Hospital Leadership in Support of Digital Transformation

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Abstract

Evolving customer expectations and the rapid introduction of new information technologies are influencing business operations, and businesses need to transform themselves with new operating models to remain competitive. The traditional top-down administrative leadership approach is not sufficiently flexible to support the innovation needed to sustain customer engagement and retention. There is a need for both an enabling leadership that supports the exploration of innovative ideas quickly for viability and an adaptive leadership to transition the ideas that show promise into the current business model or a variation of this model to sustain growth. We define digital leadership as a strategic process that collectively uses these three leadership styles to create an ecosystem that advances a culture of innovation within organizations. This leadership process uses four foundational platforms to support business transformations: (1) An innovation platform to empower teams to explore ideas that create value using digital transformations; (2) An agile system and business platform to quickly design and deliver IT implementations; (3) A learning platform to support reflective discourse that leads to organizational capacity building; and (4) An adoption platform to decide when and what implementations get transitioned to the regular business for sustaining competitiveness. We will illustrate how digital leadership is used to transform the culture of a community hospital through several IS implementations recognized by external peers for their innovativeness.

Keywords: Digital leadership, healthcare transformation, IS implementation, complexity theory, hospital innovations

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Introduction

Information technology (IT) contributes to cost reduction, product or service differentiation, and overall business strategy. The emerging and pervasive nature of IT-artifacts—i.e., products and tools from large mainframes to smartphones in the hands of customers—increases the challenges firms face as they transform their business operations with agility and potentially conceive of new business models that address evolving customer expectations (Agarwal et al. 2010; Lucas Jr et al. 2013). Agility in transforming a business in the digital age, with customer needs changing constantly in an evolving technology landscape, means that leadership must undertake successive digital transformations at a rapid pace to compete (Hess et al. 2016). The term "digital leadership" is often used as an overarching theme to discuss the complex interplay of advanced digitization and business transformations to create value and the overlapping and/or coordinating roles that IT and business leaders must play in support of these transformations. Both practitioners and academics alike have used different perspectives to define such a leadership.

Deloitte argues that digital leadership is a team effort of multiple leaders working together (Deloitte, 2017) to understand the opportunities as well as cope with challenges posed by the fast-changing digital world (Seibel, 2017). Some have suggested the need for a chief digital officer (CDO) in support of these efforts (Tuck et al. 2015), with others arguing for multiple CDOs, each performing distinct roles, such as digital accelerator, marketer, and harmonizer, to address exploration, customer intimacy, and enterprise integration, respectively (Tumbus et al. 2017). Without assigning the role to a single individual, some have argued that digital leadership is reflected by an amalgamation of many components like strategy, business models, enterprise platforms, people mindset, IT functions, and workplace that supports various degrees of change, all helping an organization to do the "right things" in today's evolving business ecosystem (El Savvy et al. 2016). In fact, complexity theory argues that leadership is a process in complex adaptive systems that operates between stability (i.e., operating at a regular speed to meet stable customer demands) and instability (i.e., exploring new opportunities at a faster speed) (Uhl-Bien and Marion 2008). Such a process calls on leadership to identify innovation opportunities for exploration and evaluation (help move the organization to instability) and to adopt some of these innovations into the regular business (help move it back to stability).

Building on the role of leaders working together within a leadership process, we define digital leadership as a *co-leadership of business and IT leaders* engaged in a leadership process to create an ecosystem that supports digital transformations in today's market dynamic. The ecosystem nurtures a culture of empowerment; the innovation, exploration, and evaluation of new ideas; and reflection and adoption of some of these ideas for incorporation into the regular business to take advantage of advanced digitization opportunities that create value. The goal of this paper is to illustrate how digital leadership helped a hospital build an ecosystem to support digital transformations over seven years.

The rest of the paper is organized as follows. The next section discusses the role prior research on IT implementations and complexity theory in the development of the digital leadership process and section 3 briefly discusses the research methodology. Section 4 discusses the case study, and Section 5 generalizes some of the insights from the case study. Section 6 has some concluding comments with recommendations for future research.

Prior Research

Research on information systems (IS) implementations has progressed along a number of different dimensions with varying scope, depth, and objectives. These implementations have been categorized as administrative or technical, product or process, technological or architectural, and incremental or radical (Kim and Kankanhalli 2009; Levina and Vaast 2005; Sharma and Yetton 2003). Some would characterize the

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IS implementation process as an innovation strategy for firms seeking to gain a competitive advantage. Looking through the innovation lens, IS implementations can lead to the generation of new ideas, processes, products, or services (Garcia and Calantone 2002) and even change what the organization produces (Zhou and Wu 2010). The level of newness, novelty, or uniqueness determines whether the IS implementation leads to radical (completely new) or incremental (improved) change (Cao, Gedajlovic and Zhang 2009; Jansen, Van Den Bosch and Volberda 2006). For example, radical changes may be needed to address the needs of emerging markets, whereas incremental changes may address the needs of existing markets (Benner and Tushman 2002).

Researchers have generally viewed the adoption and diffusion strategies of IS implementations contextually by focusing on the anticipated operational change, the complexity of the IS implementations, and adopter characteristics (Arvidsson, Holmström and Lyytinen 2014; Cooper and Zmud 1990; Kim and Kankanhalli 2009). However, as an organization goes through a number of radical and incremental IS implementations over time, the associated adoption and diffusion strategies have a cumulative impact on the organization's capacity to change with future implementations. In other words, there is a temporal dimension to organizational learning from each diffusion strategy, and this becomes critical in today's market dynamic, where organizations have to continue to leverage new technological opportunities to stay competitive.

Organizations today face pressures from global and domestic customers and suppliers, regulatory agencies, and market and technological developments. These can lead to a number of changes in the organization and associated radical or incremental IS implementations. The driving force for these changes may come from either outside or inside an organization—where new ideas are constantly being explored for evaluation. In this context, IS implementation is often not an internally driven process, but an external force driving change in the organization. Relating this idea to complexity theory, the external force influences the cognitive structures (i.e. how the threat or opportunities are interpreted and perceived by management), leading to potential managerial action. Given the rapid pace with which external forces are driving organizational change, there is a need for such managerial action to be delegated to innovation teams. These teams are empowered to identify innovative opportunities to leverage advanced digitization to create business value. Members are empowered to explore innovative opportunities unencumbered by bureaucracy and with a mindset untethered to risk aversion. The digital leaders' role here is to support the acquisition and processing of knowledge by interpreting data about and from environmental changes and identify innovative opportunities to leverage advanced digitization to create business value. We will refer to this as an "innovation platform."

The rapid transformation of a business enabled by advanced digitization requires agility in decision making within firms that quickly utilizes both internal and partner businesses and IT resources to explore innovative ideas that deliver value. Information systems (IS) and business literature have called for such agility in transitioning ideas from conception to new IT implementations (or digital services) if firms are to compete successfully (Kotlarsky et al. 2014; Lusch and Nambisan 2015). While agility in IS architecture can help in the design and development of digital services, the delivery of these services at a faster speed to meet customer expectations requires a flexible business architecture (i.e., strategies around positioning services for differentiation and governance over partnerships and risks) (Bharadwaj et al. 2013; Gray et al. 2013). Agile system architecture supports the faster design of digital services (or IT implementations), and agile business architecture supports the faster delivery of these services to customers, each using frequent customer input to either redesign or reposition the digital services. We will refer to this as an "system and business platform."

After exploration, a decision is made to adopt the change (i.e. implement the system), not

adopt, or postpone the adoption to a later time. If an organization decides to adopt a new innovation, it needs to adapt the new IT implementation associated with the innovation to the existing IT architecture and the business processes and strategies. While IT architecture needs to have a sense of predictability and accountability to accommodate laws and regulations, policy guidelines, corporate standards, best practices, etc., it needs to be flexible to incorporate the new IT implementation. Similarly, while the regular business has to remain stable during exploration and evaluation of new innovations, it needs to be adaptive in its use of internal and external resources to incorporate the newer implementation to sustain growth. In some cases, such an adoption may alter either the IT or business architectures. Within complexity theory, this refers to the organizational adaptation of new systems using experimentation, openness, and improvisation. We refer to this as the "adoption" platform, and within this platform selected explorations post evaluation are chosen for immediate or later adoption, or for non-adoption. If adopted, decisions are made on when (timing), where (which unit or which customer), and how (complete or partial) the exploration is adopted, so that it becomes part of the regular business.

