Oshada; Health Journal
https://nawalaeducation.com/index.php/O/index
Volume 2 Number 3, June 2025
e-ISSN : 3047-017X
DOI : https://doi.org/10.62872/ean83813

Digital Health Technology: Smart Solutions to Increase Health Awareness

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Input	: May 22, 2025	Revised	: June 20, 2025
Accepted	: June 25, 2025	Published	: June 30, 2025

ABSTRACT

The development of digital technology has brought significant transformation in various sectors, including the health sector. Digital health technology is now present as a smart solution to increase public awareness of personal and public health. Innovations such as mobile-based health applications, wearable devices, artificial intelligence (AI), and telemedicine not only provide easy access to health information, but also enable real-time monitoring of body conditions and personalization of care. This research aims to explore the various forms of digital health technologies that are currently developing and their impact on increasing awareness and healthy living behaviors among the public. Using a literature review approach of various academic sources and recent industry reports, it was found that effective utilization of digital technologies can improve health knowledge, encourage preventive measures, and accelerate early detection of chronic diseases. In addition, these technologies are also proven to be able to reach populations that were previously difficult to reach by conventional healthcare systems, such as people in remote areas or groups with limited mobility. However, challenges such as the digital divide, data security, and digital literacy are still obstacles that need to be overcome to optimize implementation. Overall, digital health technologies offer great opportunities to create a more inclusive, proactive and sustainable health ecosystem.

Keywords: Digital Health Technology, Health Awareness, Health Apps, Digital Literacy

INTRODUCTION

Digital technology has brought major transformations in various aspects of human life, including in the health sector, which has been highly dependent on face-to-face interactions between patients and medical personnel (Andreanto, 2022; Eprilianto, 2019; Apriliyana, 2021). Advances in digital health technology have opened up new opportunities in developing a health care system that is

more efficient, responsive to community needs, and oriented towards patient empowerment. Digital technology is no longer only seen as a complement, but has become an integral part of the modern health system. Through the utilization of digital devices, the healthcare process has become more flexible and personalized. Technology-based systems allow patients to self-monitor their health conditions and obtain medical information quickly and accurately without having to rely on the physical presence of health workers.

Various innovations in digital health technology are now present as strategic solutions to expand access to services while shaping people's health behaviors (Katoch, 2024). Mobile health applications, wearable devices that can monitor heart rate and sleep patterns, telemedicine services that enable remote medical consultations, and artificial intelligence (AI)-based clinical decision support systems have proven their ability to bring health services closer to the public. In addition to providing easy access, these technologies also offer a new approach to health education that is more interactive, real-time and personalized. The role of technology is not only limited to technical aids, but also a medium of social change that encourages active participation of the community in taking care of their own health. Thus, a culture of healthy living is formed that is more adaptive to the challenges of the times and sustainable in the long run.

While there is evidence that digital health technologies can improve the efficiency of medical services, speed up the diagnosis process, and make it easier to monitor patient conditions, there are still important gaps in scientific studies regarding their impact on improving public health awareness at large. Most previous studies tend to focus on clinical indicators, such as the reduction of hospital visits, the efficiency of online consultations, or the accuracy of digital medical data processing. However, non-clinical aspects such as how this technology contributes to improving health literacy, encouraging individual behavior change, and building long-term healthy living habits have not received adequate attention. Therefore, it is important to examine more deeply the role of digital technology not only as a service provider tool, but also as a catalyst for changes in people's mindset and health behavior.

