

DIGITAL ORIENTATIONS IN HEALTH SYSTEMS: THE CURRENT STATUS AND FUTURE WORK

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INTRODUCTION

Because of the unprecedented nature of the COVID-19 pandemic, the United States saw an unprecedented adoption of virtual care, most notably in telehealth. The critical role of technology in fighting the pandemic through effective tracking of the virus across the world is undeniable. Health systems have used existing health records systems and surveillance and monitoring applications to gather, collate, analyze, and present information to the government to make meaningful and valuable decisions to help in the pandemic. The scope of health information technologies has traditionally been limited to electronic health or medical records¹. The fact remains that some health systems are still using a set of basic functionalities rather than fully leveraging more comprehensive functionalities². The increasing prevalence of digital technology is fundamentally transforming how businesses create value.

We want to ask the questions: (1) What are the digital orientations of health systems in the post-COVID-2019 new normal? Furthermore, (2) What are the factors that may influence the digital orientations of health systems? By surveying CEOs, we obtained a data set of 124 health systems located across the United States with different characteristics, including size, region, ownership status, teaching status, revenue, number of physicians, number of hospitals, and other factors.

This study takes a cross-sectional look at health information technologies across the US. We wanted to showcase what or how are the four types of different digital orientations such as analytics-oriented digital technologies, customer-oriented digital technologies, growth, and innovation-oriented digital technologies, and futuristic or experimental digital technologies. These four differ in terms of their application, their use, and purpose.

¹ Kruse C S, Beane A. Health information technology continues to show positive effect on medical outcomes: systematic review. *Journal of medical Internet Research* 2018; 20(2):e41

² Adler-Milstein J, Holmgren A J, Kralovec P, Worzala C, Searcy T, Patel V. Electronic health record adoption in US hospitals: the emergence of a digital “advanced use” divide. *Journal of the American Medical Informatics Association* 2017; 24(6):1142-1148.

³ Kindermann B, Beutel S, de Lomana G G, Strese S, Bendig D, Brettel M. Digital orientation: Conceptualization and operationalization of a new strategic orientation. *European Management Journal* 2021; 39(5):645-657.

⁴ Gatignon H, Xuereb J-M. Strategic orientation of the firm and new product performance. *Journal of Marketing Research* 1997; 34(1):77-90.

DIGITAL ORIENTATIONS

Digital orientation as a strategic direction explains superior performance using and leveraging technology in different ways and means while keeping a view of current and futuristic options. A specific digital orientation can be examined from perspectives such as technology scope and capabilities³. Different digital orientations shape the way organizations create and adapt behaviors and resources⁴. Digital orientation with a strategic and futuristic direction will nurture and implement subsequent digitalization initiatives. As a result, digital orientation will create value beyond what is seen as the immediate returns of digital investments and direct to an unprecedented scope and degree of openness, driven by generative and unpredictable processes and contingent on the specific affordances of digital technologies as realized in other sectors⁵.

The basic step of digital orientation starts with the technologies that support the existing functions of an organization on a day-to-day basis⁶. Given that electronic health records have been well disseminated in the United States healthcare, the data-driven clinical and administrative decision making, using mining applications and tools to analyze the data captured and available from the records encompassed such an orientation. We coin this category of basic orientation as analytics orientation (AODT).

The customer-oriented digital technologies (CODT) provide technical interfaces through which customers can access services that enable standardized delivery to provide increased flexibility of access⁷. Mobile technologies, for instance, provide such access. Social media integrated tools and applications result in different avenues for the customer to reach the services. Figure 1 shows the level of AODT (mean=5.03) and CODT (mean=4.70) in the surveyed health systems.

A set of emerging technologies helps health systems to foster growth and innovation orientation (GODT). These technologies help reevaluate and reengineer several business functions, similar to the enterprise resource planning applications⁸. The underlying concept here is to be innovative in changing business functions and processes and extending these innovations across partnering businesses to

⁵ Kohli R, Melville N P. Digital innovation: A review and synthesis. *Information Systems Journal* 2019; 29(1):200-223.

⁶ Drnevich P L, Croson D C. Information technology and business-level strategy: Toward an integrated theoretical perspective. *MIS Quarterly* 2013; 37(2):483-509.

