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RESEARCH ARTICLE

The Impact of Information and Communication Technologies on Gender Aspects in the Health System: A Systematic Review

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Abstract

This article explores the use of information and communication technologies (ICT) and mobile healthcare technologies (mHealth) to manage performance in medical institutions and promote social transformation, focusing on gender aspects. ICT helps to optimize decision-making processes, increase transparency, and enhance analytical capabilities. However, the introduction of these technologies can both reduce and increase gender inequality, depending on their design and context of use. The aim of the study is to identify the opportunities and risks associated with the use of ICT and mHealth in the context of gender dynamics. A systematic literature review method was applied within the study's framework, including articles selected following the PRISMA methodology used in systematic reviews and meta-analyses. Of the 610 publications found on the Scopus platform, 48 articles directly related to ICT and PMM in the health sector were selected and analyzed. ICT and mHealth technologies significantly improve operational efficiency and expand healthcare access. Persistent gender barriers, such as limited technical skills and unequal access to technology, hinder women's participation in mHealth programs. The data was updated in November 2024. Today, the possibilities of using ICT to support various processes in medical organizations are highly diverse. Managers at all levels must understand and can evaluate how each technology contributes to the fulfillment of specific tasks and increases overall efficiency.

Keywords: Digital Technologies, Information and Communication Technologies, Mobile Healthcare Technologies, Gender Inequality, Performance Management, Performance Measurement, Healthcare

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1. INTRODUCTION

The modern healthcare system faces several challenges, including improving the quality of services, reducing costs, and ensuring equal access for all population groups. Information and communication technologies (ICT) play a key role in solving these problems by providing tools for data analysis, process automation, and decision support. However, the social context, including gender relations, is often left out of consideration when developing and implementing such technologies. The study examines the dual roles of ICT and mHealth: their potential for women's empowerment and the risk of exacerbating existing gender imbalances (Aceto et al., 2018).

One of the key aspects of the evolution of PMM in recent decades has been the active introduction of information and communication technologies (ICT). Using digital tools such as big data systems, artificial intelligence, cloud technologies, and blockchain allows you to automate management processes, collect and analyze large amounts of data, and integrate various systems to ensure the continuity and consistency of medical services. However, the scientific literature must be more comprehensive in studying how ICTs can support the entire performance management cycle - from measuring indicators to making strategic decisions.

Research has shown that mHealth initiatives or health programs complemented by mobile phone technology can contribute to women's empowerment. However, there is growing concern that mobile programs targeting women may exacerbate gender inequality. Despite the active research on healthcare technologies, the focus is on the clinical aspects of their application, such as telemedicine, diagnostics using artificial intelligence, or procedure automation. Management processes, including their digital transformation, need to be more publicized. There are significant gaps in understanding how ICTs contribute to the development and implementation of multidimensional PMM systems that can consider not only traditional accounting indicators but also concepts such as value-based healthcare, sustainability, and resilience (Banta, 2003).

New public administration reforms were initiated in the 1990s, and crises such as the COVID-19 pandemic have accelerated the digitalization of medical management, heightening the importance of applying technology to improve efficiency. Research shows that digitalization improves the quality of medical care, increasing operational efficiency and strengthening public confidence in medical institutions. However, the successful implementation of ICT requires strategic planning, consideration of institutional features, and alignment of goals at the organizational and system levels.

This study is a systematic review of the literature to identify the opportunities and risks associated with using ICT and mHealth in the context of gender dynamics. The research methodology was based on the PRISMA approach, which ensured transparency and objectivity in the selection and analysis of publications. After analyzing 48 relevant articles, the authors seek to fill the existing knowledge gap by providing a holistic view of how digital technologies can be integrated into performance management processes.

This review details the key technologies and tools used to support PMM, their impact on management decision-making, and the limitations associated with implementation. The proposed structure of the analysis can become the basis for further research and practical developments in the field of digital transformation of healthcare. Thus, the article's purpose is to expand the scientific base for understanding how ICT and mHealth can contribute to achieving strategic goals in healthcare, ensuring the sustainable development of medical organizations, and reducing gender inequality.

