

Digital transformation of healthcare organizations: key issues and research opportunities

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Abstract

Digital Transformation (DT) of healthcare organizations has gained an unprecedented interest (Agarwal et al., 2010; Marques & Ferreira, 2020), demonstrating substantial contributes in increasing their efficiency (Ko et al., 2019), in enriching their service delivery (Oborn & Barrett, 2016), but most importantly impacting the overall quality of care (Bardhan & Thouin, 2013). The Covid-19 pandemic deeply affected the perception on the urgency and relevance on DT, especially in the political and practitioners' debate (Peek et al., 2020; B. K. Scott et al., 2020; Sust et al., 2020). A literature review was conducted to identify the main themes, issues, gaps and opportunities concerning DT in healthcare organizations. The literature is clustered in four main areas of research which contribute to explain the phenomenon of DT from a managerial and organizational perspective: 1) culture; 2) practice and routines of health professionals; 3) organizational structures and configurations; 4) performance. DT, as well as the single organizational "domains" involved in the transformation process. Trends and gaps were identified: overall, managerial and organizational issues have started to be debated only recently while scholars agree that many research gaps in these filed still have to be fully addressed (Agarwal et al., 2010; Arora, 2020; Jandoo, 2020; Kraus et al., 2021; Rieke et al., 2020).

Introduction

Digital Transformation (DT) of healthcare organizations has gained an unprecedented interest (Agarwal et al., 2010; Marques & Ferreira, 2020), demonstrating substantial contributes in increasing their efficiency (Ko et al., 2019), in enriching their service delivery (Oborn & Barrett, 2016), but most importantly impacting the overall quality of care (Bardhan & Thouin, 2013).

Covid-19 pandemic deeply affected the perception on the urgency and relevance of DT of healthcare, especially in the political and practitioners' debate (Peek et al., 2020; B. K. Scott et al., 2020; Sust et al., 2020). At the very beginning of the pandemic, digital technologies were perceived as useful allies to health practice: for instance, telemedicine services were employed to carry out non-urgent medical activities in the context of reduced mobility (Gunasekeran et al., 2021); AI (more specifically, computer vision) supported the diagnosis of interstitial pneumonia caused by Covid-19 (Bhargava & Bansal, 2021).

The perception of health professionals and citizens/patients, who were subject to a “forced” exposure to digital technologies, therefore changed dramatically. According to the data gathered by the Digital Health Observatory at Politecnico di Milano¹:

- The percentage of specialized physicians in Italy who performed tele-visits increased from 13% (prior to Covid-19 outbreak) to 26% (in 2022)²;
- The percentage of citizens who knew what the national Electronic Health Record (EHR) is increased from 21% to 55% (from 2019 to 2022), while, in 2022, 82% of chronic patients is aware of the existence of such technology.

In the United States, between January and June 2020 30.1% of all medical visits were performed online through Telemedicine (Patel et al., 2021).

Not only the perception of final users has changed, but also the attention of the policy makers. In Italy, several reforms from 2020 introduced reimbursement mechanisms and regulations for the use of digital technologies in the health domain (e.g. National Guidelines on Telehealth³). Moreover, the National Recovery Plan⁴ established several investments (e.g. 1 billion € for the implementation of telemedicine, around 1.6 billion € for the revision of the national EHR). Reforms and investments seem to be going in the same direction across Europe (“Hospital Future Act”⁵ and “DiGA”⁶ in Germany, “Healthcare Innovation Strategy”⁷ in France), USA (“Telehealth Program”⁸), Japan (“SAKIKAGE”⁹), etc.

Although much effort has been put in research, investments and regulations, still much needs to be done to achieve systematic DT within the healthcare domain. Digital technologies need to be integrated into healthcare organizations as a part of a vaster process of transformation embracing organizational structures, routines, activities, processes and culture. This gap is confirmed by the research performed by the Digital Health Observatory, which highlighted the need of health professionals for a more structured and clear organization of their working activities, as well as a need from healthcare managers to design new processes and networks in which digital solutions play a pivotal role.

¹ <https://www.osservatori.net/it/ricerche/osservatori-attivi/sanita-digitale>

² Data referred to the percentage of specialized medical doctors who have performed at least one Tele-visit during the year before the administration of the survey.