Discourse through reflective practice is the notion of enabling a mindfulness of the gap, an awareness of and willingness to tackle issues through experience and the knowledge sharing process (Bolton 2010). Reflective practice is paying critical attention to the practical values and theories that inform everyday actions by examining practice reflectively and reflexively. The importance of reflecting on actions has been emphasized as a prominent part of the learning process (Kolb 2014), as a process of observation that concentrates on what the experience means to the learner. In other words, reflective practice is a situational capacity an organization uses to reflect on its decision to adopt or not adopt new IT implementations and related actions, in order to engage in a process of continuous learning. The discourse through reflective practice constitutes objects such as thoughts, practices, or guidance to actions, and developing others as enumerated in situation leadership contexts (Blanchard, Zigarmi and Nelson 1993; Thompson and Glasø 2015). We refer to this as a "learning" platform, and the goal here is to use discourse from each successive digital transformation to help support learning and capacity building, sometimes leading to the identification of the next set of innovations for exploration.

The leadership process to create an ecosystem that uses an interplay of three different leadership styles: administrative, enabling, and adaptive (Uhl-Bien et al. 2011) using the four different platforms discussed here is shown in Figure 1.

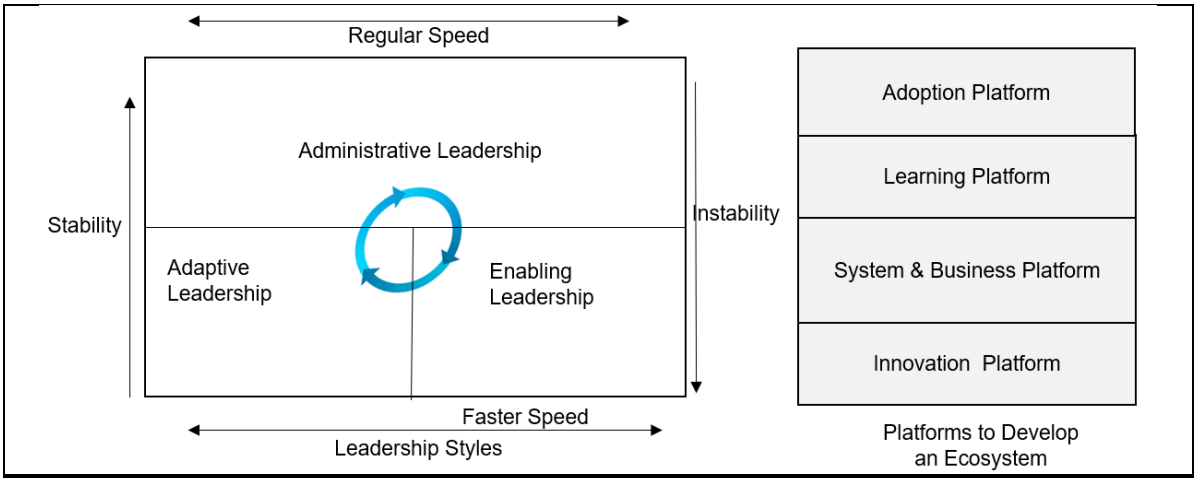

Figure 1 – Three Leadership Styles and Four Platforms: Constituents of Digital Leadership

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The three different leadership styles move an organization between instability, caused by the exploration of new digital opportunities, to stability with their potential adoption into the regular business. The administrative leadership empowers a team of individuals operating within an *innovation platform* to identify innovations that create value. The enabling leadership supports the innovation team using *system and business platform* to implement IT to create value. The system and business platform include many elements, such as strategies, business models, mindsets, as well as enterprise platforms. Adaptive leadership analyzes the IT implementations to support reflection and learning using a *learning platform* and evaluates them for potential adoption into the regular business using an *adoption platform*. Administrative leadership, in turn, will decide when these IT implementations become a part of organizational routines to help the organization compete and grow.

In summary, the combination of leadership styles and platforms help create the ecosystem needed to support successive digital transformations. The innovation platform, along with system and business platform, help firms operate at a faster speed, while the learning and adoption platforms integrate innovations explored into the firms' regular operations. In addition, leadership roles played to shepherd activities within these platforms are situational in nature, not assigned but undertaken by those involved in the transformation. In other words, business and IT leaders play an integral and coordinated role in support of the ecosystem, each exhibiting any of the three leadership roles as and when needed. It is important to note, however, that those who are playing the enabling leadership role connect administrative leadership to those involved in the innovation platform, and those playing the adaptive leadership role connect innovations chosen for adoption back to the administrative leadership. Lastly, the business should view digital transformations not as a one time or a discrete number of individual efforts, but rather as a cumulative effort needed to build organizational capacity to support future transformations.

Table 1: Representative Summary of Field Level Interactions and Sources

Interviewees	Total hours spent in every year for direct interview and unstructured interactions							Nature/topics/areas of the interactions
	2011	2012	2013	2014	2015	2016	2017	
Chief Executive Officer	3	2	3	5	6	9	7	Broad vision, strategy, and leadership contexts; the number of hours spent around design science plan and digital leadership articulation.
Chief Information Officer		2	2	2	3	3	4	IT leadership and implementation plans, strategy and relevant information on ICS, Dashboard and RSVP artifacts.
Chief Medical Information Officer				4	1	2	2	Clinical-IT alignment and implementation issues and risk mitigation, cultural aspects, integration of clinical flows and decision systems.
C-level Nurse Manager			2	2	3	2		Patient room management, discourse around digital initiatives, response of nurses, alerts/call bell management, nurse stress issues.

Business Intelligence Manager					1	4	4	Development of BI unit, involvement, emergence from IT to BI team, focus areas, details into the IT artifacts and BI integration issues.
Nurse Manager				2	2	2	1	Focus on workflow and IT issues, challenges for nurses, burn out conditions, rounding, patient call bell assistance, management etc.
Manager in charge of patient engagement area						1	2	Satisfaction measures, data collection on surveys, alignment of reimbursement and engagement issues, patient room interactions.
Manager overseeing patient flow & scheduling						4	3	Arrival times, the best approach to scheduling, adaptation to new IT artifacts.
Information technology architect					3	3		Vendor details, selection of IT artifacts, usability and testing issues, piloting plans, assimilation, and discourse patterns.
Nurse manager in charge of fall risk and multipurpose rounding						2	3	Fall risk issues and integration with ICS and other systems, patient room monitoring, the concept of rounding and floor-based challenges, new building plans and IT integration.

Research Methodology

We used a number of interviews with key executives, and an author was actively engaged over several years in these systems implementations and evaluations. We reviewed data from these systems implementation documentations and the reports submitted for external recognition. Most of the data were qualitatively analyzed for this case study. See Table 1 for details.

Digital Leadership at St. Joseph Mercy Oakland

Background of St. Joseph Mercy Oakland (SJMO) Hospital

St. Joseph Mercy Oakland (SJMO) is a 443-bed community teaching hospital located in Pontiac, Michigan. SJMO is a member of the Saint Joseph Health System, which is a subsidiary of Trinity Health, the fourth largest Catholic healthcare system in the United States. SJMO is now ranked nationally in the top 5% for clinical experience and is among the top 50 cardiovascular programs in the nation, in addition to being a level II trauma center.

SJMO is recognized as a center of excellence and a leader for women and child services, joint care, and surgical procedures. During the time of the case study, SJMO completed a $252 million renovation and expansion of the hospital's west wing in 2014 that included the addition of a new eight-story patient tower, along with a two-story surgery center.

SJMO, as well as other hospitals in the healthcare industry, have been under tremendous pressure from regulators who assess care quality and from insurers who continue to change reimbursement systems to influence care delivery behaviors. The

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need for transformative changes in healthcare is not a luxury but a necessity, and this need has become more intense as patients, like customers in other industry sectors, have started to demand more services supported by advanced digitization tools. Before we get into the transformation of SJMO, let us look at the healthcare industry and competitive landscape in southeast Michigan.

Healthcare Industry Landscape

The development of an insurance model for reimbursement began in the 1930's, following on the tradition of pooling risk for a price and then paying the bills. This started a major change in healthcare. It transformed the organizational structure and operations of hospitals and made them develop formal management systems. It also brought an amalgamation of physicians under contract with hospitals in order to provide focused care in various specialties. This was the way healthcare was primarily managed until 1965, when the federal government introduced Medicare and Medicaid to pay for health insurance for the elderly and poor. This made the federal government a major player in healthcare reimbursement and led to the further formalization of healthcare leadership and strategies, including the consolidation of many care delivery specialties to exploit economies of scale even when these specialties operated in silos within the same physical facility.

