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Integration of Wearable-Based Digital Wellness Data with Healthcare Institutions and Healthcare E-Business Innovation

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Abstract

This study aims to examine the impact of integrating wearable-based digital wellness data with healthcare institutions on healthcare e-business innovation. Recent advancements in artificial intelligence, the Internet of Things, and cloud technology are accelerating the transformation of the healthcare industry. In particular, health data collected via wearable devices is emerging as a key factor reshaping the entire spectrum of diagnosis, prevention, and management systems. This data enables patient-centered care, personalized management, and remote monitoring by collecting and integrating patients' biometric information in real time. The research methodology involved analyzing major international literature from the past five years, with results organized into four categories. First, wearable data has fostered a platform ecosystem between healthcare institutions and companies. Second, it has supported patient-centered innovation by enhancing patient self-management and engagement. Third, privacy protection and lack of interoperability remain unresolved challenges. Fourth, it has been confirmed that new business models, such as wellness programs can be created. In conclusion, while wearable data is a driving force for healthcare e-business innovation, institutional reforms, collaborative governance, and securing social acceptance are necessary for widespread adoption. This study contributes to both theory and practice by clarifying how data-driven convergence between healthcare and digital business can generate sustainable value creation.

Keywords: Wearable data, Digital healthcare, E-business, Data integration, Privacy protection

JEL Classification Code : J28; M14; M54; O33

1. Introduction

The digital transformation of the 21st century has brought about a fundamental paradigm shift in the healthcare industry. With the integration of advanced technologies such as artificial intelligence (AI), the Internet of Things (IoT), and cloud computing into the healthcare sector, the traditional concept of medical services has expanded from hospital- and physician-centered care to data-driven platform-based services (Bardhan et al., 2025; Hermes et al., 2020). At the core of this transformation are wearable devices, which collect patients' biometric and lifestyle data in real time, offering the potential to integrate such data with Electronic Health Records (EHRs) (Azodo et al., 2020; Smuck et al., 2021).

The global digital health and wellness market is projected to grow from approximately USD 349.39 billion

in 2024 to USD 1,663.33 billion by 2033, representing a robust compound annual growth rate (CAGR) of 18.93% (Bocean & Vărzaru, 2025). This rapid growth signifies not merely an industrial expansion but also the broader diffusion of patient-centered care, the enhancement of data interoperability across healthcare institutions, and the emergence of novel e-business models (Ghadi et al., 2025; LaBoone & Marques, 2024). As patients' medical data increasingly function as a kind of "digital passport" accessible across multiple healthcare entities, the structure of healthcare delivery is shifting from a hospital-centric model toward a networked ecosystem model.

Despite these opportunities, the digital transformation of healthcare presents significant regulatory and ethical challenges.

First, data privacy and security remain critical concerns. As patients' sensitive health information is shared among hospitals, insurers, pharmaceutical companies, and wellness platforms, the risk of data breaches and misuse escalates (Paul et al., 2023).

Second, the mismatch between public healthcare systems and private e-business models serves as a barrier to widespread adoption. Kelley et al. (2020) emphasized that scalable and sustainable business models are essential for the successful diffusion of digital health innovations within public healthcare systems.

Third, the lack of data interoperability persists as a major obstacle, as disparate data standards and systems among medical institutions hinder the seamless integration and utilization of data collected from wearable devices.

In this context, recent research has explored the opportunities and limitations that arise from the integration of wearable technologies and digital health data in the healthcare sector. Azodo et al. (2020) demonstrated that data from wearable sensors can enhance patient care quality and clinical decision-making but also pointed out limitations related to data quality management and standardization. Similarly, Smuck et al. (2021) emphasized the growing adoption of wearable technologies in clinical settings while arguing that successful implementation requires a clear regulatory framework and the acceptance of both patients and healthcare professionals. Ghadi et al. (2025) highlighted that the convergence of AI and wearable data could become a foundational enabler for remote monitoring and personalized healthcare, while Bardhan et al. (2025) noted that digital health platforms are restructuring the overall business model of the healthcare industry by fostering patient-centric ecosystems.

