BEST PRACTICES

Best Practices: Leveraging Infrastructure Investments to Deliver Clinical Results at Mercy

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IDC HEALTH INSIGHTS OPINION

This IDC Health Insights study focuses on the best practices seen in a case study on the second phase of a multiphase strategic plan to create core competency around IT infrastructure and services at Mercy Health System, the nation's seventh largest Catholic health system. Mercy's subsidiary, Mercy Technology Services (MTS), was established to build the next generation of IT to support Mercy's own operations and diversify the health system by adding a technology service offering that would allow the ministry to focus its efforts on providing compassionate, exceptional care to patients in its hospitals, outpatient locations, and other settings such as home-based care. Mercy's path toward making technology a core competency began in 2006 when the health system made the forward-thinking decision to move its clinical operations to a single, patient-centric electronic health record (EHR). To support the EHR and enhance IT service capabilities, in 2009, Mercy invested in a new datacenter with state-of-the-art virtualized infrastructure. Mercy's early datacenter investment provides the foundation today that allows the health system to compete effectively under healthcare reform; support its Epic EHR, population health, and patient engagement initiatives; enhance its own IT service levels; and begin to commercialize its datacenter and bring these offerings to customers. Mercy believes that the combination of IT infrastructure and EHR investments will allow the health system to remain competitive and provide better care and service for its patients. IDC Health Insights believes the following:

- High availability, high performance, secure infrastructure investments, or the availability of this infrastructure via service providers is a critical success factor for health systems. In today's environment, providers need agile IT environments that can support the EHR and go beyond it to deliver the next generation of business needs.

- Analytics and mobility surrounding the EHR will be essential for health systems to deliver collaborative care and profit under new business models. Analytics will be required to drive improvements to clinical, quality, and operating metrics and enable population health as mobility will be needed to hit targets for productivity and efficiency while driving patient engagement in the community.

- Reliable service partners can be a key part of developing the infrastructure, service, and application environment needed to access the EHR, analytics, and mobility tools required by health systems to compete in collaborative care delivery.

IN THIS STUDY

The goal of this study is to provide an objective representation of the benefits that accrue from a best practices-based investment in hardened datacenter infrastructure by health systems as a facilitator of the agile IT requirements of the future. While MTS has chosen specific suppliers and solutions providers that are mentioned in this document, this study is not meant to advocate any specific supplier but instead to discuss the process of establishing a foundation with best-of-breed agile infrastructure to support the disruption caused by healthcare-reform-related change and business model innovation in the U.S. healthcare environment. This analysis is a continuation of a previous discussion of Mercy's infrastructure decision making in *Best Practices: High-Level Infrastructure Achievements Drive EHR Success at Mercy Health System* (IDC Health Insights #HI244935, December 2013).

This analysis is meant to discuss the follow-on benefits accrued to Mercy's analytics environment, operations, and service offering resulting from the period of intense infrastructure investment in the 2009-2013 time frame discussed in the previous case study. This study focuses on developments in the 2013-2015 time frame while presenting a synopsis of the previous case study to provide an understanding of the infrastructure environment in place at Mercy, a source of today's benefits in this long-term IT strategy. During the course of the research for this case study, IDC Health Insights conducted interviews with multiple individuals at Mercy and Mercy Technology Services, held product briefings with its application and infrastructure suppliers, and conducted secondary research on customers and suppliers associated with the projects and their competitors.

SITUATION OVERVIEW

Mercy (**www.mercy.net**) is a nonprofit Catholic healthcare system that includes 34 acute care hospitals in four states (Arkansas, Kansas, Missouri, and Oklahoma) as well as more than 300 outpatient locations. Mercy's focus is on providing the best care possible through the health system's hospitals, physician clinics, outpatient facilities, outreach ministries, and other health and human services. To facilitate this clinical mission, Mercy began the transformation of its IT infrastructure to add EHR and support new consolidated operating goals across the health system. Leadership at MTS was instrumental in planning and executing the health system's IT strategy and providing centralized IT operations for Mercy's 34 hospitals. The goal of MTS was to implement the IT strategy in the most efficient way possible, supporting existing systems and the EHR while preparing for future commercialization goals for its enterprise.

Business Needs

The Formative Years: Building Mercy Technology Services, 2006-2013

In 2004, Mercy began the process of centralizing IT operations and consolidating IT infrastructure. In 2006, Mercy recognized the importance of EHR well ahead of federal incentive programs and made the decision to move its clinical records onto a common EHR across its health system. Mercy partnered with Epic Systems in 2006 to implement a single, patient-centric EHR. The anticipated infrastructure requirements for EHR led Mercy to create a strategic plan for infrastructure improvements to proceed in parallel with the EHR project. The decision to proceed with infrastructure investments, including a new datacenter, was made in 2009.