In the ensuing decades, the federal government started to look for better ways to manage payments for healthcare services. To make payment systems uniform across different hospital operations, the government started to use a program called DRGs (Diagnosis Related Group) for financial reimbursement to hospitals, even though the DRGs were initially designed to measure the quality of clinical care based on a diagnosis of a patient's medical condition. For example, the outcomes of cardiac and orthopedic procedures are different and are practiced differently by physicians, depending on institutionalized quality-related factors. However, their coding by hospitals dictated the reimbursement level, without a granular level analysis of all the costs that underlie the clinical procedures. Over time, hospitals have adapted to DRGs, and fee-for-service reimbursement based on the DRG became a way to recover costs incurred in the care of patients. Then came the Affordable Care Act (ACA) in 2009 (Civic Impulse, 2009). One of the goals of ACA is to bring healthcare coverage to many uninsured individuals using federal subsidies and an individual mandate to spread overall healthcare costs. It also created incentives for improving patient satisfaction, reducing 30-day readmissions, and bundling payments that spread reimbursements over a longer period (both inside and outside the hospital) to cover the costs of care. All these measures are intended to control healthcare cost increases and improve the continuity of patient care, but they highlighted the need for an alignment of goals among two different groups that influence hospital costs and reimbursements: the clinical group and hospital administration. These two groups have an unusual reporting structure in hospitals, as discussed below.

Organizational Structure of Hospitals

Hospitals, unlike other businesses, have a dual organizational structure. All clinical specialties have an administrative structure similar to academic institutions with departments. The head of each clinical department leads the physician staff of that department. These heads report to the chief of staff, who reports directly to the board. The chief of staff is responsible for the quality of care provided in the hospital. The CEO is the head of the administrative structure of the hospital and reports directly to the board as well (see Figure 2). The CEO works with the CFO, COO, CIO, Chief of Nursing, and the Quality and HR managers to run the hospital's operations. The staff they manage includes clinical staff (nurses, anesthesiologists, pharmacists, lab technicians, etc.) and operations staff (those who manage emergency, operating and patient rooms, lab/test facilities, etc.). Conflicts that arise between clinical and administrative units are brought to the board for resolution.

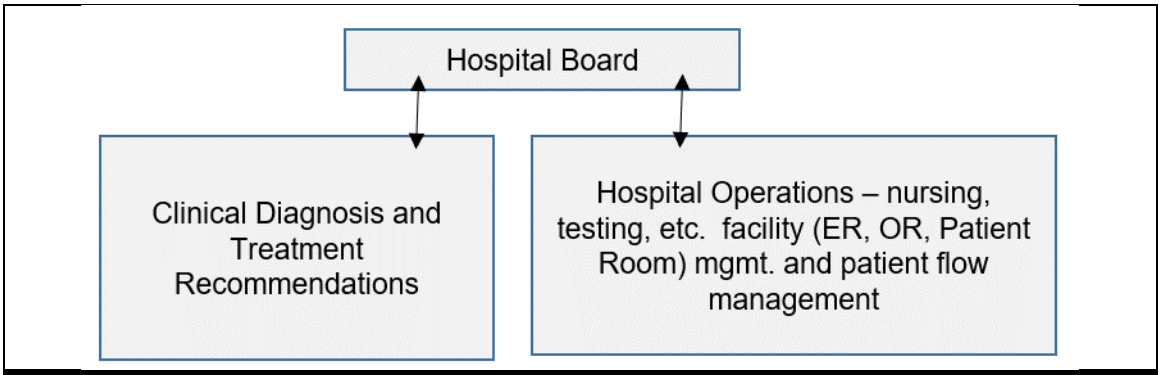

Figure 2 – Typical Hospital Structure

This dual structure poses significant challenges when attempting to align goals between clinical units and administration. The diagnosis made by the physician staff determines the DRGs and dictates the revenues generated by the hospital, while the costs incurred by the hospital include both hospital operations and physicians' costs. Typically, many physicians have their own practices and are credentialed to operate within a hospital. Even when physicians work for a hospital, the clinical group and the specialists have a significant say in the overall costs a hospital incurs in the treatment of a patient. With the clinical group deciding on the revenue stream and the administration responsible for managing overall costs, the alignment of goals between these two groups is a significant challenge. ACA, with the introduction of incentives and penalties, suddenly made the need to address this challenge paramount. Ensuring the transparency of costs incurred and the accountability for containing these costs by all involved is essential to improving patient satisfaction and reducing many of the costs in the patient room, as well as in better classifying DRGs to recover some of these costs.

Competitive Healthcare Landscape in in SE Michigan

St Joseph Mercy Oakland in Oakland County (SJMO) operates in an urban city (Pontiac, MI). It faces stiff competition from many well-known hospitals, such as William Beaumont, Henry Ford Health System, St. John Health Systems (a part of a large hospital network called Ascension), Detroit Mercy, and Crittenton-Ascension in Rochester, MI (right next to Pontiac). Many of these hospitals have significant resources from private donors, patients covered by private insurers, higher bed capacity, and well recognized surgical units that have helped them withstand some of the challenges associated with ACA. However, this is not the case for hospitals that serve urban populations, which are often covered by Medicaid, where reimbursements tend to be lower and the costs of treatment tend to be higher. Even though SJMO is also a part of a large healthcare chain (Trinity Health System), it is dwarfed by a much larger and well-recognized hospital in the same system: St Joseph Mercy Ann Arbor, which has higher level visibility, a wealthier and more educated patient mix, and a higher number of patients insured by private companies. This makes SJMO less visible within the Trinity Health System, and obtaining resources—monetary or people—for innovative research and advanced digitization is a major challenge.

The impact of competitive challenges in SE Michigan and evolving regulations under ACA was further exacerbated by a severe recession in Michigan that spanned a decade, from the mid-2000's to the mid-2010's, highlighted by the dual bankruptcies of GM and Chrysler, both of which are major employers in SE Michigan. This was the situation in 2009 when the SJMO leadership had to decide on the hospital's future.

Leadership Vision

The CEO and President of SJMO recognized the need to develop a distinct vision to compete in SE Michigan in an evolving regulatory market dynamic in order to

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transform the hospital so that it could proactively address numerous challenges, including cost containment inside and outside the hospital and patient satisfaction. He visited GM and saw how technologies were transforming the automotive industry, even prior to the recession, and he wanted to use advanced digitization to help transform the hospital to address its challenges. In his words:

"We are not following the traditional pathway of health IT implementation. We want to understand what is happening in each patient-healthcare staff encounter and make sure our digitization efforts are in alignment with our service goals as well as our organizational goals as we improve quality of care, reduce costs, and improve patient satisfaction. We want to always ask the following question: How can the use of IT best serve our patients? We want the technology used to have a positive impact on our healthcare mission (quality, cost, and patient satisfaction), and we want to assess this impact both locally and at the organizational level at every step." - President and CEO.

While costs are incurred at multiple facilities within a hospital (e.g. emergency room, operating rooms, and patient rooms), the early focus was on patient rooms. A patient spends a significant amount of time in the patient room, and several events that occur here have cost implications. For example, patient falls, hospital acquired infections, food related complications for diabetic patients, inadequate monitoring of patient conditions which can lead to complications, etc. are all controllable to some degree, and they also impact both patient satisfaction and length of stay in the hospital. Therefore, the CEO laid out the following objectives for the digital transformation of the hospital:

1. Become proactive in anticipating potential complications occurring in patient rooms to contain costs and improve patient satisfaction.
2. Support the alignment of clinical unit and hospital administration goals along a few key performance metrics (quality of patient care, unanticipated costs inside the hospital, patient satisfaction, readmission costs, etc.), so that both groups work toward the same goals.

Besides using innovative ideas to support the digital transformation of the hospital and address the stated objectives, the CEO wanted SJMO to document its innovations for both learning within the hospital and recognition by external peers. The peer evaluation is done as a part of Wired Magazine's annual solicitation of innovative applications of technology in healthcare across the US. Coordinated by the American Hospital Association (AHA) and Hospitals & Health Networks, over 350 submissions are collected each year for evaluation by a group of hospital CEOs and CIOs. Twenty finalists are chosen from this set, and one Innovator of the Year is selected. SJMO's digital transformation efforts won five "finalist" recognitions in three consecutive years (2014-2016), with one of them recognized as the "innovator of the year" award in 2015 (SJMO Press Release, 2015). No other community hospital has won recognition with such consistency. The rest of the paper will discuss the digital leadership path SJMO traveled in creating an ecosystem that led to its success and will review the role of business and IT leaders in this effort.

Information Technology, Systems, and Capabilities at SJMO

Given the role IT plays in digital transformation, it is useful to understand the IT capabilities of SJMO when its journey began in 2009. At that time, SJMO, like other hospitals, had been using IT to drive down costs and improve quality (Santavicca 2009). Some of the on-going applications included a decision support tool for a clinical unit (radiology), tools to speed the flow of patients in emergency departments and support a computerized physician order entry system (CPOE), and the Cerner electronic health record (EHR) system to track diagnoses, treatment processes, and patient record keeping. Most of these IT applications were leveraging software from a single vendor, Cerner, and the IT infrastructure and Cerner systems were managed by the corporate IT of Trinity Health in Novi, Michigan. SJMO maintained a handful of IT staff members who were

dedicated to supporting targeted IT applications as needed. This environment was not sufficient to undertake the vision espoused by the CEO for digital transformation. Both the IT director and executive leadership recognized that digital transformation through innovations must come from resources brought from the outside, prior to making any significant investments to increase internal IT resources. With this background, we will elaborate on each of the four platforms that SJMO created and the role business leaders played to support activities within these platforms.