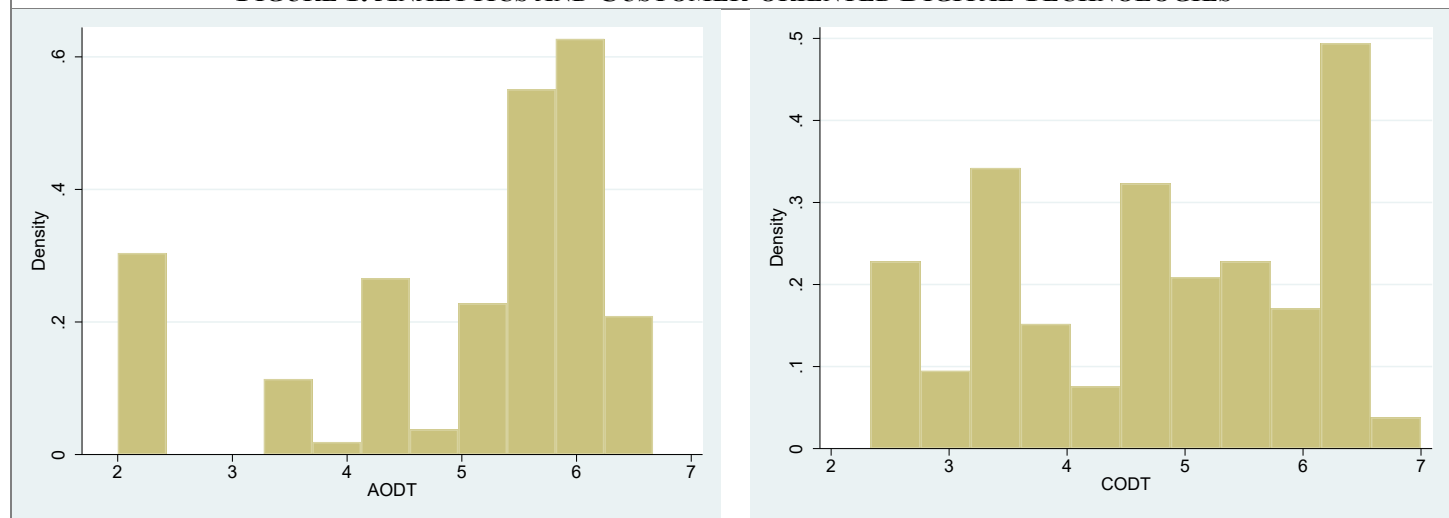
⁷ Curran J M, Meuter M L. Self-service technology adoption: comparing three technologies. *Journal of Services Marketing* 2005; 19(2):103-113.

⁸ Bagheri M, Mitchelmore S, Bamiatzi V, Nikolopoulos K. Internationalization orientation in SMEs: The mediating role of technological innovation. *Journal of International Management* 2019; 25(1):121-139.

change the value chain. For instance, information exchange with organizations helps provide just-in-time care effectively

predictably assessed like the growth-oriented technologies. Examples would include robotics applications, wearable

