REVIEW ARTICLE

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The Digital Transformation of Healthcare in The Digital Economy: A Systematic Review

Pongsakorn Limna [ID]

Rangsit University, Pathum Thani, Thailand

Corresponding author: Pongsakorn Limna (e-mail: pongsakorn.l65@rsu.ac.th)

ABSTRACT This review article aimed to assess the existing literature regarding the digital transformation of healthcare in the digital economy. The review employed narrative synthesis. Moreover, this systematic review made use of a number of databases, including EBSCO, Google Scholar, Scopus, Web of Science, and ScienceDirect. The documentary method and content analysis were used via systematic review to analyze the data. The review of literature suggested that digital technologies have the potential to improve healthcare delivery, enhance patient outcomes, and increase access to healthcare services. The studies reviewed in this article demonstrate that digital transformation in healthcare can lead to improved efficiency, reduced costs, increased patient satisfaction, and better patient outcomes. The use of digital technologies such as telemedicine, electronic health records, wearables, and mobile health applications has already started to revolutionize healthcare delivery. However, the adoption of these technologies is not without its challenges, including privacy and security concerns, regulatory barriers, and resistance from healthcare providers. It is therefore important for healthcare organizations and policymakers to address these challenges and implement strategies to ensure the effective integration of digital technologies into the healthcare system. Overall, the findings suggest that the digital transformation of healthcare is a critical area of research that has the potential to significantly transform the healthcare industry and improve health outcomes for individuals and communities.

INDEX TERMS Digital Economy, Digital Transformation, Healthcare, Technology

I. INTRODUCTION

In the digital age, globalization is taking on a new form, characterized by the proliferation of the Internet and mobile communication technologies, and the advancements in information and communication technology (ICT). The computer and other innovative ICTs are essential technological features of this new era of globalization, linking the world into a unified communication system and generating a cohesive financial and information landscape [1, 2]. The economy, at present, is ripe with new and emerging forms of consumption. These are the result of a convergence of technological, economic, and sociocultural phenomena that are currently reshaping traditional forms of commercial exchange [3]. The digital transformation of healthcare entails the adoption of digital technology to improve healthcare delivery and address medical challenges faced by society. It encompasses the internet, digital technologies, and their role in developing innovative solutions and best practices for effective health management.

The massive amounts of data collected can be analyzed through quality control measures to enhance patient well-being and reduce service costs. Overall, the digital transformation of healthcare is a critical process that can improve the quality of healthcare services, promote innovation and efficiency, and ultimately enhance the well-being of patients [4].

The current public health priorities revolve around four significant components, namely, human capital, economy, infrastructure, and modern technologies. Among these components, the digital economy is considered a vital factor in promoting financial and economic development at the national level. It has the potential to transform existing economic relations and business models and is closely linked to the digitization of healthcare and other economic sectors. The digital economy program is aimed at improving people's quality of life by producing high-quality goods and services using the latest digital technologies. Therefore, the health sector is an essential area of focus for the program's objectives, given its critical role in promoting public health and well-being. [5]. Furthermore, technology is advancing rapidly across various sectors, making businesses and services more accessible, efficient, and consumer-friendly. The healthcare industry is a prime example of this transformation. The COVID-19 pandemic has accelerated this trend, resulting in more physicians and clinicians utilizing technology to meet the evolving needs of patients in

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ways that enhance outcomes, access, equity, efficiency, and affordability. Telehealth technology is one such innovation that enables healthcare organizations to provide individualized care to patients, leading to a personalized experience that fosters better health outcomes for individuals and populations. In today's world, people are increasingly demanding tailored experiences, not just in healthcare but across all aspects of their lives. Telehealth and other technological advancements enable health systems to extend clinician visits and services seamlessly to more communities, reducing the amount of unpaid time that people take away from work to see a doctor. This shift could make a significant difference in people's lives by allowing them to receive necessary care while still meeting their daily needs. [6]. The ongoing digital revolution ushers in a new era of healthcare delivery. Traditional, hierarchical face-to-face healthcare is currently being transformed by associated structural and ideological changes, as well as patient empowerment [7].