Narrative of five digital transformations

The narrative below provides the digital transformation journey SJMO undertook since 2009 using five IS implementations that won national recognition and transformed patient care. Figure 3 below highlights each of the innovations and the initial timing of these explorations. The early warning system helps anticipate patient conditions before they became too severe (Case 1). The performance dashboard supports alignment (Case 2). An intelligent care system reduces several patient room costs and addresses patient satisfaction (Case 3). The medication board improves productivity on the nursing floor (Case 4). The RSVP system addresses patient readmission costs (Case 5).

Case 1 - Early Warning System – [2009-2014]

In 2009, an opportunity arose to test an early warning system for patients with deteriorating medical conditions using a technology product by Visensia. As shown in Figure 4, clinical staff, who had used five independent patient readings (blood pressure, pulse rate, respiratory rate, pulse oximetry, and temperature) to assess patient conditions, now can use a single index score. The color coding scheme associated with the index (red, yellow, green, and gray) can then be used to alert care delivery staff to take quick action if the trends show a deteriorating patient condition.

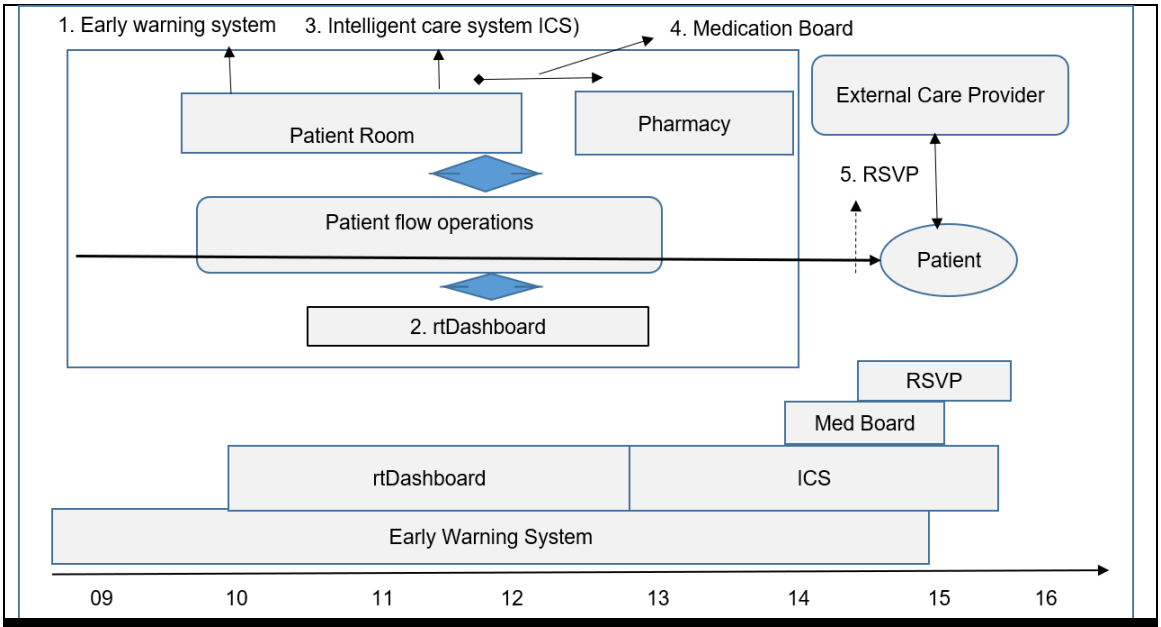

Figure 3 – Five Digital Transformations and Their Timelines

This IS implementation transformed the way care delivery staff proactively used patient conditions to improve the rapid response team (RRT) activation rate, which measures the frequency with which staff calls the rapid response team to evaluate a patient. Both the CMIO and CIO saw the value of the vendor technology in addressing patient care, but they also recognized the importance of nursing staff training and their

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engagement to effectively monitor the index and interpret the colors correctly before initiating any RRT action. The results of the early warning system pilot led to an increase in intensive care unit (ICU) up-transfers within the hospital, reduced length of stay, and reduced mortality.

Given the critical role that it played in patient safety, the technology was adopted incrementally — with a pilot introduced in medical-surgical floors first, neurology next, and the rest in subsequent stages. Frequent reporting of results and training of staff in monitoring and interpreting the results eventually made this an integral part of patient monitoring. After four years of demonstrating accuracy and adherence to clinical guidelines, the innovation was recognized as a finalist in 2014.

"With these awards, our hospital has proven itself to be a regional and national leader in healthcare innovation. Our patients have benefited from these efforts and are seeing positive results first hand." - CEO.

The speed with which organizations need to react today to address external change means that explorations must occur constantly, sometimes while other explorations are still under review for evaluation and potential adaptation. Reflecting on the early warning system experience regarding the viability of using external vendor technology to bring digital transformations with minimal disruption to the current technology infrastructure, the CEO decided to initiate the next digital transformation designed to bring alignment between clinical and administrative goals in 2010.

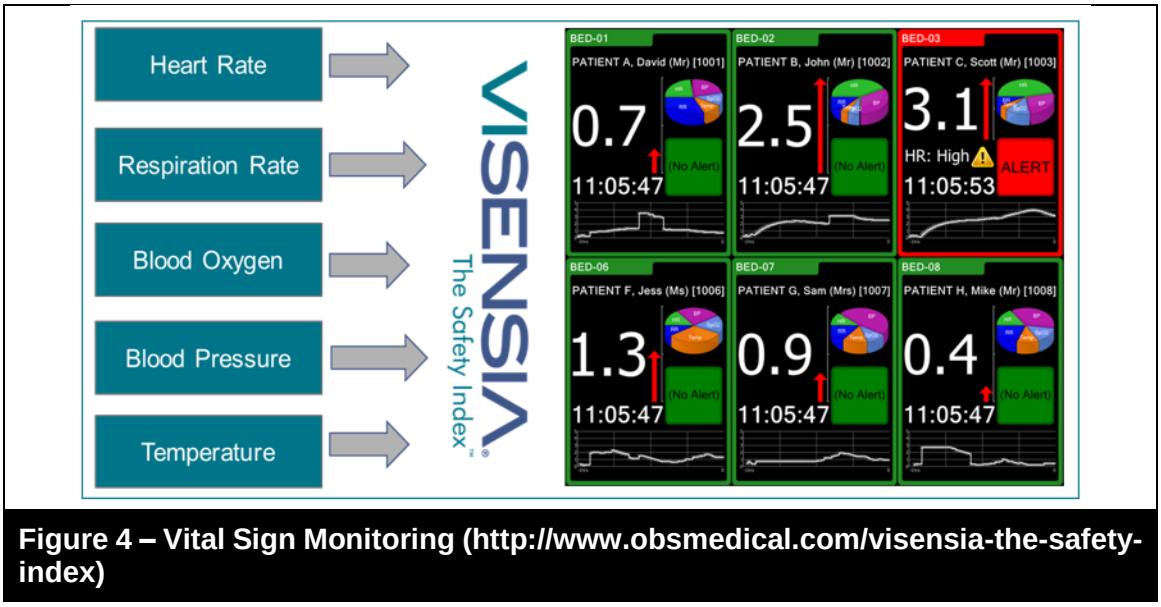

Figure 4 – Vital Sign Monitoring (http://www.obsmedical.com/visensia-the-safety-index)

Case 2 - Performance Dashboard – [2010-2012]

The CEO wanted clinical unit leaders to see the collective impact of their decisions and actions on overall hospital performance and on specific metrics, such as mortality rates, length-of-stay, and patient satisfaction. Since the CEO is a strong believer in the Hoshin Kanri philosophy, which advocates the alignment of unit actions and core performance metrics with a drill-down capability (Kesterson 2014), an external vendor was brought in to design a technology artifact called rtDashboard (rt representing "real time"). An example of this is shown in Figure 5.

The CIO found a regional vendor, and the CMIO helped identify some initial projects to pilot test the dashboard (e.g. capacity management, patient throughput, and turnaround time in the ER) that were already on the unit manager's radar. The IT staff used a number of data conversion mechanisms to bring the rtDashboard to functionality quickly, often using external university student resources. It is important

to mention that this was achieved without disrupting the existing Cerner EHR system and several unit level internal systems. The CEO led the major cultural transformation using daily huddles where hospital unit managers were able to see their unit performance against hospital metrics and assess the need to direct actions within their own units to address variance. To support a data-driven decision-making culture and bring visibility to hospital performance on many key metrics, the dashboards were displayed at various locations in the hospital so that all stakeholders, including patients and visitors, could see how well the hospital was performing on these metrics. During the first phase of this transformation, which is viewed as radical for the change it brought about in the hospital unit culture, IT played a supporting role by focusing on helping unit managers understand, interpret, and act on goal and action alignment.