2. LITERATURE REVIEW

The first wave of ICT research in healthcare

focused on improving technical and operational processes. However, since the 2000s, the focus has shifted to studying the impact of technology on social aspects, including gender relations. According to research, mHealth technologies, such as mobile health apps, have improved women's access to health services, increasing their autonomy and involvement in making decisions about their health. For example, programs that provide women with mobile phones for consultations have improved communication between partners. Nevertheless, such initiatives have sometimes provoked family conflicts related to changing traditional roles.

The gender dimensions of ICT and mHealth use also include issues of the digital divide. Men often have more opportunities to access technology, which limits women's participation in such programs. Studies have shown that women's lack of digital literacy increases their dependence on men for technology use, which can hinder the achievement of gender equality goals.

Management and Performance Assessment (PMM) systems are structured processes and methodologies that use data to help an organization achieve strategic goals within its mission and strategy (Ouchi, 1979). Performance measurement involves collecting and analyzing data, selecting appropriate metrics, and calculating metrics to assess an organization's ability to achieve strategic goals. In turn, performance management uses collected information to support decision-making (Lebas, 1995; Bititci et al., 2012).

A study conducted by Tatichiet and co-authors (2010) identified three key stages in the creation of PMM systems: the definition of performance indicators that reflect the ability to evaluate specific aspects of an organization's activities, the development of measurement systems that structure data and indicators within an overall evaluation system; and the integration of data to support management decision-making.

PMM plays a key role in medical institutions, ensuring decision-making based on objective data (Prenestini & Noto, 2023). This helps managers focus on the facts, avoiding subjective judgments and assumptions. After the New Public Administration reforms, PMM systems became widespread in the Western public sector and healthcare to limit the previously adopted bureaucratic Weber model (Hood, 1991; Nuti et al., 2018).

The first PMM systems implemented in healthcare organizations-controlled objects associated with traditional accounting indicators, such as input data (for example, financial and human resources) and output data (for example, the volume of services provided) (Nuti et al., 2018). After 2000, certain limitations and undesirable consequences of the original PMM model were identified, which required a revision of its approaches (Bevan & Hood, 2006; Wadmann et al., 2013). In response to these challenges, a new line of PMM systems was developed, featuring a more straightforward measurement approach that covered a wide range of parameters. These systems facilitate inter-organizational interaction and coordinated work of various departments of medical institutions (Kaplan & Norton, 2005; Bititci et al., 2012; Nuti et al., 2018). Achieving such results required introducing new tools to coordinate goals, share information, and facilitate collaboration between healthcare providers, which led to significant changes in healthcare management.

Information and communication technologies began to be applied in healthcare in the 1990s, significantly increasing the accessibility, efficiency, and quality of medical processes (Aceto et al., 2018). The COVID-19 pandemic has become a catalyst for the digital transformation of medical organizations, accelerating adaptation processes similar to trends in other sectors. Although the topic of the introduction of ICT in health care is being actively studied, there still needs to be more in the literature. Most studies focus on using technology to solve specific clinical problems, while the impact of ICT on management processes still needs to be better understood (Bechkami & Daim, 2012).

Of particular interest to researchers is the PMM, given its importance in both theoretical and practical aspects. The development of ICT and specialized software for PMM in the late 1980s and early 1990s played an important role in accelerating the development of innovative performance assessment tools and systems (Paolini, 2022).