³ https://www.ordinemedicilatina.it/wp-content/uploads/2020/06/C_17_publicazioni_2129_allegato.pdf

⁴ <https://www.governo.it/sites/governo.it/files/PNRR.pdf>

⁵ <https://www.elysee.fr/admin/upload/default/0001/10/878189f8b95f7905f5b4ecf540701a425e615cdf.pdf>

⁶ https://www.bfarm.de/EN/Medical-devices/Portals/DiGA/_node.html

⁷ <https://www.elysee.fr/admin/upload/default/0001/10/878189f8b95f7905f5b4ecf540701a425e615cdf.pdf>

⁸ <https://www.usac.org/about/covid-19-telehealth-program/>

⁹ <https://apacmed.org/content/uploads/2021/01/APACMed-Digital-Health-Regulation-in-APAC.pdf>

The World Health Organization confirms that: “Training, technical support and favourable organizational arrangements are critical to sustained service provision”¹⁰.

From a scientific viewpoint, DT in healthcare still poses interesting opportunities of theorization. Firstly, due to its peculiar characteristics, the healthcare sector represents a challenging empirical setting to stretch existing DT theories: it is both a public and private industry, where regulation is often determinant for decision making (Saltman, 2012); typically the final recipients of healthcare services do not coincide with payers (Walshe, 2016); patients cannot be understood in terms of “merely” customers, as *health* is hardly perceived as a consumer good (Ellwood, 2009); health professionals are experts in their field, part of complex organizations (often defined as *professional bureaucracies* (Mintzberg, 1993)), where managerial decisions are difficult to mandate, especially when concerning the introduction of digital solutions (Venkatesh et al., 2011).

Research objectives

A literature review was conducted to identify the main themes, issues, gaps and opportunities concerning Digital Transformation in Healthcare (DTH).

The phenomenon of DT was investigated in relation to *healthcare organizations*. Many qualifications on the concept of organization were considered, such as Galbraith & Kates, 2010; Mintzberg, 1993, 1993; W. R. Scott & Davis, 2015. According to the seminal work by Puranam (2018), who employed a microstructural perspective, four key features are common to these definitions: “a system which 1) has multiple agents, within 2) identifiable boundaries and 3) system level goals, towards which 4) the constituent agent’s¹¹ effort make a contribution”. The definition is broad by nature and it includes big private multinational companies, as well as universities, associations and ecosystems. Within the healthcare industry, the choice was made to primarily investigate organizations which deliver (or directly manage) healthcare services, such as hospitals, Local Health Authorities, Regions, etc., considering the dynamics involving the *agents* within them, such as health professionals and management staff.

Given the vastity and numerosity of scientific works that have been published in the recent years, the aim of this review is not to provide a synthetic view of *all* the extant literature.

¹⁰ WHO: “Implementing telemedicine services during COVID-19: guiding principles and considerations for a stepwise approach”, republished without changes on 7 May 2021 (originally published on 13 November 2020)

¹¹ Defined as “entity capable of action” and interchangeably used with “actor” and “individual”

However, through a pragmatic approach, this review will identify key pieces of research which help to identify the main relevant areas related to the overall issue of DT in healthcare organizations.

Background

Addressing the topic of DT requires to clarify the differences with its conceptual “neighbors”, such as *digital innovation*.

Among the various definitions, *innovation* was defined as “an idea, practice or new object that is perceived as new by an individual or other unit of adoption” (Rogers, 2003). It can also be understood as “the process of bringing new inventions to use” (Schön, 1967). The definition of Christensen et al. (2004) adopts the company as viewpoint of innovation, as it is defined as “anything that creates new resources, processes or values, or improves a company’s existing resources, processes or values”. There is also an explicit reference to innovation as enabler for improvement, i.e. something that allows to reshape an object, a process or values.

When digital technologies are introduced along with the concept of innovation, we can refer to *digital innovation* as a “digitally-driven innovation”, which is, innovation in which digital technologies are pivotal drivers.

However, the healthcare sector has several distinctive characteristics, which affect the process of innovation. According to Barlow (2017):

- The boundaries between technological and service innovation are often blurred, as technology very often impacts organization and processes;
- The complex regulatory environment, which strongly impacts the adoption of new technologies, and the peculiar culture of healthcare professionals, who sometimes are reluctant to innovation (or in other terms, “risk-adverse”); this is also true for private healthcare providers, which still must align with regulatory standards also when introducing technological innovations;
- The political systems underlying the management of healthcare organizations, affecting their governance, for instance, through political cycles;
- The complexity of healthcare organizations themselves, where professionals have a strong role in defining practices along with management.