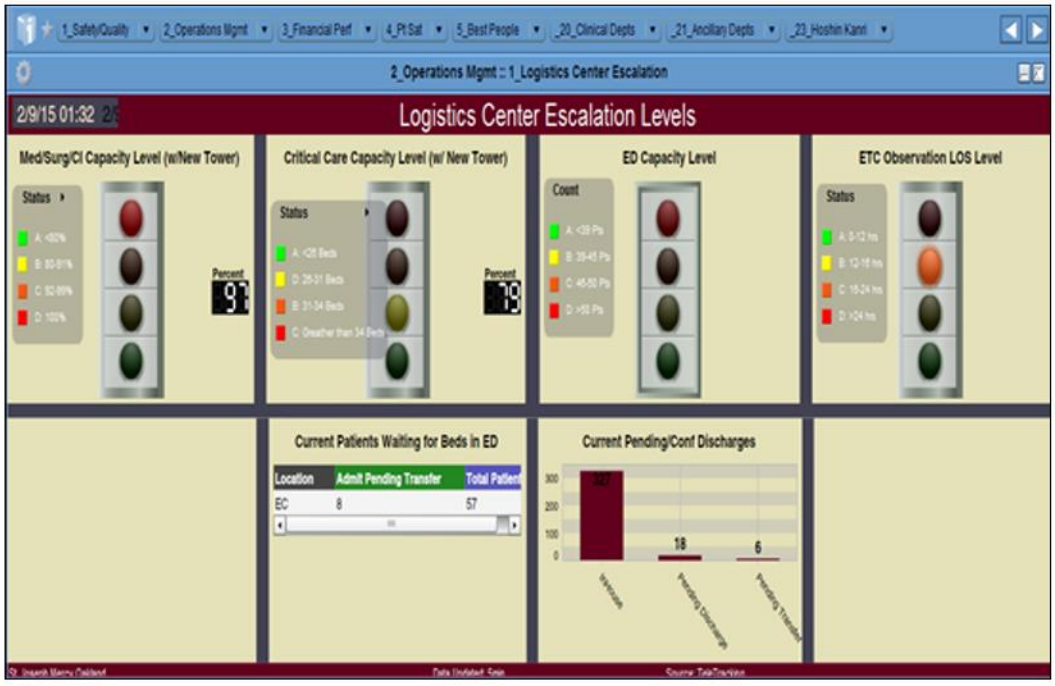

Figure 5 – A Dashboard to Evaluate Operations

Once huddles and goal/target-based discussion became a part of the daily routine of administration and unit managers (i.e. part of regular hospital business), the second phase of the rtDashboard was initiated by routinizing application solicitation, prioritization, and development using a steering committee, led by the CMIO. At this time, IT staff began exploring the building of a standardized platform for importing data from the clinical units into rtDashboard, even without a full-blown data warehouse to integrate the data. This innovation was recognized as the "Finalist" in 2015.

As SJMO leadership reflected on these two early explorations, it became apparent that vendor and external university student resources could continue to supplement internal IT staff resources for exploring future digital transformations. This led the CEO and the CMIO to look for digitization opportunities to contain patient room costs. In 2012, an opportunity presented itself when the hospital board asked for differentiation after the hospital administration requested an expansion of bed capacity to address patient needs. The CEO proposed an innovative new hospital wing (south tower) that showcased several features of design thinking – including a human-centered approach to building a hospital that creates a space for patient healing, while also leveraging advanced digitization to transform care services in all the patient rooms to reduce costs and improve patient satisfaction. This led to the third digital

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transformation: The Intelligent Care System (ICS).

"We didn't just construct a new building, we created a living, breathing hospital that plays an integral part in our patients' healing process," - President and CEO of SJMO.

Case 3 – Intelligent Care Systems – [2012-2015]

The Intelligence Care System (ICS) used 11 different technologies (see Appendix for more details about these technologies) to automate multiple services to support care delivery and patient-nurse communication within a patient room (See Figure 6). The major software components included:

- A wrist-worn device, which pulls vital sign data from a patient's wrist and sends it to Visensia for early warning (to reduce care related complications)
- A smart bed that alerts nurses when patients with high fall risk are trying to get out of bed (reduce patient falls)
- A gel dispensing system that staff use to wash their hands as they walk in and out of a patient room (reduce hospital acquired infections)
- An educational channel connected to patient diagnosis to help tailor education and nutritional guidance to patients (prepare patients for post-discharge)
- A multi-level call system that allows a patient to seek select care (toilet, pain medication, or general information) to improve communication
- A wall unit that connects care staff with catering, transport, physicians, etc. to speed up communication and set up alerts (e.g. administering pills for diabetic patients before serving food or administering pain management drugs at regular intervals)
- A smartphone system that is connected to all these systems that helps the nursing staff send texts, receive alerts, and make phone calls.

This was a radical change for both the nursing and small IT staff. While funding became available to bring about these technologies, the timing of their implementation was too short to develop an incremental strategy. The CIO, in partnership with the CMIO, who understood the need for automation of many patient room workflows, formed a sub-team of nursing and IT staff to explore available new technologies and to evaluate their effectiveness and/or maturity to support patient room services. A pilot implementation was completed in 2013 on one floor to establish its potential in reducing hospital acquired infections, reducing patient falls, and improving patient-staff communication before a decision was made to implement ICS in all the 443 patient rooms beginning in 2014 when the building was opened.

During the first phase of the ICS implementation, there was recognition on the part of the administration that this would lead to many growing pains because of its impact on the care provided on nursing floors. The hospital administration was concerned that even after the implementation of all the technologies, their full adoption would need to address a number of adjustments. They were prepared to address gaps in expectations as they surfaced and address these quickly using changes in technology, processes, or training of people. While the CIO and CMIO led the digital transformation effort in the early phases, the CEO entered the picture when post-implementation evaluation required process and policy level changes, as well as during discussions required to bridge differences among vendor technologies as they attempted to work together to streamline communication and data sharing.

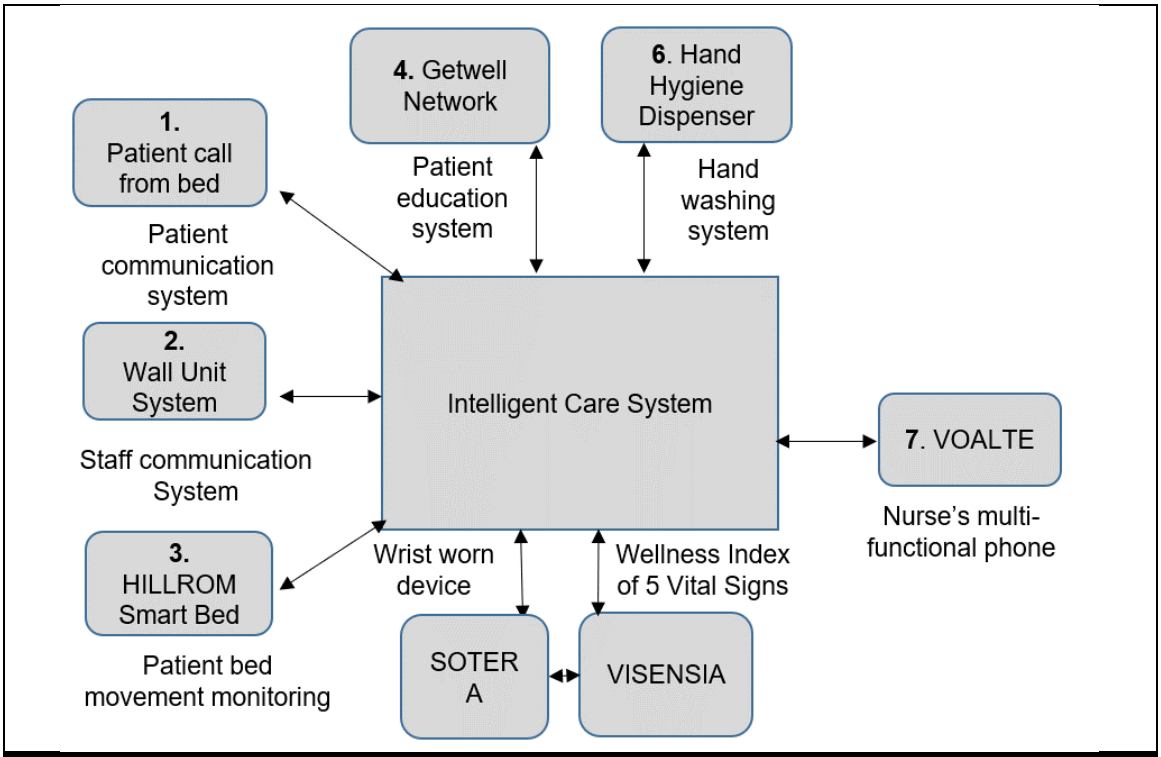

Figure 6 – Intelligent Care System

"From the start, the initiative was viewed as a clinical project, not an IT project. The IT people became clinical experts, and the pilot site's clinicians became IT experts" - Robert Jones, Director of Information Technology, SJMO.