Furthermore, Hermes et al. (2020) analyzed how digital transformation has been creating new platform ecosystems in healthcare, wherein patients are evolving from passive recipients of care to active data producers and platform participants. This perspective implies that healthcare organizations no longer compete solely as isolated entities but instead collaborate within interconnected ecosystems alongside insurers, pharmaceutical firms, IT enterprises, and wellness companies to co-create patient-centered value.

Accordingly, this study aims to provide an integrative review of recent international research to examine the opportunities and challenges that arise from linking wearable-based digital wellness data with healthcare institutions in the context of e-business transformation. Specifically, this study pursues three research objectives:

(1) to investigate how the integration of wearable data drives healthcare platformization and patient-centered innovation;

(2) to analyze how these changes lead to the emergence of new e-business models; and

(3) to discuss the regulatory challenges surrounding data privacy, security, and interoperability.

Through this analysis, the study seeks to propose strategic implications for the effective utilization of wearable data in digital healthcare transformation and to offer insights into the future direction of healthcare e-business models in both Korea and the global context.

2. Theoretical Background

2.1. The Rise of Digital Healthcare and e-Business

Digital healthcare represents a new paradigm that integrates digital technologies into the entire spectrum of medical services to provide patient-centered and personalized care. While traditional healthcare has primarily focused on hospital-based diagnosis and treatment, digital healthcare enables a continuous cycle of prevention, diagnosis, treatment, and follow-up management by collecting patient data in everyday life (Bardhan et al., 2025).

In particular, cloud computing, big data analytics, and artificial intelligence (AI) play pivotal roles in analyzing and predicting healthcare data, thereby forming the foundation of a healthcare e-business ecosystem in which diverse stakeholders—including hospitals, insurers, pharmaceutical firms, and wellness platform providers—actively participate (Hermes et al., 2020).

According to Hermes et al. (2020), digital transformation is shifting the healthcare industry from institution-centered models toward platform-based ecosystems, where patients are no longer passive recipients of care but active data producers and platform participants. This transformation marks a crucial turning point in which patients gain greater autonomy to manage and share their own health data, thereby reshaping healthcare e-business into a more patient-centered model.

Furthermore, Bocean and Vărzaru (2025) reported that digital transformation affects national health indicators and economic sustainability, suggesting that digital healthcare extends beyond medical innovation to become a driver of socioeconomic value creation.

2.2. The Role of Wearable Devices and Digital Wellness Data

Wearable devices—ranging from smartwatches and fitness bands to biosensors—have evolved into essential tools that can measure real-time data such as heart rate, blood pressure, glucose levels, sleep patterns, and physical activity (Azodo et al., 2020). These data serve not only as valuable resources for personal health management but also as critical inputs for clinical decision-making and long-term patient monitoring in healthcare institutions (Smuck et al., 2021). For example, data collected from wearable devices can support early diagnosis, chronic disease management, and the provision of personalized exercise or nutrition programs.

When integrated with Electronic Health Records (EHRs), wearable data can facilitate the establishment of patient-centered integrated healthcare systems. Ghadi et al. (2025) demonstrated that combining wearable technology with AI can enhance remote patient monitoring, thereby reducing hospital visits and enabling medical staff to make real-time assessments of patient conditions for more efficient allocation of healthcare resources. Similarly, LaBoone and Marques (2024) emphasized that the fusion of wearables and AI can revolutionize hospital workflows and promote data-driven decision-making, ultimately generating new technology-oriented e-business opportunities.

Moreover, wearable data promote participatory healthcare, allowing patients to actively monitor their own health status based on their personal data, which in turn enhances their self-efficacy and strengthens collaborative relationships with healthcare providers (Smuck et al., 2021). Thus, wearable technologies serve not merely as technical tools but as core infrastructure for patient-centered healthcare transformation.

2.3. The Transformation of Healthcare e-Business Models

The widespread adoption of digital wellness data has profoundly transformed healthcare e-business models. Hermes et al. (2020) described how digital platform ecosystems foster interaction among patients, healthcare institutions, insurers, pharmaceutical companies, and IT enterprises, thereby creating new value-generation structures.

For instance, insurance companies can utilize wearable data to design personalized insurance products, while pharmaceutical firms can enhance the efficiency of clinical trials through lifestyle-based patient data. Likewise, IT and wellness platform companies can develop customized fitness and nutrition programs derived from user data, thereby establishing new revenue streams.

