



Perspective

Digital transformation in healthcare: Have we gone off the rails?

**Digital transformation in industry: an exemplar for health care industry**

Globalization and the new revolution (Industry 4.0) paved the way toward the digital era that includes but is not limited to business models, smart machines, virtual-reality applications to support users, smart products and services integration, big data analytics, and value chain information—most of these activities are now being performed digitally.¹ This revolution has placed increasing pressure on businesses to change in order to adapt and thrive in competitive environments.² The process of efficient adaptation depends on the successful application of digital processes and collaborative tools, thereby, placing digital transformation in the spotlight. Within the business context, digital transformation is a concept that is strongly related to technology including big data, artificial intelligence, or data analytics, demonstrating the potential of technology to be viewed as a key driver as well as an instrument for achieving a competitive advantage. As digital transformation requires the adaptation to an ever-changing and competitive environment; it can be perceived as a driver of change and one that influences all aspects of human life based on the use of technologies.^{3,4}

Notwithstanding significant advances and even more significant potential, health care is not one of those dramatically transformed industries. A number of reasons can explain the slow pace in adopting digital innovations in health and their poor digital transformation. A study by Phichitchaisopa and Naenna⁵ draws on the principles of the Unified Theory of Acceptance and Use of Technology⁶ to identify these reasons. The main reasons include performance expectancy, effort expectancy, and facilitating conditions, which act as significant determinants to users' behavioral intention. Others have drawn on regulatory, compliance, and legal challenges that the digital health revolution is creating for the healthcare sector:⁷ the skepticism about the effectiveness of the technology⁸ and the quality of the services provided and the vulnerability of technology to risks such as cyberattacks⁹ to report a few. Not surprisingly, often decidedly nontechnological barriers are identified as major barriers to digital transformation. A study with leaders in the pharmaceutical and medical-technology industry concluded that culture and mindset, organizational structure, and governance are considered significant barriers to timely and efficient digital transformation.¹⁰

Despite these challenges, the healthcare industry now stands at a crossroad where it must achieve greater digital transformation, and the way for achieving this is by leveraging both new and existing technologies. In the process of digital transformation, healthcare organizations

have a strategic advantage as they can benefit from analyzing the digital successes and failures of organizations and companies in other industries that are further advanced.¹¹

The concept of digital transformation: lost in translation?

Since the exponential rise of technology in all aspects of life, the digital transformation is a term that has come to be used often in health care and is of increasing relevance for both scholars and practitioners in the field. Digital health has been described as an era,¹² a progression along the evolutionary path of information and communication technologies in health care. Digital health care refers primarily to the utilization of technology to improve patient care. Nowadays, the evolution of technology has been phenomenal, and it has resulted in numerous digital tools being integrated in health care ranging from using electronic medical records to track patient data, to using wearables to monitor patients' status, to using telemedicine to connect patients with healthcare professionals. As the transformation proceeds, it is expected to infiltrate additional phases of healthcare delivery, including health promotion, prevention, primary care long-term/social care, and self-care. While the concept of digital health care is somewhat explicit, the concept of digital transformation does not have a universal consensus as transformation is seen as a contractionary concept, and there seems to be little consensus about how to transform. It is also apparent in the literature that different definitions have been proposed for digital transformation, based on the different theoretical contexts. Digital transformation has been defined by Vial (2019:119)¹³ as “a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies. Stoumpos et al.¹⁴ defined the concept as “changes related to the internet, digital technologies, and their relation to new therapies and best practices for better health management procedures.” By digital transformation, Agarwal, Gao, and DesRoches¹⁵ refer to large, complex interventions, such as whole-of-hospital or multisite system implementations that involve major changes to how organizations function. A more simplistic approach has been proposed by Haggerty¹⁶ who defined the concept as the adoption of new technologies that enable a shift toward secure and high-quality care. As demonstrated by these different conceptualizations, digital transformation can be defined in various ways; however, the authors acknowledge in these definitions the healthcare system's interdependent character and incorporate the complex system perspective. Through a complex system perspective, digital healthcare transformation is defined as a planned change through

interventions such as the integration of digital tools that is difficult, complex, and challenging to implement and evaluate.¹⁷ As part of these interventions, the integration of digital solutions in health care aims to introduce a system-wide change that affects all organizations and care providers in the system and to improve the efficiency and quality of healthcare delivery and patient care with population-level patient outcomes.¹⁷

Digital transformation: necessity or simply luxury?

