allow the approach to evolve and strengthen as the conversion is executed. Managing the personnel who supervise UPMC's technology has been the next biggest challenge. To ensure success, UPMC completely reorganized the IT staff, changing the structure from functional groups to service-oriented teams. The 341 members of the staff will be retrained on new tools and technologies and in the best practices offered through ITSM and ITIL standards. UPMC personnel will collaborate with IBM to build the new infrastructure, and IBM will supply committed temporary staff to backfill UPMC positions and maintain day-to-day tasks throughout the transformation. To mitigate risk in consolidating the multitude of hardware systems and configurations, the implementation has been initially developed in a "laboratory" setting and deployed in a small-scale pilot environment. In this environment, testing and refining ensure a smooth transition and minimal disruption as deployment occurs throughout UPMC. UPMC learns and adapts as each portion of the project is transformed. This slow and deliberate progression will serve as validation for a repeatable process throughout the rest of the execution of the project, where UPMC will carefully migrate the applications to the new



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environment. Benchmarking tools will be employed to ensure that all systems are functioning equally well or better after migration.

UPMC constantly integrates the importance of IT and innovation throughout the organization, including aligning IT with corporate and system business objectives. For a number of years, UPMC has fostered innovation and creative thinking throughout the organization by leveraging our clinical expertise and integrated delivery and financing system to harness alternative income streams to reinvest in the Health System's core mission. The importance of IT and innovation is recognized throughout UPMC. To reinforce the support of IT innovation and creativity, UPMC established two major advisory groups within the organization. Over six years ago, ahead of other industries and organizations, UPMC established an Information Technology Committee of our Board of Directors. This committee participated in briefings and updates throughout the development of the Enterprise Transformation Project. In addition, in January 2005, UPMC created the Strategic Business Initiative (SBI) Division. SBI is a division of UPMC that identifies and develops commercial opportunities that are focused primarily on improving the quality and efficiency of health care and bio-security. The IT Committee and SBI Division continue to receive updates and provide feedback to project milestones and benefits.