The utilization of digital health technologies, despite offering various conveniences and efficiencies in health services, still faces a number of complex and multidimensional challenges (Wang, 2021). One of the main issues is the digital divide, where not all groups of people have equal access to technological devices or adequate internet connectivity. This inequality is especially felt by people who live in remote areas or come from low economic backgrounds, preventing them from optimally accessing digital-based health services. In addition, privacy and data security issues are also a serious concern, given that medical information is highly sensitive and vulnerable to misuse if not protected with a strong security system (Newaz, 2021). On the other hand, people's low digital literacy exacerbates the situation, with some individuals having difficulty operating health apps, understanding digital medical information, or utilizing service features effectively. Therefore, the development and implementation of digital health technologies cannot be done uniformly, but must be accompanied

by educational strategies and inclusive approaches that carefully consider the social, economic, and cultural conditions of the user community. This approach is important to ensure that digital transformation in the health sector does not only reach certain groups, but is truly able to improve public health awareness and quality evenly and sustainably.

In the post-COVID-19 pandemic era, the urgency of digital transformation in the healthcare sector has gained significant emphasis in response to the need for a more adaptive and resilient service delivery system. The pandemic has accelerated the widespread adoption of digital technologies in healthcare, ranging from telemedicine-based medical consultations, monitoring patient conditions through mobile applications, to digital health data integration that enables more efficient medical decision-making (Sullivan, 2021). These changes are not only technical in nature, but also reflect a paradigm shift in the way society understands the important role of technology in maintaining, monitoring and improving health conditions. The momentum of the global crisis is a strategic turning point for all stakeholders in the health system to integrate digital innovation as part of a long-term solution. Therefore, post-pandemic digital transformation should not only focus on emergency management, but should be proactively directed to increase public health awareness, expand access to quality services, and build a more inclusive, resilient, and prevention-oriented health system and improve overall quality of life.

There is still a lack of research that examines the impact of digital health technologies from a behavioral change perspective, especially in the context of developing countries with limited digital infrastructure, low technological literacy, and unique cultural and social challenges. Most of the digital applications and platforms developed today have also not been fully designed with local context in mind, so their use has not been optimized at various levels of society. This raises concerns that technology could widen health disparities if it is not integrated inclusively and adaptively to the needs of marginalized communities. To address this gap, this study proposes a new approach in understanding the role of digital health technology as a smart solution to increase public health awareness. The novelty of this study lies in the interdisciplinary perspective that combines the dimensions of technology, health education, behavior change, and public policy. This study not only discusses technology in terms of clinical functions, but also explores how digital features such as gamification, behavior-based notifications, real-time monitoring, and access to personalized health information can encourage the transformation of people's lifestyles from reactive to proactive.

This article makes a significant conceptual contribution by emphasizing the importance of collaborative synergy between key actors such as government, technology developers, healthcare providers, and civil society in shaping an inclusive, adaptive, and sustainable digital health ecosystem. The role of each actor cannot stand alone: the government serves as a regulator and infrastructure facilitator; technology developers play a role in creating solutions based on the real needs of the community; healthcare providers bridge the integration of

technology with ethical and effective clinical practices, while civil society acts as both users and social watchdogs in ensuring the alignment of technology with the public interest. This cross-sector collaboration is necessary to create an ecosystem that is not only high-tech, but also oriented towards access equity and community empowerment. By building an evidence-based framework and drawing lessons from best practices that have been implemented in various countries, both developed countries with established digital ecosystems, and developing countries with complex implementation challenges, this article seeks to offer strategic and contextual insights. The main focus is on how the development and application of digital health technology can truly have a positive impact on increasing public health awareness, literacy, and behavior change. This is important given that technology adoption does not always guarantee social transformation if it is not accompanied by a participatory, educative and inclusive approach that considers the diversity of social, cultural and economic backgrounds of the community.

The article also emphasizes the importance of a holistic approach in understanding the linkages between digital innovation and public health development. It is not enough to look only at the technical side or service efficiency, but needs to be extended to the realm of long-term impacts such as individual empowerment, improved quality of life, and the formation of a sustainable culture of healthy living. Therefore, this study is not only relevant for policy makers and health technology industry players in formulating effective implementation strategies, but also makes an important contribution to theory development in the fields of digital public health, social innovation, and public service system transformation. With a comprehensive and multidisciplinary-based analytical framework, this article is expected to enrich academic discourse as well as become a practical reference for stakeholders in building a resilient and humane digital health system in the 21st century-a system that is not only technologically sophisticated, but also fair, participatory, and truly in favor of improving the quality of life of all citizens.