Prior to the new construction, Mercy's existing datacenter struggled with the demand of centralized IT for its revenue cycle and administrative systems as well as reliability and power and cooling systems in the existing datacenter. The new $60 million datacenter, which was opened by MTS in 2011, provides a reliable network to support the mission-critical use of EHR in clinical care delivery and the capacity to accommodate planned growth and also helps Mercy execute its strategy to leverage data as a strategic asset. Mercy's disaster recovery infrastructure investment was proven when an F5 tornado struck a Mercy hospital in Joplin, Missouri, in May 2011, shortly after the opening of the new datacenter. The added resilience and scalability provided the foundation for its own operations as well as a highly available strategic service offering for other hospitals and health systems in the region and across the world.

The datacenter design was driven by the following goals:

- **Standardization**. Standardization was essential to rationalize the health system's applications, extending to physician offices, inpatients, revenue cycle, HR, and ERP systems.

- **Availability and uptime**. EHR availability was a key goal with a target of 99.9% availability for the Epic EHR. This goal extended to the original datacenter, the transition where downtime needed to be minimized, and the new datacenter.

- **Lean.** Lean operations were a priority. Applications and servers would be virtualized wherever possible, with or without supplier support. SAN would be replaced with a converged storage environment.

With over 1,100 applications to support, decisions to rely heavily on software-defined datacenter technology were controversial in 2006 but are now well proven in healthcare. The team chose converged infrastructure offerings with NetApp, Cisco, and VMware as key suppliers for its server infrastructure – choices that have stood the test of time. Today, the then-risky decisions that the team made in 2006 such as virtualizing Epic are now recommended strategies supported by EHR vendors and many other health systems in the market find themselves reinvesting in infrastructure and licenses to bring these strategies into their environments.

The Next Phase: Optimizing Mercy Technology Services, 2013-2015

Since the move to the new datacenter, Mercy has reached its goals for getting its own operations running on Epic and building out the analytics and mobility ecosystem surrounding the EHR. Follow-up on areas of optimization and fine-tuning within the environment included:

- **Security.** With its hardened private cloud infrastructure in place, MTS's security investments have focused on securing the edge of the environment while recognizing the careful balance that must exist between flexibility and security. As mobile use has expanded, so has mobile device management and security investment. Two-factor authentication has been added for remote access on devices as well as segmentation for PCI compliance. MTS' software-defined datacenter architecture has enabled partitioning that allows it to keep sensitive data protected.

- **Storage.** Like most health systems, storage growth at Mercy and its client organizations is explosive with Mercy VP Scott Richert citing a growth rate in year-over-year storage needs of 25-30% per year. Storage growth is driven by Mercy's use of EHR and imaging. Its agile infrastructure leaves MTS well equipped to handle the growth, adding new clusters to its scalable NetApp environment periodically while shifting its investments toward solid state and hybrid storage to deliver better performance.

- **Analytics.** MTS invested early in big data analytics, bringing in Hadoop and SAP's HANA offerings to build an enterprise data platform and replacing a relational data warehouse environment that was failing to deliver adequate performance as data volumes increased after the adoption of EHR. Mercy has placed a strong emphasis on real-time data in its analytics and on using clinical and supply data from across its network to examine the true cost of care. A novel architecture uses Hadoop to access data from Epic's Cache data store in real time and makes it available to 22 dashboards used by clinical and operational teams in different departments. Finding the near-real-time information in Epic's Clarity product inadequate for its operational needs, Mercy's data science team has custom coded real-time versions of the reports by using the Hadoop implementation. Efforts have paid off as MTS Analytics VP Curtis Dudley indicates that $13 million in savings was achieved in 2014, mainly concentrated in the perioperative area.

- **Workflow automation.** Mercy also leverages HANA for workflow automation, closely examining workflows in key operational areas such as its emergency departments, ordering, and discharges in the acute care setting. Real-time data has been critical in workflow automation efforts, allowing teams to reduce wait times in the emergency department, potentially increasing HCAHPS scores, and increasing discharges before noon to reduce length of stay and associated expenses.

- **Virtual care.** Virtual care has been an important investment for Mercy, both as support for its own hospitals and as a service offering. MTS runs real-time ICU monitoring as well as in-home care management support in its datacenter for its own patients and customers' patients.

- **Real-time location services (RTLS).** Mercy is piloting RTLS in several hospital locations supported by its datacenter environment. It hopes to add additional value to the clinical environment by adding tracking of equipment, staff, and patients to information available in the EHR and to further support efficiency and cost reduction efforts.

- **Patient engagement.** Mercy also has retail-class patient engagement services on the horizon. To date, most health systems' patient engagement efforts have lacked multichannel capabilities, but MTS plans to build call center, mobile, Web, and social media environments into its future patient engagement offering.

