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Innovations in Technology: Perspectives of Hospital CIOs

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Abstract

What is the message? Digital transformation in healthcare faces three key issues. First, a substantial proportion of the IT budget is consumed by maintaining multiple separate technology systems. Second, systems lack interoperability. Third, governance structures commonly limit innovation.

What is the evidence? Interviews with nine hospital-based CIOs conducted in 2019.

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Healthcare Lags in Digital Transformation

Healthcare has not yet achieved the level of digital transformation involving web services, big data, artificial intelligence, and other capabilities that has reshaped many industries. According to a study conducted by the McKinsey Global Institute, the healthcare's industry "digitization

index", a measure of digital progress, is only slightly above those of the hospitality, construction and agriculture industries.[1] In contrast, those industries leading in digital transformation, including technology, media, and finance, have used technology to create new business models for their industry. It is essential to understand why this sector lags if we are to implement the solutions needed to advance healthcare along the road of digital transformation.

The Chief Information Officer (CIO) of a healthcare system lies at the heart of the technological ecosystem for provider organizations. In this article, we explore the current state of the CIO office, particularly as it relates to its role in digital transformation. We report our findings from nine hospital-based CIO interviews conducted in 2019. These hospitals were drawn from all four U.S. census regions (Northeast, South, Midwest, and the West).

The interviews contextualize digital transformation in relation to recent historical events, trends, and current challenges. The interviews were conducted using a nine-question structured interview guide and included information on an institution's health IT-specific vision, reporting structure and strategy, and innovation. We created a rubric by which to code the free-form conversations to standardize and thus compare responses. We limited our interviews to CIOs of hospitals who had implemented certified electronic health records (EHR) according to the Office of National Coordinator for Health Information Technology.

Historical Context of the CIO Office and Factors Shaping the Current State

Three major factors are shaping current needs and opportunities for digital transformation in U.S. healthcare.

HITECH Act of 2009. First, over the last decade, the CIO's role has rapidly changed and continues to evolve. Much of this change is a direct result of the HITECH Act of 2009 and the mandate for EHR adoption. Before HiTECH, CIOs' efforts focused primarily on communication infrastructure and other technology projects. New technologies were added piecemeal as they emerged in the market or they arose from home-grown solutions, which were often developed in a decentralized fashion. HiTECH propelled the role of the CIO in the organization to one that was highly visible and touched almost all business processes.

Hospital consolidation. Second, after the pressure to install EHR systems came another

industry-wide trend that further complicated matters—consolidation of hospital systems. Mergers brought with it a need for integration of technology systems across newly formed hospital networks. However, because each EHR installation at each site was highly customized, lack of interoperability prevented integration. One CIO noted that, at one point, their physicians needed to have nine separate logins to nine different systems.

The burden of consolidation continues. Over 50% of the CIOs we interviewed listed the merger of EHR systems as a top priority in the last 12 months.

Fragmented marketplace. As the CIO's responsibilities grew, a third trend created additional pressure. The evolution of technology in other industries led to an explosion in the number of companies approaching hospitals with new digital solutions. The CIOs we interviewed found themselves increasingly hosting numerous disparate pilots sponsored by various stakeholders, all with different agendas and results. These pilots are not often well-coordinated and lack an overall strategy for dissemination and scale, as has been previously described.[2]

CIOs have adjusted to these demands – most now require an internal needs assessment before supporting a pilot project. Even still, there is a lack of standardization in how pilots test can be evaluated and supported. Many of the CIOs also expressed a need for an industry-wide set of standards to better vet technology that touches healthcare.

Taken together, the CIO's office today is a result of large-scale trends in regulation, technology changes, and industry-wide strategic shifts. Within this context, two major constraints are shaping the potential for digital transformation in healthcare – legacy systems and organizational charts.

Two Constraints: Legacy Systems and Organizational Charts

Legacy systems: the ball-and-chain for the CIOs' innovation agenda

The healthcare CIOs in our survey reported that the majority of their department's time and money were spent on maintaining their EHR systems. Our respondents suggested that 80% to 90% of the IT budget was spent on maintenance, vs 10% to 20% towards innovation and developing new technology. One CIO commented that while he spends 70% of his time thinking

about transformation, he must spend 70% of his team's resources on maintenance.

All of the CIOs reported overseeing large teams that are required to keep the EHR systems and legacy subsystems functioning at current levels. With each passing year, maintenance challenges become more daunting. One CIO stated "the cost of carrying legacy systems [i.e., electronic health records] is an unexplored and big risk for health systems. I liken it to an iceberg. There's the small, shiny white piece that is above water, and there's the big, dark, cold piece. Legacy systems are the big, dark, cold piece. And unless you are investing appropriately in them (e.g., networks and servers and data centers and upgrades and licenses) you can quickly run into trouble."

Compared to other industries, the effort spent on maintaining legacy systems has an outsized role in health care.[3] This is due to the fact that many systems in hospitals reflect older technologies that have not been updated. Newer systems are added on to older systems, creating complex workflow and technological dependencies that increase the costs and barriers to replacement.