METHODOLOGY

This research uses a library research approach as the main method to comprehensively examine the role of digital health technology in increasing public awareness of health issues. This approach was chosen because it allows researchers to collect, analyze, and synthesize various information and findings from credible secondary sources, so as to obtain a complete and in-depth understanding of the development and implementation of digital health technology in various contexts. The sources included national and international scientific journal articles, research reports from global health institutions, publications from digital technology organizations, academic books, and recent industry reports relevant to the research theme. In addition, secondary data was also obtained from survey results and previous case studies that discussed topics related to digital health technology, wearable devices, telemedicine, digital health literacy, and changes in public behavior in the context of technology use.

The literature collection process was conducted through a systematic search in several leading academic databases such as Google Scholar, Scopus, PubMed, ScienceDirect, and ProQuest, using keywords such as digital health, health awareness, mobile health applications, telemedicine, health literacy, and wearable health technology. The inclusion criteria for literature selection were publications published within the last five to ten years, thematically relevant, and of reliable academic quality. Data analysis was conducted using the thematic synthesis technique, which categorizes the information found based on key themes such as types of digital health technologies, impacts on increasing health awareness, drivers and barriers to technology adoption, and strategic recommendations for sustainable implementation. This approach allows researchers to identify patterns, relationships, and knowledge gaps that exist in the analyzed literature. Through this literature review method, it is hoped that a comprehensive picture of how digital health technologies contribute to changes in people's health behaviors can be obtained, and offer a theoretical and practical basis for the development of digital solutions that are more effective, inclusive, and oriented towards disease prevention and improving overall quality of life.

RESULTS AND DISCUSSION

The utilization of digital health technologies has made a significant contribution to improving public health awareness in various regions, both in developed and developing countries (Martias, 2024; Supriatna, 2024). These technological developments not only expand access to health services, but also change the way individuals understand and manage their health independently. Digital innovations such as mobile health applications, wearable devices, telemedicine services, and the application of artificial intelligence in monitoring and predicting medical conditions, have significantly enriched the health ecosystem by providing fast, personalized, and data-driven information. Through easy access to information that was previously only available through direct interactions with medical personnel, these technologies are breaking the barriers between patients and health services, and putting control of health in the hands of the people themselves.

Smartphone-based health apps such as MyFitnessPal, Google Fit, and Apple Health have become popular instruments in the healthy lifestyle of modern society (Hisani, 2015; Rohayati, 2020; Setiawan, 2022). These apps offer features to record and monitor daily physical activity, calculate calorie intake, develop nutrition plans, and organize rest and exercise time. With a user-friendly interface and daily notification support, these apps help users objectively recognize their lifestyle based on data, not just perception. This indirectly fosters self-awareness of habits that could potentially harm health if left unchecked. Over time, many users report increased motivation to maintain an active lifestyle, reduce consumption of unhealthy foods, and be more disciplined in keeping fit. Using the app also facilitates self-tracking and data-driven decision-making, two things that are fundamental to today's preventive health care approach. Users who regularly record their activities have a greater chance of detecting early

symptoms of health problems, such as chronic fatigue, irregular sleep patterns, or a gradual decline in fitness. Early interventions can be made before conditions develop into more serious illnesses (Sutejo, 2022; Anwar, 2022; Salim, 2024). The collected data can also be consolidated and used by healthcare providers to provide more accurate and individualized recommendations, reinforcing the principle of personalized care in the modern healthcare system. It is no surprise that digital health technologies are increasingly considered as transformational tools in public health education. It is not just a tool, but also serves as a change agent capable of directing people towards more aware, healthy and information-based behaviors. If its utilization is accompanied by increased digital literacy, equitable infrastructure, and policies that support the protection of user data, then this technology has the potential to become the main foundation in creating a society that is not only physically healthy, but also health-smart.