The concept of *digital transformation* takes several steps forward, although its definition is still very much debated into the literature. According to Gong and Ribiere (2021), DT consists in “a

fundamental change process, enabled by the innovative use of digital technologies accompanied by the strategic leverage of key resources and capabilities, aiming to radically improve an entity and redefine its value proposition for its stakeholders”. In this view, the focus is on the entity of change, both as internal and external outcomes (even “societal”, as outlined by the authors). In this sense, Appio et al. (2021) focus on three levels of analysis, in order to assess: (a) the macro-level (changes in the external environment) (b) the meso-level (changes at firm-level, impact processes, business, models, etc.) (c) the micro-level (affecting individuals’ and teams’ behaviors).

In their review, Hanelt et al. (2021) assert that the two “aggregated thematic patterns” of DT, malleable organizational design and digital business ecosystems, summarize the concept of DT itself, which in their vision focuses on “the substance of contemporary organizational change” (Armenakis & Bedeian, 1999).

Methodology

To conduct the literature review, a systematic approach was adopted for searching relevant publications and a conceptual review for the analysis of the results.

Scopus® was used as main database for articles search. In particular, a generic word related to the healthcare sector was chosen (“health*”, instead, for example, of “healthcare”) to include all possible results related to the empirical setting. To address the theoretical background, the keywords “digital transformation” were not exclusively used, as many records could address the issue using different nuances and terminologies. Therefore, the choice was made to use digital technologies as keywords to find records addressing the implications of their employment in the healthcare sector and then allow the screeners to assess whether the specific record concerns DT.

Therefore, the following keywords were used:

TITLE-ABS-KEY (digit* OR "e-health" OR ehealth OR mhealth OR "m- health" OR ict OR "information and communication* technolog*" OR "information- communication* technolog*" OR "informat* system*" OR telemedicine OR "tele- medicine" OR telehealth OR "tele- health" OR "artificial intelligence" OR ai OR "machine learning" OR ml OR analytics OR blockchain)

AND TITLE-ABS-KEY (health*)

Moreover, the following restrictions were applied in the search phase:

- publications after year 2000 were considered (as also outlined by Agarwal et al. (2010), researching from year 2000 gives the possibility to address the topics in terms that are comparable with today's state of the art);
- the research was restricted to articles and reviews;
- the fields of Business and Social Sciences were considered;
- publications in English were considered.

This search produced 18,710 publications. The last update of this search was made on August 22nd 2022.

The high number of records required a rating filter to prioritize (although not excluding *a priori*). The Academic Journal Guide 2021 (AJG¹²) was chosen as criterion, selecting publications rated as 4 and 4*. The AJG was chosen as it is based both on quantitative and qualitative information, therefore including journals that are possibly “new” and therefore would not meet a merely quantitative criterion.

In the final phase of the search (and also during the conceptual review), other articles were introduced, considering also other criteria for ranking (mainly Scopus SJR®).

The process of selection was performed on a database, which encompassed the features highlighted in Table 1.

Table 1: Database form for screening phase

ID	Identification Code
Authors	List of authors
Title	-
Year	-
Source Title	Name of the Journal
Volume (Issue)	Volume reference
Document Type	Article/review
Number of citations	Number of citations counted on Scopus
Abstract	Summary of the content
Excluded in abstract screening phase	Yes, No, Not Sure
Motivation	Motivation for exclusion
Excluded in full text assessment phase	Yes, No
Motivation	Motivation for exclusion

¹² <https://charteredabs.org/academic-journal-guide-2021/>

The following criteria were used to assess whether article should be included in the conceptual review:

- i. They deal explicitly and primarily on DT of healthcare organizations, meant as the transformative process generated by the application of digital technologies within healthcare organizations;
- ii. They have as unit of analysis healthcare providers (meant as organizations and individuals working within a healthcare organization).