The burden of maintenance also results in a high degree of dependency on existing EHR systems, shaping the innovation strategy of hospitals. Several CIOs mentioned that they had a narrow bandwidth for innovation that is not consistent with an EHR vendor's interests and "roadmap." One CIO stated: "If you put advanced technology in a new bucket, and leave all your old technology in a different bucket, it is a recipe for failure because you don't have your best people working on your core technology, and there's this shiny new stuff." As a result, most of the CIOs surveyed are reluctant to test new technologies.

Furthermore, there are economic disincentives to work outside of existing EHRs. Vendors use their leverage to price technology and services, leaving little room for investments in potentially competitive technologies. Many CIOs expressed concerns that adding any new systems that were not integrated with existing technology exponentially increased the burden of work and costs.

Beyond consuming time, money and energy, there is another way in which legacy systems prevent CIOs from investing in new technology. In most health systems, the EHR is based on out-of-date client-server technology, compared to the cloud-based technology that has become

the dominant foundation of digital solutions since 2010. Adopting these more modern cloud-based solutions is difficult as the older systems tether healthcare to this older technology.

Therefore, despite new requirements under 21st Century Cures Act that allow for solutions to be built along-side of the EHR, within the EHR, or from the data warehouse, most of the organizations we interviewed remain focused on within-EHR strategies.

The Organizational Chart and the Impact on Innovation

Flexible digital platforms could serve as a critical strategic asset for organizations facing new market challenges such as a shift towards value-based payment models. For this to occur, digital solutions need to be at the heart of the global strategic decisions for an organization, rather than existing as disconnected "IT projects." While most CIOs in our survey reported that they were involved with organizational strategy discussions, it was not clear whether participation led to alignment with organizational goals and mission.

Furthermore, there was substantial variability between institutions with regards to the organizational reporting structure for CIOs. While some CIOs report to their hospital Chief Executive Officers (CEOs), others report to the Chief Operating Officer (COO). At academic centers, there is also another chain of command, which is the medical school. We found that some CIOs report to multiple academic leaders such as the chancellors, deans, and provosts. One CIO summarized this variability as: "If you've seen one IT organization you've seen one IT organization." This variability speaks to the industry's overall lack of alignment between technology and strategic decision-making.

A new mechanism by which the CIO might be able to engage in business strategy has arisen with the establishment of a new hospital role, the Chief Innovation Officer. This new role has the potential to bridge the divide between organizational strategy and technology. Other organizations have created roles to offload the CIO's plate.

One CIO described such a solution: "I spend most of my time devoted to new technology. We have a separate role on our team of a chief operating officer. He spends most of his time maintaining what we already have today." Another CIO has a Chief Innovation Officer directly reporting to him. Together the two C-level executives can share resources to innovate with other leaders to solve business problems.

However, there is still a significant degree of variability in the reporting structures of chief innovation officers, similar to CIOs.[4] And despite the title suggesting the importance of the role in high-level decision-making, only 36% of innovation officers in that survey reported to the CEO.

Looking Forward

In this survey of health system CIOs, we gained in-depth insights into operational challenges faced by organizational leaders as well as the tensions between the aspirations for a digital transformation and the crushing reality of maintaining legacy systems. Consistent themes emerged around the challenges, opportunities, and needs that CIOs and healthcare organizations should consider in order to leverage new technologies.

Challenges centered on three key issues.

- The first theme is that a substantial proportion of the IT budget is consumed on maintaining multiple separate existing technology systems. This leads to an over-reliance on legacy vendors to drive the innovation agenda and represents an existential threat to healthcare organizations.
- The second theme is the lack of interoperability. Not only does this limit innovation and ensure vendor-lock, but it also becomes an all-consuming project for IT to solve during systems mergers and acquisitions.
- The third type of challenge was around governance structures. There was a wide array of reporting structures for CIOs. Ultimately, most are tasked to focus on implementing an organization’s business strategy after it has been developed, rather than helping to direct the strategy and incorporating digital transformation into the overall plan.

The CIOs we interviewed have recommendations to address some of these challenges that are well within the scope of most organizations. For example, organizations can change governance structures to prioritize innovation, such as by carving out a separate role within their office for innovation. Such a role should partner closely with the CIO so that innovation and maintenance are coordinated and balanced. Governance changes would also involve closer alignment between digital transformation and the overall business plan. Another solution was to create streamlined, standardized processes for approaching new technology so that limited resources could be used while allowing for a broader array of new solutions to be tested. In addition to

within-organization changes, the CIOs identified needs from the technology space for them to transform. These focused on a need for standardization and interoperability.

While the current study is limited by the number of interviews conducted, we believe the patterns are reliable. We observed limited heterogeneity in responses to our questions. Furthermore, we did not identify best-performing organizations for our interviews. All adapted with their limited bandwidth to their local needs, but all saw a significant opportunity to improve their experiences. We are unlikely to see any organization break from the crowd as the legacy technology of healthcare falls further and further behind the capabilities of other service industries.

Digital transformation in healthcare has many barriers. From the perspective of the CIO, these range from technologic barriers to governance structures to the competing challenges of maintenance vs. innovation. Creative solutions by CIOs have been demonstrated, but much of the innovation agenda lies outside their realm of control. At an organizational level, developing a strategy to separate technology maintenance from technology and service innovation was a key theme emerging from our discussions.

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