With the datacenter well established, MTS' attention has turned to adding to its commercial services portfolio and beginning to market and build a client base for its services. Commercialization opportunities have evolved organically, and the datacenter now hosts telemedicine and telestroke services as well as ICU monitoring for other organizations. Mercy's IT organization built up significant expertise in supporting Epic and has leveraged its staff to perform implementation services for other health systems, leveraging its own Epic instance as well as its Epic expertise in building new instances and hosting for other health systems. Mercy's technology innovations have continued to explore inefficiencies in the use of clustered servers that utilize virtualization to support high availability and data replication for business continuity and disaster recovery services. MTS has extended this expertise to other organizations that require assistance with the complex Epic inpatient applications and database.

Management Challenges

As MTS has matured, Mercy Health System has also grown, adding several hospitals and many ambulatory sites to its network, mainly by acquisition since the 2013 case study. These have led to integrations and additional rollouts of technology within the network. As of January 2016, MTS currently manages 1,400 different applications — 1,075 of which are business and clinical applications — including 20-30 Epic applications. MTS uses a Tibco interface engine to handle over 500 interfaces.

Mercy's alliance with Epic continues, and the health system relies on the solution, adding new Mercy-owned hospitals in the community connect model as new service areas. MTS has been involved in several Epic projects as a commercial service provider, standing up instances of Epic on behalf of customers and using its own expertise but also innovating on the platform. Mercy has updated its own Epic functionality and also added functionality that was developed on behalf of its commercial clients to its own environment.

As MTS' commercialization plans have been executed, challenges around prioritization have been created. However, the organization has implemented strong process controls and capacity planning to ensure adequate staffing, and its agile IT infrastructure has ensured that its track record of 99.98% uptime remains intact for its own and client instances of technology running in its datacenter.

THE BEST PRACTICES

To meet the challenges of the rapidly changing healthcare industry, it is clear that healthcare organizations must transform their infrastructure so they will have the agility to meet future requirements and remain competitive. Mercy's approach – a $60 million up-front investment in a new datacenter – has allowed it to meet the challenges of collaborative care with a future-ready infrastructure. MTS and its environment has not only enabled success with EHR but has also enabled the organization to build IT as a core competency, in addition to care delivery. This approach is not the right one for every health system, but those not prepared to embrace IT as a core competency should be identifying strategies for working with service providers that do offer that expertise. It is clear that the adoption of EHR has opened the door, creating the imperative for care providers to use more information in care delivery.

Mercy's strategy made it important for the health system to identify and measure its return on investment (ROI), both within its own operations and via its commercialization efforts. Mercy's own ROI has come both from efficiencies within IT and from operating efficiencies derived from the use of technology. IT efficiencies have included savings from virtualization of storage and servers, power, cooling, and staffing as examined when compared with the pre-2011 datacenter in the 2013 case study published by IDC. Mercy's most recent ROI has come from its clinical operations in which expanded analytics offerings, population health management, and operational efficiencies have allowed it to manage the business environment of accountable care. Clinical quality and safety have improved but so have operating costs, and Mercy has participated successfully in ACO pilots.

Best practices observed in Mercy's technology transformation include:

- **Strong planning.** Mercy had a clear vision and strategic plan at the outset, and it executed its plan while carefully considering hurdles and opportunities along the way. The plan did involve some risk such as the move to virtualize all applications and the decision to build excess datacenter capacity for commercialization. However, the risks were well understood and managed, and it is clear that the benefits of the strategy outweighed the risk.
- **Governance.** Mercy's IT organization worked with the support of the CEO. This level of senior management involvement helped smooth the way and get buy-in from physicians and staff.
- **Supplier partnerships.** MTS decided early on that it wanted to virtualize all its applications and built strong partnerships with suppliers VMware, NetApp, and Cisco to enable this. When this project began in 2006, there was little support from vertical healthcare vendors for running in a virtualized environment, and while support has grown, it still presents challenges. Strong partnerships with the horizontal IT suppliers it used helped Mercy overcome these hurdles.

- **Embraced analytics.** Mercy's early investment into big data technology and unabated pursuit of real-time analytics have led it to become a leader in bringing actionable data to light within the organization. Mercy's recent investments in analytics technology and data science staff will likely continue to yield benefits and facilitate Mercy's expansion and competitiveness in its accountable delivery markets as this area of its business grows.

- **Standardization of applications.** Mercy chose to standardize its applications and IT environment across its health system. While this was no doubt difficult for some individual departments along the way, it was critical to achieving the efficiencies and end results that were seen. Mercy leaders facilitating standardization are also a management best practice seen in this case study.