Medical ICTs are digital technologies used in healthcare to optimize management, improve accessibility and delivery of medical services, and facilitate communication between patients and medical organizations (De Rosis et al., 2020; Wyers, 2024). This technological advance aims to improve the accuracy and efficiency of data presentation and measurements and predict the impact of actions on the final results based on cause-and-effect relationships (Noto et al., 2023). According to a study by Porter and Theisberg (2006), ICTs serve as a tool for collecting, analyzing and using data on patients, procedures, methods, costs and results. However, their goal is not to use the technology itself but to apply the principles of value-based healthcare, combining clinical, administrative, and financial information. The introduction of multidimensional PMM systems required the support of integrated ICTs that help manage the complexities of PMM, ensuring data quality and accuracy and facilitating the establishment of cause-and-effect relationships (Tortorella et al., 2020). Modern ICTs such as big data, artificial intelligence, blockchain, cloud computing, and other technologies continue transforming PMM systems. However, many studies focus only on certain technologies without offering a comprehensive approach. This indicates the need to develop strategies that will facilitate the implementation of ICT in healthcare.

3. METHODOLOGY

A systematic approach was used to analyze the relationship between PMM and modern ICT. This helped minimize bias and implement a transparent analysis process. The method made it possible to identify the study's results for selecting relevant publications. Although effective, this approach can sometimes exclude essential materials. To solve this problem, we have applied a flexible article selection process, considering it an auxiliary tool. The research protocol included three key stages: literature selection, analysis, and peer review.

At the first stage, we selected publications from two leading databases - Scopus (351) and Web of Science (238), which together resulted in 589 publications. To eliminate duplicate entries, a deduplication process was carried out. During this process, 142 articles were deleted, leaving 447 unique publications for further analysis. Then, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method filtered the first set of articles twice based on their scientific content at the selection stage. The main objective was to assess the relevance of the research topic, as well as to exclude publications that dealt with aspects not directly related to PMM and ICT in healthcare. These publications also lacked sufficient scientific input, such as short reviews or unpublished materials. In particular, as soon as the set of articles was determined, we read their annotations, which led to the exclusion of 279 articles.

At the second stage, a full text analysis of the remaining 168 articles was carried out. The selection criteria included the presence in the article of empirical data, practical examples of the use of ICT and mHealth in healthcare. The reliability of the research methodology. All selection steps and results are presented in the PRISMA diagram (see Figure 1).

This study demonstrated the chronological distribution of publications on using ICT and mHealth technology in the healthcare sector. Figure 2 shows the number of publications in this field from 2011 to 2022. It is noteworthy that the graph shows a significant jump starting in 2020. This can be explained by the increased demand for efficiency improvements in the health sector after the effects of the COVID-19 pandemic. In 2022, the most significant number of publications emphasized integrating operational excellence with healthcare 4.0 technologies.