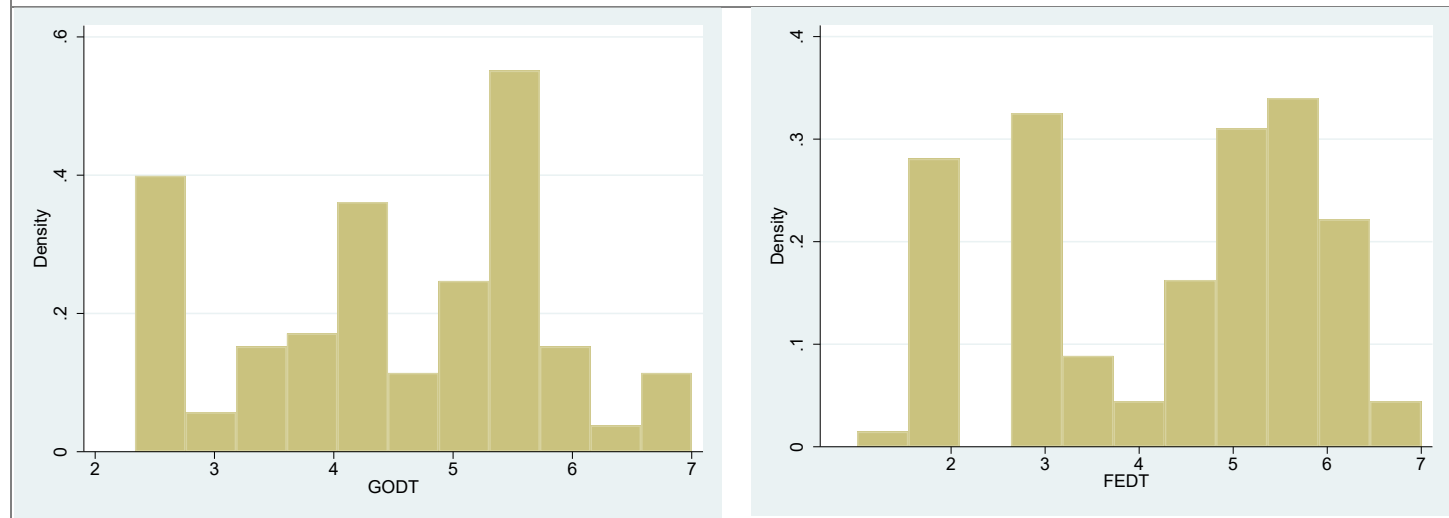
FIGURE 1. ANALYTICS AND CUSTOMER-ORIENTED DIGITAL TECHNOLOGIES



while extending care provisions across health systems⁹. Similarly, virtual and remote care models need the physician-patient diagnosis and treatment processes and workflows to be redesigned and aligned to newer value-based models than the earlier fee-based models.

chips, and tracking devices¹¹. A set of artificial intelligence and machine learning applications are also being introduced to healthcare, with some value potential, but are waiting for broader dissemination¹². Figure 2 shows the level of GODT (mean=4.54) and FEDT (mean=4.31) in the surveyed health

FIGURE 2. GROWTH AND FUTURISTIC DIGITAL ORIENTATIONS



Finally, futuristic and experimental digital technologies (FEDT) are being trialed or experimented with the potential to change the practice and delivery of healthcare¹⁰. These may not be widely disseminated, and the value may not be

systems. Delineating the current stage of the four digital orientations described above will guide strategies and policies in healthcare. The United States healthcare needs an overarching digitally enabled strategic orientation.

⁹ Chang H H, Wong K H, Chiu W S. The effects of business systems leveraging on supply chain performance: Process innovation and uncertainty as moderators. *Information & Management* 2019; 56(6):103140.

¹⁰ Scholten H, Granic I. Use of the principles of design thinking to address limitations of digital mental health interventions for youth. *Journal of medical Internet Research* 2019; 21(1):e11528.

¹¹ Cresswell K, Cunningham-Burley S, Sheikh A. Health care robotics: qualitative exploration of key challenges and future directions. *Journal of Medical Internet Research* 2018; 20(7):e10410.

¹² van der Schaar M, Alaa A M, Floto A, Gimson A, Scholtes S, Wood A, et al. How artificial intelligence and machine learning can help healthcare systems respond to COVID-19. *Machine Learning* 2021; 110(1):1-14.