Wearable devices such as smartwatches and fitness bands have shown significant influence in supporting increased public health awareness, especially in terms of independent and continuous monitoring of body conditions (Dewi, 2025; Widyarini, 2021; Batubara, 2025). The technology is designed to provide real-time biometric data, including heart rate, daily steps, sleep quality and duration, stress levels, and blood oxygen levels. Such information is not only informative, but can also be an early indicator that helps users recognize abnormal patterns or symptoms. For example, unusual heart rate fluctuations or consistently disrupted sleep patterns can be an early warning of health problems such as heart problems, sleep disorders, or chronic fatigue. The advantage of this technology lies in its ability to present data instantly and in an easy-to-understand format, allowing users to take immediate preventive action, such as resting, consulting medical personnel, or changing lifestyle habits. In addition to monitoring functions, wearables also play an important role in shaping healthy habits through data-driven approaches and motivational reinforcement (Aggrawal, 2025). Some devices are equipped with features such as reminders to move after sitting too long, breathing training to lower stress. These strategies have proven effective in increasing users' psychological and emotional engagement with their health goals. In the long run, this active engagement contributes to more consistent behavior change and is oriented towards disease prevention rather than treatment once illness has occurred.

The use of telemedicine services has also experienced a rapid surge and has become an integral part of the modern healthcare system, especially since the outbreak of the COVID-19 pandemic (Mizaniah, 2024; Ismiyah, 2024; Andriani, 2023). When people's mobility is limited and health facilities become hotspots for transmission, telemedicine comes as a crucial solution to maintain the continuity of medical services. Through online applications such as Halodoc, Alodokter, and Teladoc Health, people can consult with doctors, obtain prescriptions, and even conduct follow-up examinations without having to be physically present at the clinic or hospital. This transformation brings many benefits, not only in terms of time efficiency and travel cost savings, but also in terms of greater accessibility, especially for people living in remote areas, islands, or geographically and socio-

economically underserved communities. Telemedicine opens up opportunities to distribute health services more evenly and fairly (Sembiring, 2025; Yulianto, 2025). In the context of Indonesia, which is an archipelago with complex geographical challenges, the digitization of healthcare allows people in remote areas to obtain quality medical services without having to travel long distances or incur high costs. This also contributes to reducing the burden on health facilities in big cities, as people have alternative services without having to come directly to the hospital. In practice, telemedicine can also serve as an effective educational tool, as patients can get explanations about their health conditions directly from experts, even accompanied by educational materials in the format of videos, infographics, or interactive articles.

With the combination of wearable devices and telemedicine, people now have the opportunity to manage their health more independently, intelligently and sustainably. These two technologies, if utilized optimally, not only support healthy lifestyles, but also strengthen the transformation of the health system towards a more participatory, efficient and technology-based direction. However, to ensure its effectiveness, it needs to be supported by increased digital literacy, trust in the service system, and regulations that strictly regulate the security of medical data so that the use of this technology does not pose new risks in the field of privacy and health ethics. In addition to providing easy access to health services, digital health technology has also proven effective in increasing public literacy and awareness of various health issues. Digital health literacy refers to an individual's ability to access, understand and use technology-based information to make informed health decisions (Sjamsuddin, 2023; Yani, 2022; Ayumaruti, 2023). In this context, modern health apps not only provide raw data, but also present it in an easy-to-understand format through infographics, interactive videos, and short learning modules that can be accessed at any time. Thus, the community is no longer a passive party, but turns into an active actor who is directly involved in efforts to maintain and improve their quality of life. These apps are generally equipped with educational features that customize content based on the user's condition, such as disease history, daily habits, or personal health goals.