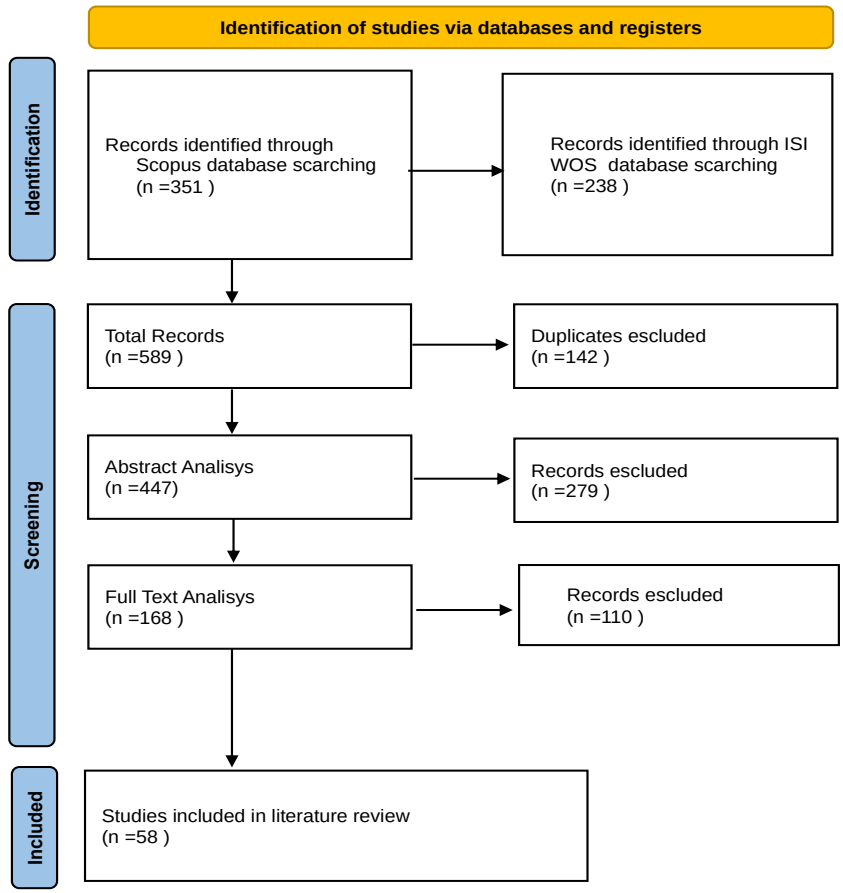

Figure 1. A selection of relevant literature using the PRISMA method

Note: compiled by the authors

4. RESULTS

Conducting a systematic review of the literature, we analyzed the number of published articles according to the year of their publication, which determines the study's contribution to the relationship between RMM and ICT in the health sector. Notably, the early 2000s marked the initial rise in publications, likely driven by advancements in mobile technology and ICT infrastructure. However, the most remarkable growth occurred in the post-pandemic era, reflecting the increased focus on remote healthcare solutions necessitated by global health crises.

Figure 2 illustrates the evolution of scientific publications addressing the application of ICT and mobile health (mHealth) solutions in healthcare from 1995 onwards, using data sourced from Scopus and Web of Science.

In Figure 2, we see that research on the relationship between RMM and ICT has been conducted since 1995, and the first publication is the work of Bomb et al. (1995). Studying historical trends, we noticed that in 2015, there was more interest in exploring this topic. An article by Rosen and co-authors (2015) on using sensors to measure the effectiveness of teamwork in healthcare has become one of the most cited in our sample. Over the past five years (2020-2024), scientific achievements in this field have increased, which may have been facilitated by the COVID-19 pandemic.

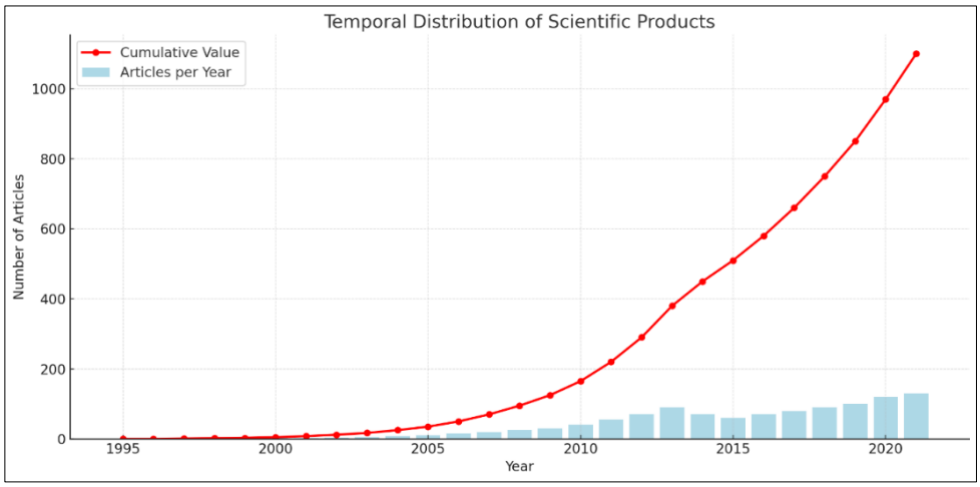

Figure 2. Distribution of scientific results over time

Note: compiled by the authors

In 2022, most of the studies reviewed were published in management journals such as Span'o and Ginesti (2022), Tortorella et al. (2022), and Srivastava and Srivastava (2022). A similar trend may be observed in 2023 (Ippolito et al., 2023; Korhonen et al., 2023). In 2024, the publication on this research topic was also active since the concept of healthcare development until 2026 provides for further infrastructure development and digitalization of the healthcare system.