eHealth, which stands for electronic health, refers to the use of ICT in health-related services and processes. It has become a critical component of modern healthcare systems worldwide, covering a broad range of applications such as electronic health records, electronic medication (eMedication) management, and telemedicine-related services. Telemedicine involves providing or supporting health services via ICT when patients and healthcare providers are not in the same location. In this context, ensuring the secure transmission of sensitive medical data in various forms, including text, sound, and images, is crucial for medical prevention, diagnosis, treatment, and follow-up. [7, 8, 9]. Telemedicine is a promising solution for providing supportive care to mildly ill patients while limiting their exposure to other acutely ill patients. The only risk for telehealth users is being affected by computer viruses. Telemedicine services are generally covered by most health plans and large employers. Healthcare providers who have embraced telemedicine for an extended period may feel a sense of accomplishment. However, it is not the time for the telemedicine community to be complacent or claim victory. While recent events have shown the effectiveness of extending health resources via telemedicine to those in need of care, regardless of distance or time constraints, it is also important to reinforce the safeguards that ensure safe and effective medical care [10].

The digital transformation of healthcare in the digital economy is an area of research that is rapidly evolving and has the potential to enhance the quality and accessibility of healthcare services. This review article aimed to assess the existing literature on the digital transformation of healthcare in the digital economy. Narrative synthesis was used in the review. Furthermore, this systematic review drew on a variety of databases, including EBSCO, Google Scholar, Scopus, Web of Science, and ScienceDirect. The terms used in the searches were "digital transformation in healthcare," "electronic health (eHealth)," "digital healthcare," "technology in healthcare," and "telemedicine." Studies that

(1) studied the digital transformation of healthcare in the digital age, (2) were published between 2015 and 2023, and (3) were written in English met the inclusion criteria. To analyze the data, the documentary method and content analysis were used in conjunction with a systematic review. Through a thorough evaluation of the literature, this review article contributes to the existing knowledge on the topic and emphasizes the importance of digital transformation in healthcare. Also, this article can guide future research and provide a better understanding of the digital transformation of healthcare in the digital economy. The findings of this review can be valuable to healthcare administrators, directors, and providers in formulating appropriate strategies to improve care and services that cater to the needs and expectations of patients.

Wang et al. [11] emphasize the importance of eHealth literacy among older community-dwelling individuals for their health outcomes. The study highlights the mediating roles of self-efficacy and self-care ability in the relationship between eHealth literacy and health promotion behaviors. These findings provide insights into the potential of eHealth literacy to indirectly influence health promotion behaviors through mediating factors. The study's chain mediation effect also suggests that interventions targeting enhanced eHealth literacy among older adults should address improving their self-efficacy and self-care ability. Overall, this study underscores the importance of addressing eHealth literacy among older adults living in communities to promote healthier behaviors and improve their health outcomes.

Sitthipon et al. [12] found that several factors, including performance expectancy, effort expectancy, social influence, facilitating conditions, and trust, significantly influence customers' intention to use healthcare chatbots and apps. Facilitating conditions were identified as having the most significant predictive power on intention to use, followed by effort expectancy, trust, performance expectancy, and social influence. The study highlights the importance of healthcare marketers and strategic planners addressing these key factors to increase customers' intention to use healthcare chatbots and product/service applications. The study's findings can guide healthcare organizations in developing user-friendly, reliable, and responsive healthcare chatbots and apps that meet customers' preferences and needs, ultimately leading to better healthcare outcomes.

Esposito et al. [13] highlight the usefulness of telemedicine in extending healthcare practice beyond physical spaces. However, it is essential to integrate telemedicine services into clinical practice by establishing the necessary enabling conditions. This requires a rigorous evaluation of telehealth services that includes health technology assessment (HTA) methods to describe performance using various indicators. The study emphasizes the importance of prioritizing the dissemination of telemedicine services to meet changing health needs while considering the relationships among patients, caregivers, doctors, and other healthcare providers. While there are still limitations, including the lack of integrated and interoperable

services without barriers between different care settings and appropriate training for all stakeholders, this study provides important insights into the potential of telemedicine to improve healthcare delivery.

II. METHODOLOGY

To summarize and explain the findings of a systematic review that relies heavily on words and text, narrative synthesis is the method of conducting a systematic review and synthesis of the results from multiple studies [14, 15]. A systematic review of the literature was conducted to identify studies that investigated the impact of smart education on learning outcomes. This systematic review made use of a number of databases, including Google Scholar, EBSCO, Scopus, Web of Science, and ScienceDirect. The search terms used included "digital transformation in healthcare," "electronic health (eHealth)," "digital healthcare," "technology in healthcare," and "telemedicine." The inclusion criteria were studies that (1) studied the digital transformation of healthcare in the digital age, (2) were published between 2015 and 2023, and (3) were written in English.