"One challenge early on was getting the vendors of the different technologies to work together." - Fabian Fregoli, Vice President of clinical quality and patient safety and Chief Medical Information Officer.

As anticipated, the second phase of ICS implementation led to addressing several issues that surfaced. For example, early use of the smart bed led to too many alerts and contributed to stress among nursing staff, and adjustments had to be made to address both alerts and process changes in the workflows to support better workflow integration. Similarly, hand hygiene technology saw limited adoption at first because staff viewed it as "big brother" watching, so processes were altered and until level competition was used to increase adherence.

"Nurses were given time to get accustomed to the RTLS (real time locator sensor) badges before hand-hygiene performance data were shared — first at the unit level, lastly at the shift level, and now down to the individual level. The system resulted in a 300 percent improvement in hand-hygiene compliance, and the HAI (hospital acquired infection) rate fell to zero in the pilot's first quarter" - Fabian Fregoli, Vice President of clinical quality and patient safety and Chief Medical Information Officer.

SJMO won the "2015 Most Wired Innovator" award for its Intelligent Care System. In addition, the new building was recognized for its design.

"From the integrated technology, to lights, to art, to the size and shape of patient windows, the design of the new South Patient Tower utilizes proven methods and techniques to further promote positive outcomes for our patients." - CARITAS Project's Generative Space Award.

The next digital transformation came not from the CEO, CIO or CMIO, but from the nursing staff, which up to this point were complaining about too many alerts from ICS. To improve their productivity, nurses saw the need for another alert when drugs are sent to the nursing floor. Indicative of the cultural change within the hospital, the staff began to

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look for opportunities for digitization to solve problems. This digital transformation was the medication board.

Case 4 - Medication Board – [2014-2015]

SJMO nursing staff realized that they were spending a considerable amount of time tracking drugs prescribed to a patient and sent to the pharmacy, as these medications were either on their way or deposited at a location (e.g. IV Room for the sterile preparation of intravenous medications), without the awareness of nurses. The new innovation allowed a pharmacist to use a television screen or log on to a portal to access a medication board. The medication board provided order category, priority, patient name, room, destination, drug name, location, status, etc. It showed the prescription delivery time, distributed either physically or via a tube system, and an automated text message alert was sent to the nurse via Voalte iPhone for pickup.

After its implementation, it was viewed as an easily generalizable innovation to improve productivity for many hospitals across the Trinity system. At the same time, the CMIO is exploring porting the technology used in the patient rooms to high risk patients post-discharge to reduce readmission costs, another key hospital metric. This led to the next digital transformation, called RSVP, which was the first extension of hospital technology to patients outside the hospital.

Case 5 – RSVP – [2014-2015]

RSVP stands for the Remote Specialist Visiting Physicians program and was designed to support continuity of care for high-risk patients using a mix of technology and care coordinators inside and outside the hospital. External care coordinators recruited from the local fire department—emergency medical technicians (EMTs)—visited patients as a follow-up and engaged in a two-way consultation with physicians using video conferencing technology (e.g. SwyMed Telemedicine). In addition, SJMO partnered with Vivify Health to distribute 20 kits to patients so they could monitor their vital signs and consult with a hospitalist at SJMO.

The pilot project showed improvements in reducing patient readmissions and improving patient satisfaction and was expanded to another region. Both the Medication Board and RSVP won finalist recognition by Wired magazine in 2016.

"Our hospital has been active in identifying opportunities where technology may benefit our patients. We explore IT solutions that have the potential to improve quality and patient care; however, we never substitute technology for the personal connection with our patients and their families. We look for solutions that support and strengthen that personal connection." - Fabian Fregoli, Vice President of Clinical Quality and Safety and CMIO at SJMO.

In summary, the five digital innovations helped to transform the hospital over six years (2009 to 2015). Today it is an active user of technology to improve care within the hospital, including ER (Emergency Room) operations and specialty units like Radiology. Before we highlight a few key insights from the four different platforms used in support of these digital transformations, it is informative to provide the following statements as a testament to the vision set out by the CEO, as well as the research methodology used to collect the data used in this study.

"Our ability to change the culture of managers and care providers in the last five years will position us to be a champion of change to other hospitals within the Trinity system as well as others who want to see how it can be done. We received not only external recognition, but many visitors came to see what we have done." – Chief Executive Officer.

"Today, we expect hospitals to continue to evolve and look for new digitization opportunities, and we feel like are ready to tackle these with flexibility and speed." - Chief Information Officer.

"St. Joseph Mercy Oakland has served as the pilot program for many of our health system's technology innovations. Our health system is actively working to deploy many of these award-winning technologies across each of our five hospitals in the Metro Detroit

region." - Rob Casalou, President and CEO of Saint Joseph Health System.

Discussion

The case study covered the time between 2009 and 2016. The following discussion looks at how the digital leadership process developed using the four platforms discussed in Figure 1 and provides some general strategies for organizations to support digital transformations today.

Innovation Platform: Enabling Leadership to Support Exploration

With a small IT staff, the digital transformation of a community hospital is very risky unless the organization develops an innovation team that includes both IT and other members, all acting as a catalyst to support transformations. The team, by virtue of the unique activities and structure of the hospital, included staff from clinical, administrative, and IT. To complement internal resources, the team also used external partners as needed in support a number of digital transformations. The leadership roles were played by the CEO, CMIO (chief medical informatics officer), and CIO (called the IT Director within the organization), with IT and clinical staff playing various supporting roles as needed. For each transformation, the team was empowered to use an established budget to support the effort without approval delays from the corporate administration (Trinity) through the entire cycle: innovation exploration to evaluation and adaptation.

The team, later called the business intelligence (BI) team, used a mix of IT, medical, and business leaders to lead each of the transformations based on the focus of the effort. For example, the CIO and the CMIO led the early warning system, the CEO led the performance dashboard, and the CIO and the CMIO led the implementation of ICS. The nursing staff led the medication board, and all three (CEO, CMIO, and CIO) played a role in leading the RSVP system. While the leadership of the first four cases relied on the change contemplated in the early phases of the digital transformation, the last case needed three types of leadership to effect change: external partnerships such EMT's (CEO), technology integration with hospital systems (CIO), and clinical validation of vendors systems (CMIO). In addition, the teams were empowered to explore the potential viability of the ideas within a set of constraints, such as time (ICS implementation) and budget (performance dashboard), and were allowed to seek external resources (vendor or others) as needed. Based on our experience, some general guidelines for the formation of innovation teams are discussed in Table 2.

System and Business Platform: Building Agility to Enable Digital Transformation

Agility in system architecture is enabled by isolating explorations from regular IT systems, supplementing limited internal resources with external resources, and modularizing the design and development of each system explored. The early warning system used existing data from five different systems to develop an index for evaluation, and the longer time needed for evaluation posed no significant IT integration challenges. The performance dashboard used an external vendor and other university student resources to modularize data extraction and integration in the early phases to give the application a business focus, with standardization of data integration coming in the later phases. The intelligent care system leveraged modularity of system architecture using a "communication bus architecture" and supported multiple new vendors. This allowed data sharing from the EMR system without disrupting hospital operations. The agile system architecture also enabled faster introduction of the medication board and RSVP, as they simply extended the bus architecture to pharmacy systems and technologies used to interface with patients outside the hospital.

Agility in business architecture used a modular approach in value assessment, where each definable deliverable is evaluated for its impact. In the rtDashboard, the modularity embedded in each application, sought by clinical units, made its value assessment easier. In addition, each

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dashboard application supplemented internal resources with those from outside to deliver systems on time and within budget. Similarly, ICS as a technology was implemented in all rooms at one time, but modularity of digitized services (e.g., food catering, lab transport, vital sign monitoring, etc.) enabled an assessment of their impact individually on the value they generated. Even vendor partnerships were isolated to support integration and communication with appropriate nursing staff. Use of new vendors, while risky, allowed for operating within budgets and gave the flexibility to change certain vendor system characteristics when needed or even drop some vendor systems when they were not effective (e.g. bed alerts). Lastly, leadership was able to bring about a radical transformation of culture among clinical units (with rtDashboard) and IT and nursing staff (with ICS) by using a phased implementation approach. This allowed both business and IT leaders to focus on "business first and IT standardization later" in the early phases of the rtDashboard implementation, and "IT first before process standardization later" in the early phases of the ICS implementation.