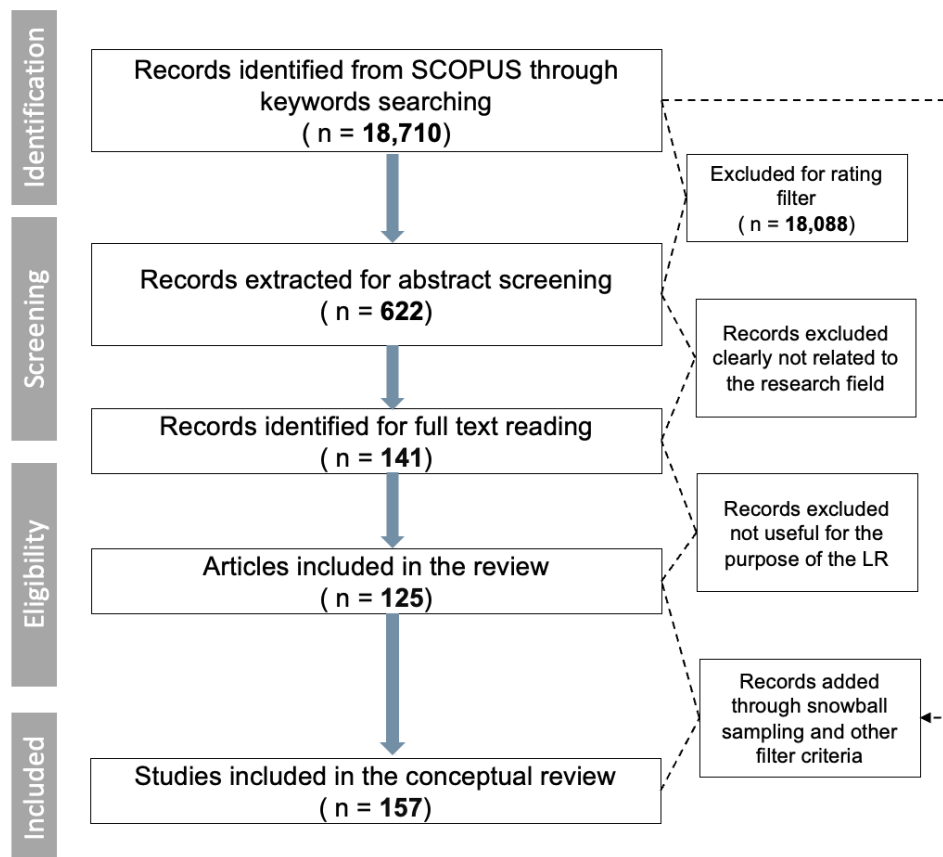
The following criteria were used instead to determine whether article should not be included:

- a) Specularly to *i.*, publications found on Scopus not dealing with digital technologies (e.g. they were cited in the abstract but they were not the focus of the research) and publications not dealing with the healthcare sector (e.g. which were in the database as health was cited in the context of “occupational health”, or e.g. the focus was not primarily on the healthcare sector);
- b) Specularly to *ii.*, publications not focused on healthcare providers/organizations were not considered. These included:
 - Pharmaceutical / Biotech / MedTech companies and more in general, the process of pharmaceutical / biotechnological R&D;
 - Sustainability issues and their implications considering the application of digital technologies in the healthcare sector;
 - Supply chain in healthcare;
- c) Publications addressing primarily the perspective of patients (not related to their recurrence to healthcare services, such as articles falling into the domain of “Internet information research”);
- d) Publications whose aim was to assess health outcomes (from a medical perspective);
- e) Publications whose aim was to produce new technologies, i.e. having a specific technical connotation and few managerial implications.

Criteria c), d), e), f) were not applied *a priori*, but they were defined during the process of screening, also considering the structure and rationale of the conceptual review.

Figure 1 shows the PRISMA chart, which synthetically describes the screening process.