The following analysis is related to the geographical location of the research from the point of view of the countries where the universities of the authors conducting the research are located. This analysis gives us an idea of how scientific interest is distributed depending on territorial boundaries. We identify countries and can thus identify researchers who make the most significant contribution to the scientific literature. Figure 3 shows the distribution of articles made by research area, from 1993 to 2023.

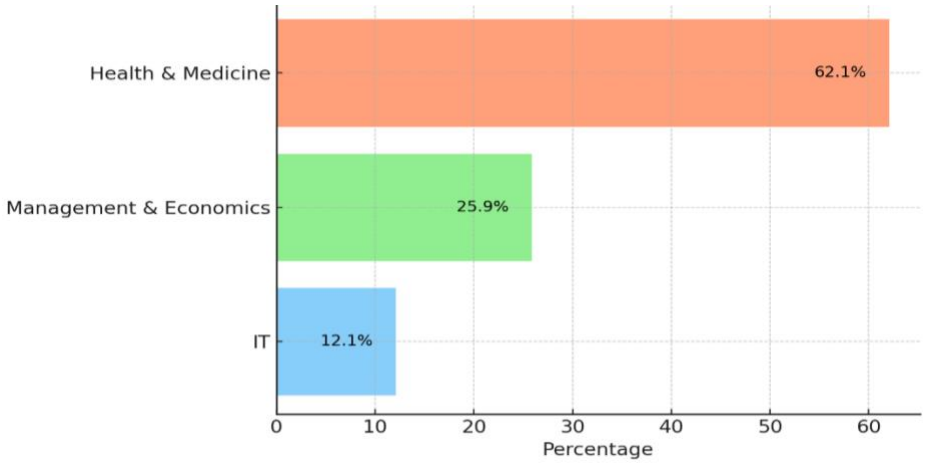

Figure 3. Distribution of articles by research area (1993-2023)

Note: compiled by the authors

The following analysis is related to the geographical location of the study in terms of the countries where the universities of the authors conducting the study are located. This analysis gives us an idea of how the scientific interest of researchers is distributed depending on the territorial boundaries in the scientific literature.