Table 2: Formation of Innovation Teams in SJMO

Business Elements	Specific to Case Study	Application to a broader context	Idea extension
Team Membership	Included clinical, nursing, administration, and IT staff	Membership in the team is drawn from key disciplines involved in the digital transformation	Membership can extend to key individuals outside the organization, such as vendors, researchers, or customers
	The IT Staff of the Business Intelligence team and CMIO are permanent members, while others joined as needed	Varies from transformation to transformation, even though a few key individuals may remain to keep organizational summary.	Extending to key researchers or institutional partners may provide opportunities for identifying opportunities not easily visible to the team
Leadership Roles	Leadership roles varied from project to project, allowing the right leader to direct the transformation, but a few leaders remained as a part of the team (CMIO and CIO)	While roles can vary, a select group of leaders from specific levels should be used for consistency and to help build cross-leadership competencies, and potentially help build leadership training for digital transformation	In select cases, leadership for transformation may be provided by an external entity, such as a technology leader for a new application or business leader with demonstrated competency.
Empowerment of Teams	Predefined targets in terms of time and funding allowed the team leader to pursue their goals unimpeded by bureaucracy and seek outside resources as needed.	Soliciting ideas for exploration and setting budgets for exploration is not effective, entrepreneurially speaking. However, providing budget or time constraints earlier might empower teams to seek ideas worth exploring and be creative in seeking a mix of resources, internal or external, to assess their viability.	Use of external partners (vendors) or researchers (universities) in the team might give more avenues for idea generation as well as resources to support exploration

In summary, systems and business platforms are set up to support agility in exploration and evaluation. Table 3 provides some general guidelines in building a platform to support such agility.

Table 3: Building Systems and Business Platform in Support of Agility in SJMO

Business Elements	Specific to the Case	Application to a broader context
Modularity in Application	Three systems (Cases 1,4, and 5) are fairly self-contained, while rtDashboard and ICS had built application modularity around customers (clinical units and patient room services).	While the nature of transformation may dictate the opportunity for modularity, viewing digital transformation from a customer services perspective might provide opportunities for modularization. Examples here include a digital transformation to support customer awareness, decision making, purchase (or receipt), and engagement post-sale (post-receipt).
Agility in Architecture	All systems developed have separated data from application, and new applications from current applications. They used distributed architecture, segmented applications, and supported lose coupling of individual systems (dashboard and ICS).	Distributed or federated architectures are often used to support agility by separating new from current systems. Cloud-based architectures, software-as-a-resource vendor technology, and sourcing of certain key communication and coordination systems can all help agility in explorations without modifying significantly the current architecture.
Modularity in Value Assessment	Three systems have distinct value on which to assess innovations. Dashboard and ICS have their values defined by the metrics - clinical unit operations and patient care services.	Aligning digital transformation around services delivered to a customer (internal or external) can help evaluate systems based on the value they create incrementally and mitigate risk in their implementation. Use of vendor software in digital transformation may let technology options of the software help modular value assessment of services the options supported.
Agility in the use of external resources	The case uses many external vendors in support of digital transformation and speed up transformation effort. Use of other university resources helped supplement minimally staffed IT resources.	Organizations have experience in using external technology vendors and need to leverage this experience in digital transformations. The focus today, however, is on the use of digital "new" comers whose longevity is always in doubt, and leveraging such vendors as partners needs a "lean-start-up" mindset - shorter transformation efforts, low investment early on, frequent customer feedback, and flexible delivery on focused outcomes.
Flexible governance	The leadership used a number of decision making approaches. Diligent evaluation in early warning system, make ad hoc changes in policies and technologies in exploring ICS, early use of external resources to path data to data integration for dashboard implementation	Empowered teams need flexibility is decision making and vendor relationships/partnerships. In addition, the empowered teams need to do several process/policy adjustments to assess operational changes, or value metrics (monetary, learning, relationship building, etc.) to assess viability. Focusing on commercial viability alone, when digital transformations occur frequently, defeats the purpose of creating an ecosystem that supports a culture of innovation and building organizational capacity.

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Learning Platform: Reflective Discourse to Build Organizational Capacity

When debriefing is used effectively after each transformation, it can lead to cumulative learning and can speed up future explorations. This, in turn, helps build organizational capacity. The preliminary experience with the use of an external vendor in the early warning system led to a faster start of the performance dashboard system using another external vendor. Effective use of vendor and university resources and a phased approach to bringing about business change with the performance dashboard implementation led to going forward with a more complex exploration with ICS, which used many more technologies and required a much larger cultural change among nursing and IT staff. A phased approach here allowed for IT implementation before process adaptation. All of these led to a much faster exploration of the last two transformations, even when one of them used multiple external stakeholders. Documentation developed for external recognition and weekly meetings of the BI team, headed by the CMIO, have become the place for debriefing, documentation for recognition and research, and learning that helped in successive transformations. In summary, the team that leads the explorations in transforming operations needs to play a major role in the debriefing so that future transformations can occur at a faster speed. This is even more critical when multiple leaders are playing a role in leading teams involved in the transformation – unless there are a few who can remain as permanent members of the team. Some general observations are discussed in Table 4.

Adoption platform: Bridging enabling and administrative leadership

While enabling leadership uses innovation teams and agile system and business platforms to support the exploration of new ideas that can support digital transformations, adaptive leadership relies on reflection and learnings to decide how best to move viable explorations into the organizational routines of the regular business. When explorations are occurring at a faster speed, the adoption must occur independently of the exploration and evaluation. SJMO took almost five years to use a mix of clinicians, nursing staff, and a technology vendor to validate the early monitoring system, and yet it was adopted by only some patient floors. The performance dashboard and the ICS came back-to-back for exploration and required different approaches for adoption. The early phases of each exploration were designed to support exploration, but the later phases were designed to look at the best way to adopt each of these applications and make them a part of the organizational routine. After showing promise, dashboard applications were adopted to become organizational practice much faster, while several ICS technologies and the associated digital services still were not adopted fully. Some were used by a few nursing floors (e.g. wrist monitors), and others were put on hold or abandoned for technology and people reasons (e.g. smart bed for fall risk alerts needed technology changes and changes in nursing practices, and both were difficult to implement). The medication board had a short implementation cycle (led by the nursing staff) and was adopted much faster, while RSVP implementation showed promise and is moving through expansion to other patient populations incrementally.

In summary, adoption platforms are designed to make every exploration become a part of the regular business or repository of explorations (a.k.a. R&D initiatives) for the future. However, the pace of new explorations should continue to occur on an on-going basis, if the ecosystem created is to help the hospital continue to address patient and regulatory expectations by leveraging advanced digitization. These observations are further generalized in Table 5.

Table 4: Observations Regarding Learning at SJMO

Business Elements	Specific Case	Application to Broader Context
Capturing Learning	Debriefing through reflection and discourse has been enabled by BI team acting as a cohesive unit in support of all explorations, even if the leadership varied on each project. Documentation of digital transformation for external review provided a nice venue to collect thoughts after a certain phase in each digital transformation, but having IT staff and CMIO be a permanent part of this team helped enhance this learning.	The need to explore opportunities rapidly requires a learning platform that supports reflection and documentation of practices in real time. A knowledge base that includes reports, discussion logs, etc., unless gathered frequently and easily searchable, will be ineffective. Having a select interdisciplinary group become a part of each team engaged in exploration can help capture tacit knowledge and help with any future training. Presenting the work with internal and external stakeholders can help others see the effort on multiple dimensions, even if the lead members of the team move on to another project or organization.

Conclusions and Directions for Future Research

The case study illustrated how a hospital has used five digital transformations to demonstrate its digital leadership. The five IT implementations at SJMO transformed the hospital from a community hospital in 2009 to a digital leader that leveraged new technologies to transform the way care is provided. Digital leadership helped build an ecosystem that brought together leaders and nurtured an entrepreneurial mindset (as part of the innovation platform) to support exploration. Modular and distributed system architecture and flexibility in the use of external resources and decision making helped the team to explore and evaluate new innovations to support patient services without disrupting the regular business (system and business platforms). Documentation, weekly briefings, and successive and rapid introduction of several digital services supported capacity building of the BI team (learning platform), and varying approaches were used to incorporate these services into hospital operations (adoption platform).