Figure 1: PRISMA Chart

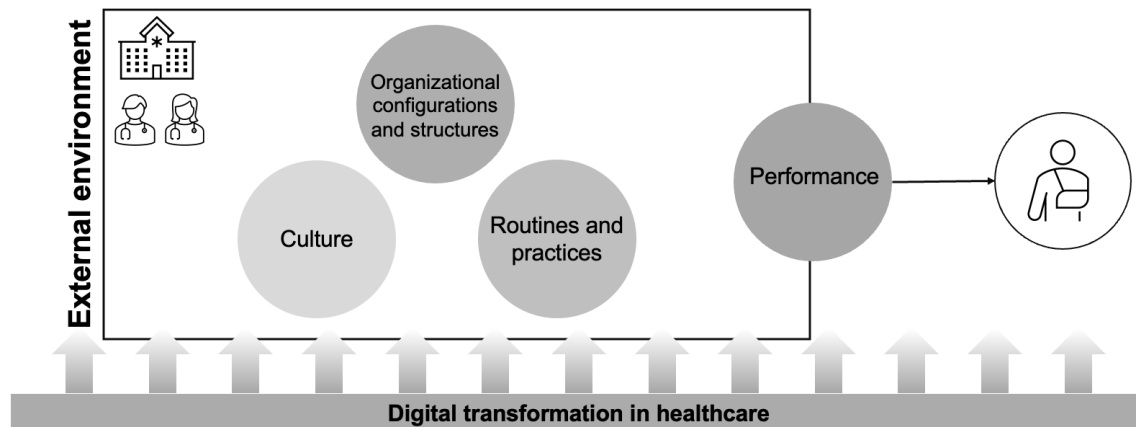


Results

The literature deepening the DT of healthcare organizations (as defined in the previous paragraphs) can be clustered in four main areas of research: 1) culture; 2) practice and routines; 3) organizational structures and configurations; 4) performance (Figure 2).

The analysis hereby presented is related to the work conducted by the authors *so far*: a more comprehensive analysis is to be performed in the next months including a greater number of scientific works, which will contribute to refine the overall analysis.

Figure 2: Main areas of research which contribute to explain digital transformation in healthcare



Source: own elaboration

Culture is considered a success factor for both the adoption and usage of a digital solution within healthcare organizations (Aarts et al., 2004; Ash, 2004; Venkatesh et al., 2011), as it strongly influences the perception of healthcare workers towards digital technologies (Callen et al., 2007). However, the importance of addressing the cultural issue with a multi-group/multi-level approach has been pointed out as key for understanding its dynamics: a distinction was made, for instance, among the individual (health professional), the managerial and the organizational levels (Callen et al., 2007). At managerial level, the introduction of digital solutions is usually perceived with favor (Doolin, 2004). However, at professionals' level, the culture of healthcare professionals is affected by the cognitive schema which are characteristic of their training and experience. This professional culture has a relevant impact on their perception of how contact with patients should take place, as well as the autonomy and power that they should enjoy within the boundaries of their professional activities (Labianca et al., 2000). Culture is also a key issue beyond the implementation phase, as some scholars identified the concept of *avoidance* referring to the preference of health professionals not to engage with digital solutions despite their substantial convenience (Kane & Labianca, 2011). The literature on culture points out how peer influence could play a pivotal role, for instance through the nurturing of “organizational champions”, who motivate colleagues and experiment new practices (Hendy & Barlow, 2012).

The literature agrees that DT has a relevant impact on **health professionals' practices and routines** (Mort et al., 2003; Nickelsen & Elkjaer, 2017; Oudshoorn, 2008, 2009). These variations have common features with some specificities according to the technology/service

which is introduced in health practice. For instance, It has been seen that health professionals who use telemedicine services must (Nicolini, 2007): a) redistribute their tasks among human and technological agents; b) revise accountability principles; c) reconfigure relationships with all actors involved. Concerning, in particular, relationships among physicians and nurses, it has been investigated how telemedicine imposes greater accountability, direction and responsibility to the nurses (Nickelsen, 2019). Researchers have also investigated task redistribution with non-human agents and decision-support systems constitute explicative cases: these systems support clinicians in making decisions based on large availability of data, but pose challenges in terms of accuracy, errors and conflict among the suggestion of the machine and the decision based on medical experience (Jussupow et al., 2021).

DT requires changes in **organizational structures and configurations** of an healthcare organization (Li & Benton, 2006), which can choose to adapt according to different functional models in order to cope with the relative issues. For instance, a management team constituted of IT professionals could be established to guarantee functional knowledge (Abraham & Junglas, 2011). Configurational decisions also include adjustments in staffing of health professionals, due for instance to the acquisition of new knowledge or to decisions related to different task allocations (Li & Benton, 2006). Finally, DT allows for new forms of inter-organizational networks, which allow multi-sided management of healthcare processes and distributed provision of services, whereas choices at macro level can influence coordination mechanisms among the actors in the network (King, 2013).