Additional features such as medication reminder notifications, regular check-up schedules, and daily tips on diet and exercise also encourage consistent healthy habits. These technologies slowly integrate healthy practices into users' daily routines, making preventive measures a natural part of the lifestyle. Interestingly, some apps take a gamification approach, using game elements such as points, challenges, award badges or rankings between users to increase motivation and engagement. Literature shows that this approach has been shown to increase people's participation in physical activity, stress management, and self-monitoring of eating habits. By creating a fun and competitive experience, gamification transforms what can be a tedious health improvement process into a more engaging and sustainable one. Furthermore, a number of studies have shown that utilizing digital technologies in health interventions directly contributes to reducing the prevalence of non-communicable diseases, such as

hypertension, diabetes mellitus, obesity, and cardiovascular diseases (Xiong, 2023). These diseases are the leading cause of premature death and the biggest economic burden on health systems in many countries, including Indonesia. Apps that focus on lifestyle management are proven to help users manage a low-sugar and salt diet, remind them of regular physical activity, and provide an evaluation of long-term health progress. Some devices are even capable of integrating with digital medical records, allowing doctors or healthcare providers to evaluate and adjust interventions more precisely and quickly.

This positive impact shows that digital technology is not only an administrative or informative tool, but also a change agent that encourages a shift in health culture from curative to preventive and promotive patterns (Benis, 2021). Technology has succeeded in reaching segments of society that were previously difficult to reach by conventional approaches, such as adolescents, workers with limited time, and people with high mobility. Therefore, it is important for all stakeholders, including the government, private sector, and educational institutions, to continue to encourage the development and equitable distribution of this technology in an inclusive manner. With the right approach, digital health technology can be a key pillar in shaping a society that is not only physically healthier, but also smarter and more empowered in maintaining their health independently and sustainably. However, the results of the literature review also show that the use of digital health technology still faces various challenges that are quite complex, hindering the process of optimizing and equitable use. One of the most fundamental challenges is the digital divide, which is the inequality in access to technological devices and internet connectivity between community groups. The groups most affected by this gap are people living in remote areas, low-income earners, and the elderly who are not familiar with digital devices. Hard-to-reach geographical conditions, lack of telecommunications infrastructure, and relatively expensive device costs are the main obstacles in accessing health-based digital services. As a result, these vulnerable groups are the most at risk of being left behind in the process of digitizing health services, even though they really need this access.

Low digital literacy is also a challenge that cannot be ignored. Digital literacy includes not only the basic ability to use devices and applications, but also an understanding of how to read and interpret health data, and awareness of cybersecurity risks (Kemp, 2021). Many users feel anxious or confused when dealing with complex application interfaces, and are unable to optimally utilize the features available. This condition shows that technology alone is not enough, there is a need for assistance, training, and continuous education programs to build the capacity of the community to use health technology wisely and effectively. Without adequate educational interventions, there is a risk that technology will widen the health gap between social groups instead of bridging it. An equally important issue is related to data security and privacy. Digital health technology relies on the collection and processing of large amounts of personal data including biometric data, medical history, lifestyle information, and geographic location of users. If not managed with adequate protection

systems, these data are highly vulnerable to misuse by third parties for commercial, discriminatory, or even criminal purposes. Unfortunately, in many developing countries, including Indonesia, there is still no comprehensive and strict regulation regarding the protection of digital medical data. Many health apps operate without strict oversight, and the public is often uninformed about how their data is collected, stored and used.