Texts are a common starting point for qualitative content analysis. The goal is to condense a large amount of text into a well-organized and concise summary of key findings. The typical starting point for this type of analysis is to methodically transform extensive textual data into a succinct and well-organized summary of key findings [16, 17]. To analyze the data in a systematic and objective manner, this review article utilized content analysis, a qualitative method that involves describing and quantifying specific phenomena from verbal, visual, or written data, as recommended by Limna et al. [18].

III. RESULT AND DISCUSSION

The digital economy has created new opportunities for innovation and growth in the healthcare industry, and the adoption of digital technologies has become increasingly important for healthcare providers and administrators to remain competitive and provide high-quality care. In addition, the digital transformation of healthcare in the digital economy refers to the use of digital technologies to improve the quality, accessibility, and efficiency of healthcare services. This includes the use of telemedicine, electronic health records, wearable devices, mobile health applications, and other digital tools that enable healthcare providers to deliver care remotely and in real-time.

The integration of advanced digital technologies is rapidly transforming economies and societies worldwide. As claimed by Cepal [19], this integration is leading to a digitized economy where traditional economic structures merge with innovative digital features, such as 5G mobile networks, IoT, cloud computing, AI, big data analysis, and robotics. This convergence results in a complex, digitally interwoven system where both traditional and digital models interact, creating a new ecosystem that is undergoing organizational, institutional, and regulatory transformation.

Furthermore, the healthcare industry is experiencing the effects of digital transformation. Faddis [20] provided some examples of this phenomenon, such as the integration of patient data systems and the implementation of cybersecurity measures for networked medical devices. The decreasing costs of manufacturing microscopic sensors and the availability of cloud computing have made it possible for Internet of Things (IoT) technologies to revolutionize healthcare. As telemedicine, wearables, biometric sensors, clinical efficiency, and interoperability continue to gain popularity, the proliferation of digital devices is expected to increase.

Ter-Akopov, Kosinova, and Knyazev [5] stated that the digital economy is a vital component of the current and future public health landscape. With its potential to revolutionize the healthcare industry, it is closely linked to the digital transformation of healthcare and all other sectors of the economy. The digital economy program seeks to improve people's lives by producing high-quality goods and services using the latest digital technologies, and the health sector is an essential area of focus for this program. As such, policymakers and stakeholders must continue to prioritize the development and implementation of strategies that enhance the digitalization of healthcare and other critical sectors to meet the evolving health needs and expectations of patients.

In research from Jiang, Chang, and Shahzad [21], the Internet has played a significant role in not only facilitating the delivery of healthcare services, but also improving communication between health providers and patients. Its use has also enhanced the efficiency and management of public utilities and government, leading to better service delivery. In addition, ICT has been instrumental in promoting health literacy by providing access to vast amounts of health-related information, and enabling individuals to obtain and exchange information without temporal or spatial constraints, and at low cost. The benefits of ICT in healthcare are undeniable, and its continued integration in healthcare systems will be crucial in improving the quality and accessibility of healthcare services to individuals globally.

Lyu et al. [22] provided valuable insights into the impact of China's digital economy on the efficiency of public health institutions. The study highlights the importance of the digital economy in strengthening a country's ability to cope with public health crises, as evidenced by China's experience during the COVID-19 pandemic. Moreover, the researchers found that the development of the digital economy promotes the establishment of a digital government, leading to improved quality of governmental supervision and performance, which positively impacts the efficiency of the provision of public health services. These findings underscore the critical role of digital technologies in healthcare, and the need for policymakers and healthcare organizations to address challenges and implement strategies to ensure the effective integration of digital technologies into the healthcare system. Overall, this study has significant

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implications for the digital transformation of healthcare and its potential to improve health outcomes for individuals and communities.re government delivery of public health services is crucial.