Kelley et al. (2020) emphasized that for such digital health innovations to proliferate within public healthcare systems, scalable and sustainable business models are essential. They pointed out the institutional and financial barriers that digital health startups encounter when collaborating with healthcare providers and suggested the necessity of hybrid business models that foster cooperation between public and private sectors.

Similarly, Bardhan et al. (2025) argued that healthcare e-business must go beyond simple technology adoption to focus on data-driven service design, patient engagement, and the establishment of governance frameworks that ensure sustainability.

2.4. Regulatory and Ethical Challenges

Despite its potential, the expansion of digital healthcare faces significant regulatory and ethical challenges. Paul et al. (2023) warned that the digitalization of healthcare data may exacerbate issues related to privacy protection, data security, and legal accountability. In particular, the sharing of patient data among multiple institutions increases the risk of data breaches and commercial misuse, thereby undermining public trust in digital health systems.

Additionally, differing national regulatory frameworks and data standards hinder the achievement of international interoperability. For example, while the United States' Health Insurance Portability and Accountability Act (HIPAA) and the European Union's General Data Protection Regulation (GDPR) both impose stringent data protection requirements, healthcare organizations and companies face the dual challenge of maintaining compliance while continuing to innovate.

Kelley et al. (2020) further noted that such constraints pose substantial barriers to the scalability of digital health business models, particularly for startups and cross-border collaborations.

3. Research Method

3.1. Research Design

This study adopts a literature review methodology to explore the impact of wearable-based digital wellness data integration with healthcare institutions on the broader

healthcare e-business ecosystem. Rather than conducting a single case study or quantitative statistical analysis, this approach was deemed more appropriate for synthesizing insights from major academic studies published over the past five years.

This methodological choice reflects the fact that the utilization of wearable data in digital healthcare is still in an institutionalization phase, wherein both academia and industry are concurrently engaging in theoretical discourse and practical application. Accordingly, the purpose of this study is to systematically review and analyze prior research findings and discussions to deepen conceptual understanding and provide a robust theoretical foundation for future empirical investigations.

3.2. Data Collection

The research data were collected primarily from international academic publications released since 2020. This temporal scope was selected because the large-scale diffusion of digital healthcare and wearable technologies has accelerated notably within the last five years.

Major academic databases—Scopus, PubMed, Web of Science, ScienceDirect, and SpringerLink—were utilized for literature retrieval. The search keywords included combinations such as “wearable devices” AND “digital health”, “wellness data” AND “healthcare integration”, “AI-driven healthcare” AND “e-business models”, and “health data interoperability” AND “privacy.”

The initial search yielded approximately 200 articles. After eliminating studies with limited relevance or overlapping content, the remaining papers were reviewed through an abstract and full-text screening process. Ultimately, ten core studies were selected as the final analytical corpus.

These key works included studies that examined the potential of wearable data integration for patient-centered healthcare (Azodo et al., 2020), the factors influencing clinical adoption (Smuck et al., 2021), the constraints of digital health business models (Kelley et al., 2020), data privacy and security concerns (Paul et al., 2023), and the feasibility of AI-driven telemedicine (Ghadi et al., 2025), among others.

3.3. Analytical Procedure

The collected literature was analyzed using a qualitative content analysis approach.

First, each study’s objectives, subjects, theoretical frameworks, and key findings were systematically reviewed and summarized. Subsequently, recurring core concepts across the selected papers were identified to extract principal thematic dimensions.

These extracted concepts were then categorized according to their conceptual similarity and relevance, resulting in four primary thematic categories:

(1) formation of platform ecosystems,
(2) patient-centered innovation in healthcare,
(3) regulatory and ethical challenges, and
(4) transformations in e-business models.

Finally, these four categories were synthesized to construct an integrative framework illustrating how the integration of wearable-based digital wellness data into healthcare institutions influences the evolution and dynamics of the healthcare e-business landscape.

4. Result of the Study

4.1. Formation of a Platform Ecosystem

The literature analysis revealed that the integration of wearable-based digital wellness data with healthcare institutions plays a crucial role in forming a new platform ecosystem within the healthcare industry.