Figure 4 illustrates geographical distribution of research for 1993-2023

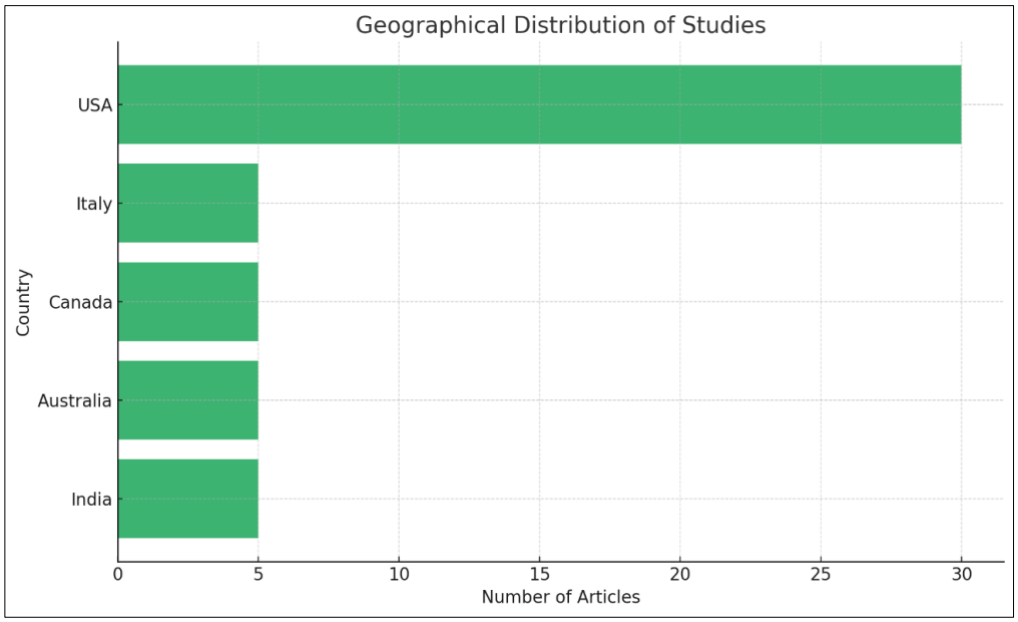

Figure 4. Geographical distribution of research for 1993-2023

Note: compiled by the authors

The graph shows the number of published articles by country, highlighting the significant imbalance in their geographical distribution. Thus, the United States leads in publications, which significantly exceeds the figures of other countries. Next, countries that have made the most significant contribution to the development of modern literature and published five or more publications include Canada, Australia and India. The findings reflect uneven global participation in research activities, with the dominant role played by the United States highlighted. Lower activity in other countries may be due to differences in funding, infrastructure, and access to resources. Broader international initiatives are needed to ensure a more balanced scientific activity globally.

The chart shows gender differences in access to technology, participation in mHealth programs, and digital literacy (Figure 5).

The data for 2022 reflect the gender gap in three key categories: access to technology, participation in mHealth, and digital literacy. Men perform significantly better in all categories, with a gap remaining at 20%. The most pronounced differences are seen in digital literacy, where men's rates reach 75%, while women's reach 55%. These results highlight the advantage men have in developing digital skills needed for active participation in the technological environment. A similar trend is seen in access to technology where a 20% gap reflects structural barriers women face. A similar dynamic is also seen in the use of mHealth technologies which indicates women's insufficient involvement in mobile health programs despite their potential for improving quality of life. Thus, the data presented demonstrate a persistent gap that requires targeted efforts to increase women's access to modern technology and digital tools.

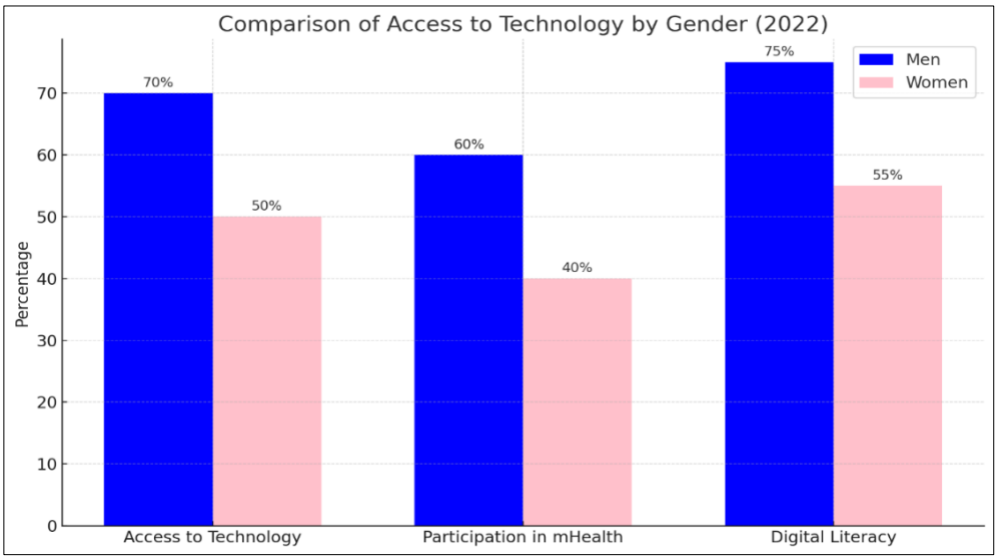

Figure 5. Comparison of access to technology by gender for 2022

Note: compiled by the authors

Such differences may be related to unequal access to resources, educational barriers, as well as social and cultural factors that hinder women's active participation in the technological environment. Lack of resources and technical skills also create significant constraints for women, indicating the need to consider barriers in more detail. Furthermore, gender barriers to participation in mHealth programs illustrate the main obstacles for men and women, such as social pressure, lack of resources and technical skills (Figure 6).