Belliger and Krieger [23] argue that the shift in society from closed systems to open networks has transformed the way healthcare is organized and delivered. Healthcare is no longer limited to the doctor-patient relationship but extends to a complex network of human and nonhuman actors that rely on connectivity, communication, flow of information, and authenticity to operate efficiently. This transformation has led to the creation of value for health-related knowledge, including efficiency and quality of care. As such, it is crucial for healthcare organizations to embrace the networked nature of healthcare and incorporate digital technologies to enhance connectivity, communication, and the flow of health-related information and knowledge. By doing so, healthcare organizations can leverage the power of networks to improve the delivery of care and ultimately, health outcomes for individuals and communities.

As reported by Boston Consulting Group [24] and Qiu et al. [25], in the realm of digital health, technological advancements are constantly unlocking new possibilities. For instance, virtual reality is poised to offer innovative approaches to treating mental health conditions, while digital twins are increasingly being used in clinical trials, hospital operations, and disease modeling. Smarter clinical development is also on the horizon, with organizations exploring the use of generative AI technology like ChatGPT for therapeutic idea generation, medical data analysis, and pattern identification. Additionally, there is a growing focus on reducing consumers' out-of-pocket spending for healthcare through tech-related solutions. As digital tools become more widely available, they will play a critical role in improving health equity by bridging care gaps, increasing access, enabling personalized treatment, and eliminating geographic barriers. Mental health services, in particular, stand to benefit from these developments, as more options become available for those seeking care. The healthcare industry must navigate the economic uncertainty that currently clouds many sectors, even as it continues to demonstrate resilience in the face of such challenges.

D'Ambrosio, Mascia, and Ricciardi [26] explored the opportunities and challenges associated with the digital transformation of healthcare in the context of the digital economy. The authors argued that the digital transformation of healthcare has the potential to significantly improve the quality, accessibility, and efficiency of healthcare services. They discussed various digital technologies that are being used in healthcare, including electronic health records, telemedicine, wearable devices, and artificial intelligence. The authors also highlighted the potential benefits of these technologies, such as improved patient outcomes, reduced healthcare costs, and increased patient engagement and empowerment. However, the authors also acknowledged the challenges associated with the digital transformation of healthcare. These challenges include issues related to

privacy and security of patient data, the digital divide, and the need for a skilled workforce to manage and interpret the vast amounts of data generated by digital technologies. The authors emphasize the importance of addressing these challenges in order to fully realize the potential benefits of the digital transformation of healthcare.

An article by Kamilaris, Mavromoustakis, and Pitsillides [27] provided an overview of the digital transformation of healthcare in the digital economy, highlighting the impact of digital technologies on healthcare delivery, patient outcomes, and the healthcare industry as a whole. The authors discussed the opportunities and challenges associated with the digital transformation of healthcare, and they identified key technological trends that are driving this transformation. Moreover, the article discussed how digital technologies such as the Internet of Things (IoT), artificial intelligence (AI), and blockchain are being used to improve healthcare delivery and patient outcomes. For example, IoT devices are being used to monitor patient health in real-time, allowing healthcare providers to provide more personalized care and intervene earlier when health problems arise. AI is being used to analyze medical data and make more accurate diagnoses, while blockchain is being used to improve the security and privacy of patient data. The authors also discussed the challenges associated with the digital transformation of healthcare, such as concerns about data privacy and security, the need for more comprehensive regulations, and the need for healthcare providers to adapt to new digital technologies. They suggested that these challenges can be addressed through collaboration between healthcare providers, technology companies, and government regulators.

Grewal and Ahuja [28] explored the impact of digital transformation on healthcare in the digital economy, and examined the benefits and challenges of digital transformation in healthcare and analyzed the key drivers that have led to the digitization of healthcare. The study also discussed the emerging trends in digital healthcare, such as telemedicine, remote monitoring, and digital therapeutics. The study found that digital transformation has the potential to significantly improve the quality and efficiency of healthcare delivery. Digital technologies can help healthcare providers to deliver personalized, patient-centric care and improve patient outcomes. Additionally, digital technologies can help to reduce costs and improve operational efficiency in healthcare organizations. However, the study also highlighted several challenges associated with digital transformation in healthcare. These challenges included data privacy and security concerns, the need for new regulatory frameworks, and the digital divide between patients who have access to digital healthcare technologies and those who do not. The study concluded that digital transformation is rapidly changing the healthcare industry, and healthcare providers must embrace digital technologies to remain competitive in the digital economy. However, healthcare organizations must also address the challenges associated

with digital transformation to ensure that the benefits of digital healthcare are available to all patients.