The complexity and width of digital transformation in health care constitute the full understating of the impact of the digital transformation a challenging one. Nevertheless, digital health has the potential to revolutionize the way healthcare is organized, delivered, experienced, and evaluated by facilitating remote monitoring, improving disease management, and providing more personalized treatment. It also provides the possibility for user-generated digital health data that can play a crucial role in medical practices and in the creation of real-world evidence as it is exercised in the current shift toward patient-centered, value-based care¹⁸ (real-world evidence). By leveraging digital tools, healthcare providers can enhance the quality of care that they provide and improve patient outcomes. This includes, for example, preventing up to 95% of adverse drug events, saving lives by improving compliance with care recommendations, and reducing the number of duplicate diagnostic tests and reducing costs by 7%–11%.¹⁹

The World Health Organization has outlined the potential benefits of digital health, including increased access to health care, improved quality and safety of health care, and increased efficiency in healthcare delivery.²⁰ Similarly, the European Commission has also acknowledged the potential of digital transformation across business and services, and hence it incorporated a corresponding regulation namely Regulation (EU) 2021/694 of the European Parliament and of the Council of 29 April 2021,²¹ establishing the Digital Europe Program and repealing Decision (EU) 2015/2240.

The Lancet and Financial Times published a Commission on “Governing health futures 2030: growing up in a digital world” where the effect of digital transformations has been acknowledged as being so pervasive that in the near future will become a dominant prism through which health and wellbeing dynamics are understood and addressed.²²

It is evident, that digital technologies are already integrated in every aspect of our lives and hence driving health transformations both directly (through their application in health systems, health care, and self-monitoring of health status and behaviors) and indirectly (through their influence on the social, commercial, and environmental determinants of health).²²

Governing digital transformation in health: the elephant in the room?

One of the main challenges for the digital transformation is posed by poor governance at any or all levels including local, district, provincial, and national. It has been demonstrated that poor governance in the process of incorporating digital health solutions can jeopardize the opportunity for smart and strategic investment decisions to be effectively and efficiently implemented. It is therefore pertinent for digital transformation to acquire a comprehensive approach to digital health and one which requires sound governance for successful nationwide sustainable deployment. In the absence of clear governance structures, policies, and processes, the roles and responsibilities are blurred, which results in fragmentation, wastage of resources, duplication of efforts, nonstrategic investment decisions, and a lack of common standards.²³

The World Health Organization provides guidelines and recommendations to assist member states in the continued development of national and regional digital health governance systems and governance frameworks, which seek to deliver step-by-step rubrics and evidence of efficacy

for many digital health governance system components. Ricciardi et al.²⁴ stress that such frameworks for the governance of the digital transformation of health services should also generate the evidence required for decision-making on stimulating, using, and/or funding digital health strategies at various levels in the healthcare system. The authors propose that the Transparency Accountability Participation Integrity Capacity (TAPIC) framework is a rigorous one that identifies five areas of governance: transparency, accountability, participation, integrity, and capacity.²⁵ The framework can therefore provide priority areas within these five categories that any public body will want to think about when considering their governance arrangements.²⁴

Good governance for digital health aims to strengthen the capabilities and skills needed for countries to promote, innovate, and scale up digital health technologies.²⁶ The pillars of a good digital health governance are based on accountability, transparency, rule of law, responsiveness, equity and inclusiveness, effectiveness, efficiency, and participation, as well as confidentiality.²⁷ These pillars create the conditions for better stakeholder coordination and the instigation of policies that enable solutions and investments, avoid duplication and fragmentation, and harmonize efforts. In turn, these conditions improve the functioning of health information systems to support broader health goals and can transform the way health care is delivered.²³

The Lancet and Financial Times Commission on “Governing health futures 2030: growing up in a digital world” has set the primary goal of digital health governance, which should be to address the power asymmetries reinforced by digital transformations, increase public trust in the digital health ecosystem, and ensure that digital technologies and data applications are utilized with the purpose to support public health and universal health coverage.²² The commission clearly places great emphasis digital health governance and identifies it as one of game-changers for shaping health futures in a digital world. In this light, the report stresses the need to build a governance architecture that creates trust in digital health by enfranchising patients and vulnerable groups, ensuring health and digital rights, and regulating powerful players in the digital health ecosystem.

Conclusions

The healthcare industry continues to evolve and transform within a rapidly developing digital environment that constantly includes the emergence and implementation of new technologies. Digital health provides extensive ways to better support the current and future needs of healthcare professionals by for example analyzing the massive amounts of recorded patient's data that are generated by high-tech devices from multiple sources or by utilizing digital interventions within the care pathway. There is an urgent need to scale digital solutions that both digitize the front-end of care and augment the back-end to address healthcare's biggest challenges and improve outcomes. Digital transformation is not however without its challenges and these include both technological as well as non-technological issues. Poor governance of digital transformation is among those significant non-technological challenges that warrants actions on local, district, provincial, and national level. Despite its complexity and multi-level challenges, digital care can transform disease-centered services toward patient-centered services. This requires coordinated and systematic efforts within the context of the healthcare industry so that the right conditions for optimal digital transformation are generated.

Ethics statement

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Declaration of competing interest

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