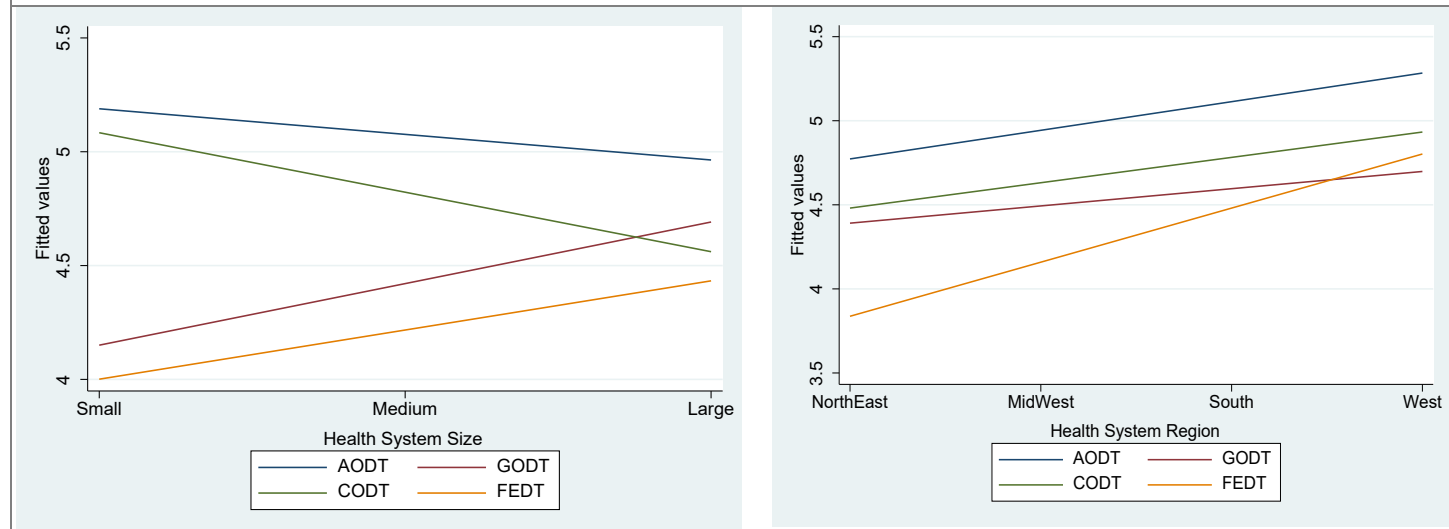
CURRENT STATUS IN HEALTH SYSTEMS

This study also examined the factors that may influence the digital orientations of health systems. The most critical four factors are size, region, teaching focus, and revenue level of health systems.

Figures 3 and 4 display the differences of the four digital orientations across the health systems with different sizes, in different regions, with different teaching focus and revenue levels.