Hermes et al. (2020) emphasized that digital transformation is shifting the healthcare sector away from a single-institution-centered structure toward a platform-based ecosystem involving multiple stakeholders. Patients have evolved from being mere recipients of medical services to becoming data producers and active participants within the ecosystem. In this process, hospitals, insurance companies, pharmaceutical firms, and IT corporations have begun sharing and utilizing patient data, thereby constructing new value networks.

Similarly, Bardhan et al. (2025) underscored that patient-centered data integration facilitates the expansion of healthcare platform ecosystems and enables data-driven service innovation. Such developments not only enhance decision-making within medical institutions but also reinforce interorganizational collaboration across the industry, shaping new forms of competition and cooperation.

4.2. Patient-Centered Healthcare Innovation

Second, wearable data emerged as a major driver of patient-centered healthcare innovation.

Azodo et al. (2020) demonstrated that data collected through wearable sensors can improve treatment processes and support clinical decision-making by healthcare professionals. Likewise, Smuck et al. (2021) highlighted that wearable technologies enhance patients’ self-management capabilities and foster interactive communication between patients and clinicians, thereby improving treatment outcomes.

Moreover, Ghadi et al. (2025) illustrated that

combining AI with wearable data enables remote patient monitoring (RPM) and the realization of personalized prevention, diagnosis, and treatment.

Collectively, these findings indicate that wearable-based data empowers patients to actively manage their health information and engage meaningfully in the care process, thereby realizing the vision of patient-centered care.

4.3. Regulatory and Ethical Challenges

The third key finding pertains to regulatory and ethical challenges.

During the integration of digital wellness data into healthcare systems, data privacy and information security emerged as the most critical issues.

Paul et al. (2023) warned that as patient data become increasingly digitized and shared among multiple institutions, the risks of data breaches and misuse grow, potentially undermining public trust.

Furthermore, national differences in legal regulations and data standards hinder interoperability across healthcare systems.

Kelley et al. (2020) argued that for digital health innovation to proliferate within public healthcare systems, institutional safeguards must be strengthened alongside privacy protection to establish scalable business models.

These findings imply that wearable data integration extends beyond technical challenges, necessitating comprehensive institutional and ethical responses.

4.4. Transformation of Business Models

Finally, the integration of wearable data is reshaping healthcare e-business models.

LaBoone and Marques (2024) explained that the convergence of wearable data and AI technologies revolutionizes hospital workflows and enables the creation of new data-driven services. This transformation supports healthcare organizations in developing new revenue models—such as personalized insurance products, digital therapeutics, and customized wellness programs.

Bardhan et al. (2025) further argued that digital healthcare e-businesses must move beyond mere technology adoption, emphasizing sustainable service design and value creation based on patient engagement and data utilization.

Meanwhile, Kelley et al. (2020) stressed that to diffuse innovative business models within public systems, both financial sustainability and regulatory alignment must be achieved.

Overall, wearable data are transforming the healthcare industry's business models toward platform-oriented, personalized, and sustainability-driven structures.

5. Conclusions and Implications

This study synthesized recent international literature to analyze the impact of wearable-based digital wellness data integration with healthcare institutions on the evolution of healthcare e-business.

The analysis identified four major outcomes:

(1) it promotes the formation of platform ecosystems connecting hospitals, insurers, pharmaceutical companies, and IT firms;

(2) it facilitates patient-centered medical innovation by enhancing patients' self-management and engagement;

(3) it exposes regulatory and ethical limitations, particularly regarding privacy, security, and interoperability; and

(4) it drives business model transformation through customized services and the creation of new revenue streams.

These findings suggest that digital healthcare innovation demands not only technological advancement but also structural and institutional transformation across the entire healthcare system.

5.1. Academic Implications

This research contributes to academic discourse in three major ways.

First, it extends the study of wearable data and digital healthcare beyond traditional medical informatics or management frameworks by adopting an e-business perspective. This interdisciplinary approach enables a more comprehensive understanding of digital healthcare as an economic and managerial phenomenon, not merely a technological one.

Second, by linking the concepts of platform ecosystems and patient-centered care, the study underscores that patients are no longer passive data providers but active participants in healthcare value creation. This expands the theoretical understanding of patient roles and highlights the need for future research to explore user experience and data sovereignty more deeply.

Third, by positioning regulatory and ethical issues as essential analytical variables, this study moves the discourse beyond technological utility to address the governance and social acceptability dimensions of digital wellness data integration.