The observations made in Tables 2-5, which generalize the concepts around platforms, can be applied to any industry (product or service), but they may have greater applicability to the service industry. Service organizations in general experience faster change in customer expectations, low barriers for competition to enter the market, and a short service cycle – all contribute to leveraging external vendors to develop digital services at a rapid pace to meet evolving customer expectations. Specifically, the digital leadership at a hospital has some interesting parallels regarding alignment challenges with education industry (alignment between educators and administrators) and governmental organizations (alignment among multiple units of the government). Similarly, service level effectiveness extends beyond the walls of the service facility. Just as hospitals need to understand a patient's ecosystem (i.e. people around the patient who can support continuity of care after patients leave the hospital), the education industry needs to understand student ecosystem to support learning outside the classroom, and governments need to understand resident ecosystem to effectively coordinate city services.

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Table 5: Adoption Platform at SJMO		
Business Elements	Specific Case	Application to Broader Context
Flexibility of Adoption	All digital transformations at SJMO, in spite of their importance to various stakeholders, were considered for adoption after their evaluation showed promise. The timing and extent of their adoption was tailored to reflect both the need as well as their effectiveness. This deliberate process still allowed SJMO to make significant gains in building an ecosystem that allowed frequent and visible digital transformations.	Adoption research considers the implementation of an innovation a success when it is adopted by a sufficient number of individuals to generate value. Digital transformations brought into organizations at a rapid rate need not all lead to adoption, even when explorations show early promise to create value. One of the goals of rapid digital transformations is to build organizational capacity to learn and continue to innovate. Therefore, the adoption time and the extent of adoption of each digital transformation may consider multiple criteria before an organization decides when to adopt, adopt fully or partially, and for what purpose.

SJMO addressed misalignment of goals between clinical staff who control revenue generation and administration who have to manage costs using highly visible performance dashboards to support data-driven transparency and accountability. It would be interesting to see how such as approach would work in education or government. Similarly, the RSVP model has used patient support groups to track and sustain continuity of care. While online and hybrid models are used to support student ecosystems in educational settings, and smart city concepts are used to integrate technology across governmental services to support resident ecosystems, it is not clear how these service extensions support student learning or quality of service to city residents. Specific service metrics like patients readmitted or remote tracking devices are helping hospitals monitor patients at home. The challenge for the educational industry and government is to develop specific metrics and remote tracking to ensure that services delivered within their facilities can be sustained after students or residents leave the facilities that provided the service, specifically when their ecosystem cannot address learning goals or service quality needs.

References

Agarwal, R., Gao, G., DesRoches, C. and Jha, A. K. (2010). "Research Commentary - The Digital Transformation of Healthcare: Current Status and the Road Ahead," *Information Systems Research,* 21(4), pp.796-809.

Arvidsson, V., Holmström, J. and Lyytinen, K. (2014). "Information systems use as strategy practice: A multi-dimensional view of strategic information system implementation and use," *The Journal of Strategic Information Systems,* 23(1), pp.45-61.

Benner, M. J. and Tushman, M. (2002). "Process management and technological innovation: A longitudinal study of the photography and paint industries," *Administrative Science Quarterly,* 47(4), pp.676-707.

Bharadwaj, A., El Sawy, O. A., Pavlou, P. A. and Venkatraman, N. V. (2013). "Digital business strategy: toward a next generation of insights," *MIS Quarterly,* 37(2), pp.471-482.

Blanchard, K. H., Zigarmi, D. and Nelson, R. B. (1993). "Situational Leadership® after 25 years: A retrospective," *Journal of Leadership & Organizational Studies,* 1(1), pp.21-36.

Bolton, G. (2010). *Reflective practice: Writing and professional development*: Sage publications.

Cao, Q., Gedajlovic, E. and Zhang, H. (2009). "Unpacking organizational ambidexterity: Dimensions, contingencies, and synergistic effects," *Organization Science,* 20(4), pp.781-796.

Civic Impulse. (2009). H.R. 1 — 111th Congress: American Recovery and Reinvestment Act of 2009. Retrieved from https://www.govtrack.us/congress/bills/111/hr1

Cooper, R. B. and Zmud, R. W. (1990). "Information technology implementation research: a technological diffusion approach," *Management Science,* 36(2), pp.123-139.

El Sawy, O. A., Kræmmergaard, P., Amsinck, H. and Vinther, A. L. (2016). "How LEGO Built the Foundations and Enterprise Capabilities for Digital Leadership," *MIS Quarterly Executive,* 15(2).

Garcia, R. and Calantone, R. (2002). "A critical look at technological innovation typology and innovativeness terminology: a literature review," *Journal of Product Innovation Management,* 19(2), pp.110-132.

Gray, P., El Sawy, O. A., Asper, G. and Thordarson, M. (2013). "Realizing Strategic Value Through Center-Edge Digital Transformation in Consumer-Centric Industries," *MIS Quarterly Executive,* 12(1).

Hess, T., Matt, C., Benlian, A. and Wiesböck, F. (2016). "Options for Formulating a Digital Transformation Strategy," *MIS Quarterly Executive,* 15(2).

Jansen, J. J., Van Den Bosch, F. A. and Volberda, H. W. (2006). "Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators," *Management Science,* 52(11), pp.1661-1674.

Kesterson, R. K. (2014). *The Basics of Hoshin Kanri*: CRC Press.

Kim, H.-W. and Kankanhalli, A. (2009). "Investigating user resistance to information systems implementation: a status quo bias perspective," *MIS Quarterly,* 33(3), pp.567-582.

Kolb, D. A. (2014). *Experiential Learning: Experience As The Source of Learning And Development*: FT press.

Kotlarsky, J., Scarbrough, H. and Oshri, I. (2014). "Coordinating Expertise Across Knowledge Boundaries in Offshore-Outsourcing Projects: The Role of Codification," *MIS Quarterly,* 38(2).

Levina, N. and Vaast, E. (2005). "The emergence of boundary spanning competence in practice: implications for implementation and use of information systems," *MIS Quarterly,* 29(2), pp.335-363.

Lucas Jr, H. C., Agarwal, R., Clemons, E. K., El Sawy, O. A. and Weber, B. W. (2013). "Impactful Research on Transformational Information Technology: An Opportunity to Inform New Audiences," *MIS Quarterly,* 37(2), pp.371-382.

Lusch, R. F. and Nambisan, S. (2015). "Service innovation: A service-dominant logic perspective," *MIS quarterly,* 39(1).

Rickards, T., Smaje, K. and Sohoni, V. (2015). "Transformer in chief: the new chief digital officer," *McKinsey Quarterly*.

Santavicca, W. (2009). "St. Joseph Mercy Oakland," *Cath Lab Digest, URL:http://www.cathlabdigest.com/articles/ St-Joseph-Mercy-Oakland,* 17(7).

Sharma, R. and Yetton, P. (2003). "The contingent effects of management support and task interdependence on successful information systems implementation," *MIS Quarterly,* 27(4), pp.533-556.

Siebel, T. M. (2017). "Why digital transformation is now on the CEO's

DOI: 10.17705/1pais.10301

shoulders," *McKinsey Quarterly,* 4(3), pp.1-7.

SJMO Press Release. (2015). St. Joseph Mercy Oakland wins national "2015 Most Wired Innovator" award from American Hospital Association [Press release]

SJMO Press Release. (2016). St. Joseph Mercy Oakland Receives National Awards for Innovative Technologies [Press release]

Thompson, G. and Glasø, L. (2015). "Situational leadership theory: a test from three perspectives," *Leadership & Organization Development Journal,* 36(5), pp.527-544.

Uhl-Bien, M. and Marion, R. (2008). Complexity leadership Part I: Conceptual foundations. In: Information Age Publishing, Inc: Charlotte, NC.

Uhl-Bien, M., Marion, R. and McKelvey, B. (2011). Complexity leadership theory: Shifting leadership from the industrial age to the knowledge era. In *Leadership, Gender, and Organization* (pp. 109-138): Springer.

Walsh, B. (2017). *Rewriting the Rules for the Digital Age 2017: Deloitte Global Human Capital Trends*: Deloitte University Press.

Zhou, K. Z. and Wu, F. (2010). "Technological capability, strategic flexibility, and product innovation," *Strategic Management Journal,* 31(5), pp.547-561.

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JACK WEINER of JW Healthcare Concepts has led St. Joseph Mercy Oakland (SJMO), as President and Chief Executive Officer till July 2016. Under his leadership, it went through a $300 Million campus redevelopment, major cultural transformation and became the regional leader in clinical quality and safety. It went through the construction of a new Patient Tower that includes state of the art technology found in only one other hospital in the country. Prior to joining SJMO in 2003, Mr. Weiner served as President and CEO of St. Joseph's Mercy of Macomb, VP for Facility and Ambulatory Operations at St. Mary's Health Services in Grand Rapids, and President and CEO of Northeastern Hospital in Philadelphia. He received his PharmD in clinical pharmacy from Wayne State University, and a Master of Arts degree in health services administration from the University of Michigan.

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