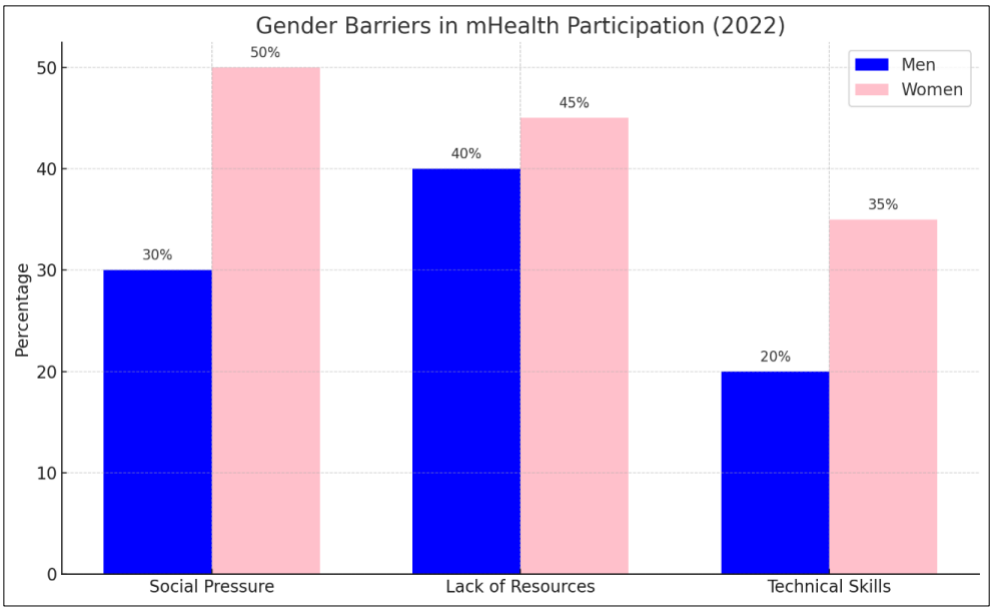

Figure 6. Gender barriers in mHealth program participation

Note: compiled by the authors

The chart shows the difference between men and women regarding access to technology, mobile healthcare, and digital literacy in 2022. It is clear that men have a major advantage in all these areas. Their access to technology was 70% compared to 50% for women. When it comes to mobile healthcare, men's participation was 60%, while women's was only 40%. Men had a higher level of digital literacy at 75% compared to women at 55%. These numbers show that there is still a big gap between men and women when it comes to using technology.

5. CONCLUSIONS

Initially, ICT research focused on technical aspects such as process automation and service quality improvement. However, since the 2000s, attention has been paid to social aspects, including gender relations. Men often have more access to technology, which limits women's participation in mHealth programs. Studies have shown that women's lack of digital literacy increases their dependence on men when using technology, which hinders the achievement of gender equality goals.

The main conclusions are as follows:

1. The role of ICT and mHealth in healthcare: ICTs increase transparency and analytical abilities, which contribute to more informed decision-making in healthcare management. mHealth technologies can expand access to medical services for different segments of the population, including women, who traditionally face great barriers to access to medicine.

2. Impact on gender inequality: ICT can both reduce and increase gender inequality, depending on the technology's design and the context of its use. For example, women's limited access to technology or lack of digital skills may exacerbate the existing gap. At the same time, well-designed programs aimed at developing digital literacy among women can reduce this gap.

3. Gender barriers to using mHealth: The main barriers include social pressure, lack of resources and technical skills. Women are more likely to face these problems, which indicates the need for gender-oriented initiatives in the development and implementation of mHealth.

The study confirms that information and communication technologies can significantly improve the effectiveness of management in healthcare. However, their implementation must take gender aspects into account. In the process of implementing technology, certain risks are identified, such as women's limited access to digital tools and low digital literacy levels, which may exacerbate existing gender imbalances, especially in the case of mobile technologies. These technologies, on the one hand, can increase access to health services but, on the other, can also strengthen gender barriers if social and cultural factors are not considered. Programs aimed at supporting women, for example, may provoke resistance from conservative communities due to their violation of traditional roles and expectations.