From the left panel of Figure 3, we can see with the

FIGURE 3. HEALTH SYSTEM SIZE AND REGION AND FOUR DIGITAL ORIENTATIONS

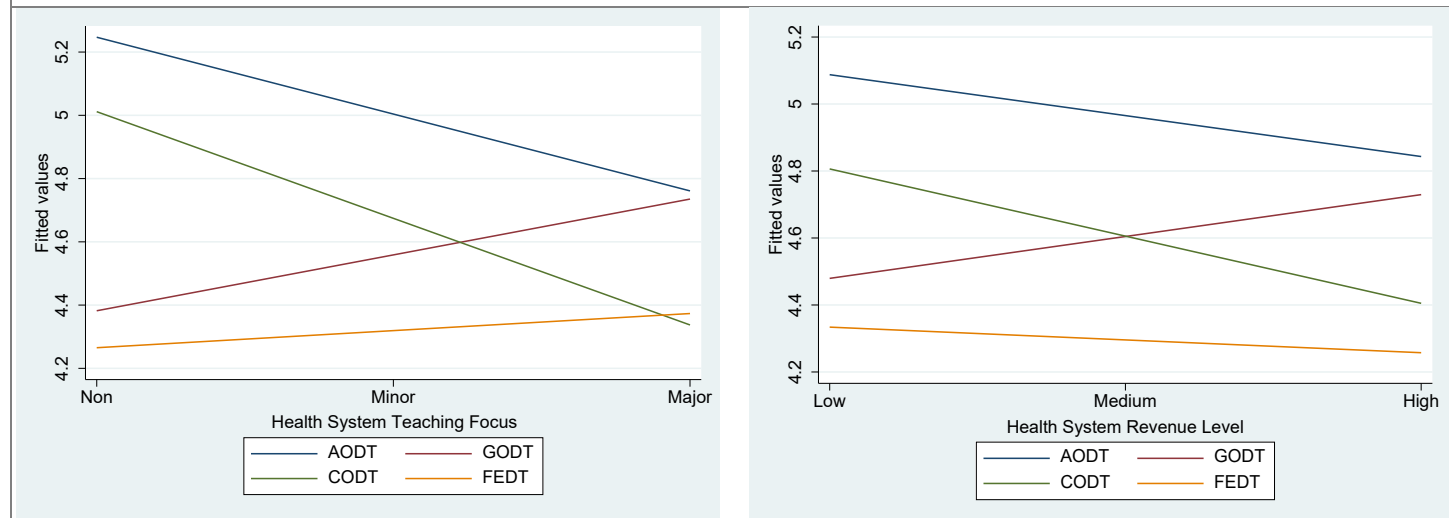


The health system's size is measured using the total beds managed by the health system across all hospitals, reported by AHRQ Hospital Compendium (small: less than 100 beds, medium: 100 to 400 beds, large: more than 400 beds). Based on their primary location in the United States, health systems are grouped into four regions: Northeast, Midwest, South, and West. There are three types of teaching status of health systems: non-teaching, teaching-minor, and teaching-major. The three revenue levels are measured using the health system's annual revenue across all hospitals (low: less than 2 billion dollars, medium: 2-5 billion dollars, high: more than 5 billion dollars).

increase of health system size; there is an increasing trend of GODT and FEDT, but a decreasing trend of AODT and CODT. It indicates that large health systems are more growth and futuristic oriented. They may want to invest more in digital technologies that can contribute to their growth and innovation and emerging technologies such as artificial intelligence.

There is a consistently increasing trend in the right panel of Figure 3 regarding the location of health systems. It seems that compared to health systems in the NorthEast region, the health systems in the West region are more digital-oriented, meaning they leverage various digital technologies for

FIGURE 4. HEALTH SYSTEM TEACHING FOCUS AND REGION AND FOUR DIGITAL ORIENTATIONS



different purposes. This may be because many leading high-tech companies are located in the West.

The left panel of Figure 4 shows that compared to non-teaching health systems, health systems with more teaching focus would invest more on GODT and FEDT, while the opposite trend is observed in AODT and CODT. A similar trend is also shown in the right panel of Figure 4 regarding the health system revenue level. With a higher level of revenue, AODT and CODT decrease, while the level of GODT increases. However, one interesting thing is that the level of FEDT shows a slight decrease when the revenue level increases. One possible reason is that health systems with a high level of revenue focus more on short-term growth than long-term futuristic technologies.

When looking at both Figures 3 and 4, we found two common things. First, there are two groups of the four digital orientations. The group of AODT and CODT, and the group of GODT and FEDT. The former is more about the basic functionalities of digital technology, while the latter involves the implementation of advanced digital technologies. We see the concerning disparities of these two groups of digital orientations in different health systems. Generally speaking, larger and richer health systems are leveraging advanced digital technologies more than their counterparts. Second, despite the increasing trend of GODT and FEDT, AODT and CODT are still relatively high. This means the digital transformation is still happening in health systems. There are still chances for health systems with smaller sizes and low revenue to make changes and reduce the gap.

FUTURE WORK

After studying the current status of digital orientations in health systems, we need to ask why there is disparity across different health systems. It is vital to have a solid blueprint at the national level to guide health systems to leverage the potential of digital transformation. A lack of consistency across health systems can aggravate or accelerate these outcomes across different health systems.

We saw that during the COVID pandemic, the different sizes of health systems are responding at a much more disparate pace, which is not good. So utilization of digital technologies around the United States has to be aligned, much more planned. This is where the policy needs to play a role by giving a, we call in the paper, a clarion call from the top level of US health systems to shape a digital strategy and plan for the entire nation, then health systems will follow that based on different mechanisms. Currently, we lack that plan.

Policy intervention and help will change the complete blueprint for the next 5 to 7 years. That is the most considerable insight and recommendation we give out of this study for future work, theoretically and practically.

CONCLUSION

We believe the digital orientation assessment will give us insights into how digital health transformation can help healthcare. We know that there are disparities in health IT adoption in terms of tools and applications being adopted by different health systems and hospitals and clinics across health care. Knowing where we stand is going to help the planning and preparation as we go ahead. And, given that COVID-19 has disrupted several things in health care and thrown up new challenges, at the same time, COVID-19 also showcased the acceleration of digital health tools and technologies, especially virtual care, remote care, telehealth kind of technologies. That has led us to think, probably proactively, we can do something to leapfrog our health IT adoption across the health care completely.

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