A study by Serrano-Castro, Garcia-Sanjuan, Maldonado, and Lopez-Delgado (2022) analyzed the impact of digital technologies on the healthcare sector and identified several benefits of digital transformation, including improved patient outcomes, increased efficiency, and cost savings. The study found that digital transformation has the potential to revolutionize healthcare by enabling remote patient monitoring, telemedicine, and personalized medicine. These technologies can improve patient outcomes by providing more timely and accurate diagnoses and treatments. Furthermore, the study found that digital transformation can increase efficiency by reducing administrative tasks and streamlining processes. This can lead to cost savings for healthcare organizations and better resource allocation. However, the study also identified several challenges to the digital transformation of healthcare, including privacy concerns, data security, and the need for regulatory frameworks to ensure the safety and effectiveness of digital technologies. The study concluded that digital transformation is essential for the healthcare sector to meet the challenges of the digital economy. However, it is important to address the challenges associated with digital transformation to ensure its successful implementation and maximize its benefits for patients and healthcare organizations.

The digital transformation of healthcare has the potential to enhance patient outcomes, reduce healthcare costs, and increase patient satisfaction by improving access to care and reducing the need for in-person visits. Overall, the digital transformation of healthcare in the digital economy is a rapidly evolving area of research with significant potential to transform the healthcare industry.

IV. CONCLUSION

The digital transformation of healthcare in the digital economy is a crucial area of research and development that can improve the quality of healthcare services and enhance patient outcomes. The existing literature on this topic demonstrates the potential benefits of digital technologies in healthcare, including telemedicine, chatbots, and mobile applications. Furthermore, healthcare in the digital economy is expected to undergo significant changes in the future. While total eradication of illness and disease is unlikely, a digital-first approach will make it easier for healthcare providers to prioritize preventive care, coordinate care across diverse teams and regions, and deliver services in a way that is convenient and personalized for each patient. Thus, there is a constant need for a commitment to the advancement of technology that improves patients' lives and delivers care in ways that align with their needs and preferences, making it a critical priority for healthcare systems. However, it is critical to note that there are also challenges that must be addressed, such as ensuring the safety and reliability of digital health solutions and promoting equitable access to these technologies. Therefore, the healthcare industry should

continue to prioritize the pursuit of technological innovations that improve the lives of patients and deliver care in ways that meet their needs in the future. Overall, the digital transformation of healthcare is an essential aspect of the digital economy and should be given significant attention by researchers, policymakers, and stakeholders to ensure continued progress and development.

This review article provides valuable insights into the digital transformation of healthcare in the digital economy and adds to the existing body of literature in this field. Its findings and recommendations can serve as a useful guide for future research on the topic, informing researchers of the key issues and gaps in current knowledge. Moreover, this review article has the potential to enhance our understanding of the digital transformation of healthcare, providing administrators, directors, and healthcare providers with insights into the latest trends and best practices in the field. This, in turn, can assist them in developing effective strategies and initiatives to improve the quality of care and service, as well as meeting the evolving needs and expectations of patients in the digital age. For academic limitations and recommendations, while this study employed a narrative synthesis method, future research could use more rigorous methods such as questionnaires or interviews to further investigate the digital transformation of healthcare in the digital economy.

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PONGSAKORN LIMNA, also known as Palm, is presently a Ph.D. fellow in the Ph.D. in Digital Economy program of Rangsit University, Thailand. As a researcher, he is actively engaged in preparing research papers in diverse areas, including management, business administration, communication, psychology, and consumer behavior. Mr. Limna's academic background comprises a Bachelor of Arts (B.A.) degree from the esteemed Faculty of Humanities and Social Sciences at Burapha University, Thailand. He majored in English and minored in tourism management, exhibiting a keen interest in language and tourism. Additionally, he obtained an Executive Master of Business Administration (Executive MBA) degree from the Faculty of Business and Technology at UNITAR International University, Malaysia, which further strengthened his academic and professional acumen. In recognition of his academic achievements and potential, Mr. Limna was awarded a scholarship by the Office of the Basic Education Commission, Thailand, and the Wisconsin Department of Public Instruction, USA, in 2012, to participate in the Thailand-Wisconsin International Sunrise Program in Wausau, Wisconsin, USA. Mr. Limna's multidisciplinaryacademic background, coupled with his keen research interests, make him a promising scholar in his field.