This lack of transparency and legal certainty can reduce the level of public trust in digital health technology. When public trust is weakened, technology adoption will be slow, and may even trigger social resistance to innovations that are actually beneficial. It is important for policymakers to immediately formulate a legal framework that not only protects users' privacy rights, but also sets data security standards, application audits, and reporting and dispute resolution mechanisms. A multi-sectoral approach involving the government, private sector, consumer protection agencies, and civil society organizations is key to building a safe, inclusive, and trustworthy digital health technology ecosystem. Without a comprehensive handling of these challenges, it is feared that the great potential of digital technology in the health sector will never be fully realized in a fair and equitable manner. Overall, the results of the literature study show that digital health technology is a smart solution and has great potential in increasing public awareness and active participation in maintaining their health (Mbunge, 2021). This technology has encouraged a paradigm shift from a healthcare system that previously focused on a curative approach, which is the treatment of disease after symptoms appear, to a promotive and preventive approach that emphasizes the importance of prevention, education, and strengthening healthy living behaviors from an early age. This change is very relevant in the context of the double burden of disease in many countries, including Indonesia, which must face high rates of infectious and non-communicable diseases simultaneously. In this case, digital technology is present not only as a technical tool, but also as a transformational medium that expands access, accelerates services, and improves the quality of interaction between the community and the health system.

The optimization of digital health technology is highly dependent on a number of interrelated supporting factors (Samad, 2025; Ramadhani, 2025). First, the readiness of digital infrastructure is the main prerequisite, especially the availability of a stable and affordable internet network, as well as access to adequate technological devices. Infrastructure inequality between urban and rural areas is still a real obstacle that hinders equitable utilization of health technology. Second, improving digital literacy and public health is needed so that technology is not only used technically, but also understood and utilized critically and responsibly. Without sufficient understanding, even the best technology will not have maximum impact. Third, progressive regulatory and public policy support is the main foundation in ensuring the safety, fairness and sustainability of the digital health system. The government needs to develop personal data protection policies, health application certification mechanisms,

and incentives for local innovators in developing digital solutions based on community needs.

Cross-sector collaboration is a key aspect in ensuring that the benefits of digital health technologies are widely and equitably shared (Firdaus, 2025; Rosmayati, 2024). The government has a strategic role in directing policy and building infrastructure; healthcare providers are responsible for system integration and patient education; technology developers must ensure inclusive and user-friendly application design; while local communities and civil society organizations can serve as a direct link between technology and grassroots communities. The synergy between these stakeholders is crucial to creating a digital health ecosystem that is not only technologically innovative, but also socially equitable. With structured, participatory and sustained support, digital health technology has the potential to be a catalyst in creating a more resilient, efficient and individual-centered future health system. Not only can these technologies address contemporary health challenges, they can also form the foundation of a healthier, more aware society that is better equipped to deal with the global dynamics of the digital era.

CONCLUSION

Digital health technology has proven itself as a smart and adaptive solution in answering various challenges in the modern health sector, especially in terms of increasing public awareness and concern for personal and collective health. With the utilization of technologies such as health-based mobile applications, wearable devices for body condition tracking, telemedicine services, to artificial intelligence (AI)-based clinical decision support systems, people now have much easier, faster, and personalized access to various medical information that previously could only be obtained through direct visits to health facilities. This access includes information on healthy eating, exercise schedules, body vitals, to first aid guides and online consultations with medical professionals. This convenience has opened up space for a more active and engaged interaction between individuals and their own health.

This digital transformation has fundamentally shifted the healthcare paradigm from one that previously focused on a reactive approach of treating illness when it occurs to one that is more proactive, promotive and preventive. In other words, technology is not only present when individuals are sick, but also in the process of keeping individuals healthy. This can be seen from the increasing number of people using medication reminder apps, pedometer, sleep tracker, and stress level evaluation features as part of their daily routine. The presence of these technologies encourages people to know their own bodies better and detect small changes that could be early indicators of health problems. Real-time data generated from wearable devices, for example, provides a stronger basis for users to make health decisions quickly and accurately. Moreover, the digitization of healthcare also plays an important role in strengthening individual autonomy in managing medical conditions independently. Now, patients are not only recipients of instructions from

medical personnel, but also active partners in the process of healing and health maintenance. They can choose services, self-evaluate their health progress, and seek second opinions from various trusted sources available online. In the long run, this shift is believed to be able to form a society that is more health literate, more responsible for lifestyle choices, and better prepared to face future health challenges with a data and technology-based approach.

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