Scholars have investigated how DT influences the **performance** of healthcare organizations and many (also conflicting) studies have allowed to identify the main areas of impact, which are hereby explained through explicative examples:

- *operational efficiency*: telemedicine reduces congestion in emergency rooms (Sun et al., 2020);
- *clinical decision-making efficiency*: AI allows faster and more precise decisions by clinicians (Laker et al., 2018);
- *quality of care*: big data analytics are linked with better health outcomes, such as readmission rates and patient satisfaction (Wang et al., 2019).

The literature agrees that technology only is not a sufficient explanatory factor for improved performance, as capabilities, skills and organizational resources play a pivotal role for their successful exploitation (Wang et al., 2019).

Gaps and research opportunities

The main gaps identified in the considered literature are synthesized in Table 2.

Table 2: Gaps identified in the analyzed literature

Domains of DT	Research gaps
Culture	<ul style="list-style-type: none"> • The domain of culture was addressed through both qualitative and quantitative research methodologies, but mixed approaches could add further elements to the issue. • Organization-specific samples do not always allow for the generalization of results; therefore, larger, longitudinal and multi-center data could contribute to stronger evidence.
Health professionals' practices and routines	<ul style="list-style-type: none"> • The literature on this issue very often takes a social/behavioral perspective. Approaches based on managerial and organizational perspectives are needed to generate applicable insights for practitioners. • Studies in this area often have a solid theoretical background, which has allowed for theory stretching through the case of DT in healthcare. However, the specificities of each process of DT requires for new studies to untangle the new challenges of technological developments and continue to provide not only theoretical but also practical tools for management.
Organizational structures and configurations	Few studies investigate the area of organizational structures, meant as the design of organizational tasks, networks and responsibilities and ultimately their formalization. Studying this perspective would allow to understand how organizational design choices change with DT.
Performance	<ul style="list-style-type: none"> • Research in this area is prosperous, but technological development, along with increasing complexity, still require for new evidence on the performance effect of DT of healthcare organizations. • Unitary frameworks to understand how performance of healthcare organizations is affected by DT are underdeveloped.

The scientific debate on digital transformation in healthcare has mainly had technical and medical connotations: managerial and organizational issues have started to be debated more recently and scholars agree that many research gaps still need to be addressed (Agarwal et al., 2010; Arora, 2020; Jandoo, 2020; Kraus et al., 2021; Rieke et al., 2020). Considering this perspective, a conceptual shift towards digital transformation rather than “innovation” or merely application of digital technologies could provide management scholars a significant field to contribute to.

Addressing the literature in DTH has allowed not only to gather the main elements in the scientific debate on a complex issue, but to assess the complexity of the issue itself: the many

facets of DTH were addressed with specific theoretical backgrounds, referring to specific research areas, and resulted in a debate which has taken a “silos” configuration. Multi-disciplinarity is key to have an overall understanding of the phenomenon of DTH, which encompasses all the disciplinary fields of management, but also the areas of computer engineering, medicine, health psychology, etc.

Moreover, research on DTH is very often based on non-mature projects under an implementation point of view, which was due to the sector historically lagging behind in embracing digital transformation. Even when mature projects are analyzed in the literature, they are usually small sized and micro-context specific (Cannavacciuolo et al., 2022; Hashiguchi, 2020; May et al., 2001).

The transformation which we are witnessing nowadays (briefly described in section 1) allows us to tackle even more complex phenomena, which poses new challenges for researchers to stretch the existing theory and provide new applicable practical insights for today's practitioners and policymakers.

Finally, there is much room for contribution and collaboration between the academic arena and practitioners to generate useful and actionable insights and fully exploit the potential of DTH (Burton-Jones et al., 2020; Cameron et al., 2011).

Limitations of this review and suggestions for future research

The authors are aware of the main limitations of this review. As previously stated, the aim is not to provide an analysis of *all* the extant literature on the issue of digital transformation in healthcare, which would require to analyze several thousands of publications. However, the pragmatic approach adopted in this review allowed to identify some key issue, gaps and trends with respect to this research area.

The authors call for confrontation with different literature review with different approaches. In particular, a bibliometric analysis would be interesting to allow to consider a larger number of publications and provide further insights.

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