5.2. Policy Implications

From a policy standpoint, several key implications

emerge.

First, data privacy and security must be recognized as prerequisites for the expansion of wearable data utilization. Governments should establish data governance frameworks aligned with international standards. For instance, legal and institutional measures should be developed with reference to global regulations such as HIPAA (U.S.) and GDPR (Europe) while adapting them to the Korean context (Paul et al., 2023).

Second, policy frameworks that facilitate collaboration between public health systems and private enterprises are required. As Kelley et al. (2020) noted, scalable business models are often lacking in public healthcare systems, necessitating government incentives and regulatory flexibility.

Third, because digital healthcare innovation transcends the boundaries of individual institutions, cross-ministerial collaboration—among the Ministry of Health and Welfare, financial regulators, and the Ministry of Science and ICT—is essential. Such coordination would ensure both secure data sharing and industrial competitiveness.

5.3. Practical Implications

Practically, this study offers valuable insights for healthcare ecosystem participants, including hospitals, insurers, pharmaceutical firms, and IT companies. First, hospitals should leverage wearable data not merely as supplementary information but as core assets in clinical decision-making and operational strategy. This necessitates improved medical staff training and data literacy. Second, insurance and pharmaceutical companies can use wearable data to design personalized insurance plans and enhance drug development efficiency, thereby generating new revenue streams while improving customer loyalty and reducing costs. Third, IT companies and startups should develop sustainable service models through long-term partnerships with healthcare institutions and public systems, prioritizing strategic collaboration over short-term technological gains. Finally, patients themselves can actively participate in their own health management through wearable data utilization, thereby improving quality of life and contributing to the sustainable growth of healthcare e-business. In summary, the integration of wearable-based digital wellness data into healthcare institutions serves as a core catalyst for innovation in healthcare e-business. However, realizing its full potential requires a convergence of academic research, policy reform, and practical implementation strategies.

Through its comprehensive literature-based analysis, this study provides both theoretical and practical foundations for advancing Korean and global digital healthcare e-business models in the era of intelligent health ecosystems.

References

Azodo, I., Williams, R., Sheikh, A., & Cresswell, K. (2020). Opportunities and challenges surrounding the use of data from wearable sensor devices in health care: qualitative interview study. *Journal of Medical Internet Research, 22*(10), e19542.

Bardhan, I., Kohli, R., Oborn, E., Mishra, A., Tan, C. H., Tremblay, M. C., & Sarker, S. (2025). Human-centric information systems research on the digital future of healthcare. *Information Systems Research, 36*(1), 1-20.

Bocean, C. G., & Vărzaru, A. A. (2025). Health status in the era of digital transformation and sustainable economic development. *BMC Health Services Research, 25*(1), 1-15.

Ghadi, Y. Y., Shah, S. F. A., Waheed, W., Mazhar, T., Ahmad, W., Saeed, M. M., & Hamam, H. (2025). Integration of wearable technology and artificial intelligence in digital health for remote patient care. *Journal of Cloud Computing, 14*(1), 39.

Hermes, S., Riasanow, T., Clemons, E. K., Böhm, M., & Krcmar, H. (2020). The digital transformation of the healthcare industry: exploring the rise of emerging platform ecosystems and their influence on the role of patients. *Business Research, 13*(3), 1033-1069.

Kelley, L. T., Fujioka, J., Liang, K., Cooper, M., Jamieson, T., & Desveaux, L. (2020). Barriers to creating scalable business models for digital health innovation in public systems: qualitative case study. *JMIR public health and surveillance, 6*(4), e20579.

LaBoone, P. A., & Marques, O. (2024). Overview of the future impact of wearables and artificial intelligence in healthcare workflows and technology. *International Journal of Information Management Data Insights, 4*(2), 100294.

Paul, M., Maglaras, L., Ferrag, M. A., & Almomani, I. (2023). Digitization of healthcare sector: A study on privacy and security concerns. *ICT express, 9*(4), 571-588.

Smuck, M., Odonkor, C. A., Wilt, J. K., Schmidt, N., & Swiernik, M. A. (2021). The emerging clinical role of wearables: factors for successful implementation in healthcare. *NPJ digital medicine, 4*(1), 45.