The study highlights the need for further work in this direction, including a detailed study of the impact of ICT and mHealth on social structures and the development of practical recommendations for the implementation of these technologies in various cultural and social settings. The introduction of such solutions could be an important step towards creating a healthcare system that is effective, sustainable, and fair.

REFERENCES

Aceto, G., Persico, V., & Pescapè, A. (2018). The role of Information and Communication Technologies in healthcare: Taxonomies, perspectives, and challenges. *Journal of Network and Computer Applications, 107*, 125–154. https://doi.org/10.1016/j.jnca.2018.02.008

Banta, D. (2003). The development of health technology assessment. *Health Policy, 63*(2), 121–132. https://doi.org/10.1016/s0168-8510(02)00059-3

Bevan, G., & Hood, C. (2006). What's measured is what matters: Targets and gaming in the English public health care

system. *Public Administration, 84*(3), 517–538. https://doi.org/10.1111/j.1467-9299.2006.00600.x
Behkami, N. A., & Daim, T. U. (2012). Research forecasting for health information technology (HIT), using technology intelligence. *Technological Forecasting and Social Change, 79*(3), 498–508. https://doi.org/10.1016/j.techfore.2011.08.015
De Rosis, S., Cerasuolo, D., & Nuti, S. (2020). Using patient-reported measures to drive change in healthcare: The experience of the digital, continuous and systematic PREMs observatory in Italy. *BMC Health Services Research, 20*, 315. https://doi.org/10.1186/s12913-020-05099-4
Hood, C. (1991). A public management for all seasons? *Public Administration, 69*(1), 3–19. https://doi.org/10.1111/j.1467-9299.1991.tb00779.x
Kaplan, R. S., & Norton, D. P. (1992). The balanced scorecard: Measures that drive performance. *Harvard Business Review, 70*(1), 71–79. https://www.hbs.edu/faculty/Pages/item.aspx?num=9161
Lebas, M. J. (1995). Performance measurement and performance management. *International Journal of Production Economics, 41*(1–3), 23–35. https://doi.org/10.1016/0925-5273(95)00081-x
Noto, G., Prenestini, A., Cosenz, F., & Barresi, G. (2023). Tackling wicked problems in performance management and governance of public health: An empirical analysis of COVID-19 vaccination strategies. *International Journal of Public Sector Management, 36*(2), 130–151. https://doi.org/10.1108/ijpsm-07-2022-0163
Nuti, S., Noto, G., Vola, F., & Vainieri, M. (2018). Let's play the patients' music: A new generation of performance measurement systems in healthcare. *Management Decision, 56*(10), 2252–2272. https://doi.org/10.1108/md-09-2017-0907
Paolini, A. (2022). Integrated data management: New perspectives for management control. *Management Control, 2*, 5–14. https://doi.org/10.3280/maco2022-002-s1001
Tortorella, G. L., Fogliatto, F. S., Espósito, K. F., Vergara, A. M. C., Vassolo, R., Mendoza, D. T., & Narayanamurthy, G. (2020). Effects of contingencies on healthcare 4.0 technologies adoption and barriers in emerging economies. *Technological Forecasting and Social Change, 156*, 120048. https://doi.org/10.1016/j.techfore.2020.120048
Tortorella, G. L., Fogliatto, F. S., Kurnia, S., Thürer, M., & Capurro, D. (2022). Healthcare 4.0 digital applications: An empirical study on measures, bundles, and patient-centered performance. *Technological Forecasting and Social Change, 181*, 121780. https://doi.org/10.1016/j.techfore.2022.121780
Wyers, K. (2024). Health ICTs and transgender health equity: A research agenda. *Information Technology for Development, 30*(2), 264–290. https://doi.org/10.1080/02681102.2023.2292740

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