TECNOLOGÍA: RESULTADOS DE INVESTIGACIÓN

What is it wrong with healthcare digitalization? Restriction and biases

¿En qué falla la digitalización del sector de la salud? Limitaciones y sesgos

O que há de errado com a digitalização dos serviços de saúde? Limitações e preconceitos

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Abstract:

While digitization can make the health sector faster and more efficient, there are many financial, social and organizational obstacles and barriers to its implementation. This article offers a systematic review, with PRISMA method, of the main troubles detected from the scientific literature review. Also there is a proposal of new kind of restrictions and biases to pay attention. Finally, its offer a heterodox reading about the problem analyzed to improve its management and narrative.

Key words: healthcare digitalization, bias´ analysis, obstacles and barriers, heterodox analysis.

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Resumen:

Si bien la digitalización puede hacer que el sector de la salud sea más rápido y eficiente, existen muchos obstáculos y barreras financieras, sociales y organizacionales para su implementación. Este artículo ofrece una revisión sistemática, con el método PRISMA, de los principales problemas detectados a partir de la revisión de la literatura científica. También se proponen nuevos tipos de restricciones y sesgos a los que prestar atención. Finalmente, se ofrece una lectura heterodoxa sobre el problema analizado para mejorar su gestión y narrativa.

Palabras clave: digitalización de la atención sanitaria, análisis de sesgos, obstáculos y barreras, análisis heterodoxo.

Resumo:

Embora a digitalização possa tornar o setor da saúde mais rápido e eficiente, existem muitos obstáculos e barreiras financeiras, sociais e organizacionais à sua implementação. Este artigo oferece uma revisão sistemática, com o método PRISMA, dos principais problemas detectados a partir da revisão da literatura científica. Também são propostos novos tipos de restrições e preconceitos aos quais devemos prestar atenção. Por fim, oferece-se uma leitura heterodoxa do problema analisado para melhorar sua gestão e narrativa.

Palavras-chave: digitalização da saúde, análise de viés, obstáculos e barreiras, análise heterodoxa.

1. Introduction

The digital age represents a transformative economic and social phenomenon driven by key technologies, including artificial intelligence, Internet of Things (IoT), nanotechnology, biotechnology, and robotics (Moetlhoa, Nxele, Maluleke, Mathebula, Marange, Chilufya, Dzinamarira, Duah, Dzobo, Kekana, Jaya, Thabane, Dlangalala, Nyasulu, Hlongwana, Dlungwane, Kgatle, Gxekea, Mashamba-Thompson, 2024).

Digitization affects all areas of public and private-life and their management (Sánchez-Bayón, Sastre and Sánchez, 2024): people connect with friends, family, colleagues, and

businesses and exchange data with each other every day via apps and platforms (García and Sánchez-Bayón, 2021; Sánchez-Bayón, 2021). However, digitization in the healthcare sector is lagging far behind (Kajüter, Arlinghaus, Kus and Teuteberg, 2022; Joshi and Sharma, 2023).

Digital transformation involves using information and communication technology (ICT) in basically new business capabilities, public administration, and the lives of individuals and society to enable substantial advancements like effective operations, better consumer experiences, or new business models (Inampudi, Rajkumar, Gopi and Sruthi, 2024; Sánchez-Bayón, 2022; Sánchez-Bayón, 2023a; Sánchez-Bayón, 2023b).

The tidal wave of digital innovations, which has intensified into a technological tsunami over the past several years, has also impacted the healthcare sectors across the globe (Inampudi, Rajkumar, Gopi and Sruthi, 2024).

The emergence of digital technologies has significantly impacted efficiency, effectiveness, and reduced healthcare service costs (Moetlhoa, Nxele, Maluleke, Mathebula, Marange, Chilufya, Dzinamarira, Duah, Dzobo, Kekana, Jaya, Thabane, Dlangalala, Nyasulu, Hlongwana, Dlungwane, Kgatle, Gxekea, Mashamba-Thompson, 2024).

Eventually, as EMR provides proper management of chronic disease and other social problems, it can save up to $142–371 billion per year (Numair, Harrell, Huy, Nishimoto, Muthiani, Nzou, Lasaphonh, Palama, Pongvongsa, Moji, Hirayama, Kaneko, 2021).