- **IT as a core competency.** Healthcare has long been a paper-based industry, but the advent of accountable care has made this a thing of the past. To succeed under the new business models of healthcare reform, optimizing EHR, analytics, and care delivery will be critical. A responsive, agile IT environment will be a prerequisite for success under healthcare reform.

FUTURE OUTLOOK

Mercy has seen significant improvements in IT efficiency with these completed projects and is now positioned to offer its services to other hospitals and health systems. Projects on the horizon include executing its pilot projects on RTLS and patient engagement and continuing to expand and grow its analytics programs while building its client relationships. Mercy is also working to improve productivity of its providers through its workflow automation efforts and to incorporate remote and mobile workflows in order to further optimize the environment.

ESSENTIAL GUIDANCE

Actions to Consider

Provider organizations that are considering pursuing an IT road map that includes commercialization should consider the following:

- **Conduct an initial assessment of the opportunity.** Perform an initial assessment of the current applications, architecture, and resources to determine the extent of the opportunity. Consider potential goals for the project, whether to commercialize specific capabilities, diversify revenue streams, or better utilize resources.

- **Consider key partners.** For many health systems, it may not make sense to build the environment in its own datacenter, and these organizations should consider leveraging cloud service providers. Organizations should explore the offerings of IT and infrastructure-as-a-service providers or other hospitals in the community with commercial datacenter capabilities as an alternative to building their own virtualized environment. Select the applications and services to be commercialized, and develop partnerships with their suppliers if they are not homegrown.

- **Plan your strategy and its products.** Plan the strategy carefully, identify the capabilities that are considered strengths, offer unique competitive advantage to the organization, and determine a path to productize these offerings. A strong track record, demonstrable ROI, and quality and safety improvements represent characteristics that will make a commercialization offering unique and will prove to potential customers that your expertise and environment is valuable.

- **Determine the scope of the project.** Will the new environment support primarily clinical applications or administrative applications? It may make sense to start with operations that are more easily virtualized such as those within IT, better lend themselves to service delivery, and move on to mission-critical clinical and administrative areas later.

- **Present the value proposition to clinical and financial leadership**. Be clear about the expected results from the project, whether your organization is focused on ROI, care quality improvement, IT service levels and response times, productivity, application performance enhancement, or other goals.

- **Have a plan for managing the processes and gaining buy-in within the organization.** Move forward when there is buy-in from senior management in IT and in the organization as a whole. Project leadership is also an important factor in success. Project leadership should include stakeholders from both IT and the departments affected to ensure collaboration and end results that meet needs.

- **Identify and train a service delivery team.** Work with end users to determine functionality and performance needs, understand workflows, and communicate the scope and milestones of the project as well as how their participation will be needed.

LEARN MORE

Related Research

- *IDC PeerScape: Practices for Standalone Enterprise Clinical and Financial Analytics Platforms for U.S. Healthcare Providers* (IDC #259370, October 2015)
- *IDC MaturityScape: Cloud* (IDC #259534, October 2015)
- *Perspective: The DoD Cerner-Leidos Decision – A Turning Point for EHR?* (IDC Health Insights #HI258652, August 2015)
- *IDC MarketScape: U.S. Healthcare Provider Clinical and Financial Analytics Standalone Platform 2015 Vendor Assessment* (IDC Health Insights #HI255139, April 2015)
- *Business Strategy: Crossing the Innovation Gap from 2nd Platform to 3rd Platform Acute Care Systems – The athenahealth and BIDMC Collaboration* (IDC Health Insights #HI254764, March 2015)
- *Perspective: Taking Commercialization One Step Further – Health Catalyst and Allina Announce Risk-Based Analytics Partnership* (IDC Health Insights #HI253623, January 2015)
- *Business Strategy: The Current and Future State of Decision Support in U.S. Hospitals* (IDC Health Insights #HI251698, October 2014)
- *Business Strategy: Getting to Goal – The Role of Cost Accounting in U.S. Health Systems' Transformation* (IDC Health Insights #HI251771, October 2014)

Synopsis

This IDC Health Insights report focuses on best practices seen in a case study on the clinical analytics programs operated by Mercy Health System and its subsidiary Mercy Technology Services, which represents the second phase in a multiphase strategic plan to create a core competency around IT infrastructure and services at Mercy Health System.

According to IDC Health Insights Research Director Judy Hanover, "As U.S. healthcare organizations continue to move toward new business models, including at-risk contracting and value-based, accountable, and integrated care, IT enablement is clearly a key to success." This case study of Mercy

Technology Services' clinical analytics programs provides an example of the benefits that accrue from best practices-based investment in hardened datacenter infrastructure by a health system and describes how a long-term strategic approach helps to facilitate the IT requirements of new business models in healthcare.

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