Applying advanced digital technologies can provide real-time accurate information access to healthcare workers (HCWs) and provide decision supports to healthcare professionals for better clinical care provision (Numair, Harrell, Huy, Nishimoto, Muthiani, Nzou, Lasaphonh, Palama, Pongvongsa, Moji, Hirayama, Kaneko, 2021).

Thanks to digital technologies and tools in Medicine, particularly through e-Health technologies, prevention, diagnosis, treatment, monitoring and administration have been improved (Nikitenko, Voronkova, Kozar, Oleksenko, Yanchevskyi and Korobko, 2023).

Digitalization of health information can help to better patient information management and improve health services (Rahul, 2019; Numair, Harrell, Huy, Nishimoto, Muthiani, Nzou and Kaneko, 2021; Abbas, Qureshi, Khan, Chandio and Ali, 2022; Brenda, Douglas, Michelle and Atul, 2022; Gleiss and Lewandowski, 2022; Mahajan, Garg, Pandita and Sehgal, 2022; Saxena and Godfrey, 2022); also to improve the social wellbeing (Peña-Ramos, Recuero, Sánchez-Bayón and Sastre, 2021; Sánchez-Bayón and García-Ramos, 2020; Sánchez-Bayón, González and Andreu, 2022).

Yet, recent reviews suggested that patients and healthcare providers continue to resist the digital transformation in the health sector despite its several applications and benefits (Gopal, Suter-Crazzolara, Toldo and Eberhardt, 2019; Lu, Tsai, Wang, Tang, Li, Ke and Chen, 2021; Larisa and Patru, 2023; Lerzynski, 2021; Radwan, Alsharif, Alsharif, Aloufi and Alshammari, 2023; Aslan, Mold, Van Marwijk and Armes, 2024; Chen and Ruan, 2024; Inampudi, Rajkumar, Gopi and Sruthi, 2024).

There are important obstacles to implement these technologies to the health sector in different countries: Mediterranean and East European countries, Latin American countries, etc. (Lapão, 2019; MERCO, 2020; Dimitrova, Dimitrov, Ahchiyska, Nikolaeva, Ganova and Petrova, 2023; Grigorieva, Demkina and Korobeynikova, 2024).

Addressing such implementation challenges is crucial in designing and delivering digital health services. Current researches show that there is a chasm between the current health IT ecosystem and the health IT ecosystem that is needed.

Both the technologies themselves and the application of those technologies and the data they contain urgently need improvement to support the transition to value-based care. The existing obstacles are largely not knowledge barriers, but execution barriers (Adler-Milstein, Embi, Middleton, Sarkar and Smith, 2017).

It is known, what needs to be done but not necessarily how best to do it in terms of which specific actions should be pursued by which specific stakeholders.

And while the barriers to successful execution are considerable and require coordinated multi stakeholder action, they could, and should, be tackled with concerted efforts (Adler-Milstein, Embi, Middleton, Sarkar and Smith, 2017).

The health care industry is one of the most important industries in any society. Therefore, reducing costs, and increasing efficiency and effectiveness using digitalization of this industry is of great importance.

In order to succeed in digitizing the healthcare industry, it is necessary to first identify and examine the obstacles that stand in the way of this industry.

For this purpose, in this article, the barriers to digitalization of the healthcare industry are going to be extracted from the research literature of this field.

2. Literature review

Research on the barriers to digitalization of the healthcare industry in different countries has been conducted by various researchers (Rudwan, 2022; Monferdini, Pini, Bigliardi and Bottani, 2024; van Drumpt, Timan, Talie, Veugen and van de Burgwal, 2024). These researchers have suggested certain obstacles for the digitalization of the healthcare industry.

Some of these researches are as follows: Nuamir, Harrell, Huy, Nishimoto, Muthiani, Nzou and Kaneko (2021) implemented a mother and child health registration system in the study areas of Kenya and Lao PDR to evaluate barriers to digitalization.

They conducted in-depth interviews with 20 healthcare workers (HCWs) who used the system and analyzed it qualitatively with thematic framework analysis.

The results showed that workload and motivation to maintain high performance were significant obstacles to implementing a digital health system. They recommend enhancing the scope and focus on human needs and satisfaction as a significant factor for digital system durability and sustainability.

Adler-Milister, Embi, Middleton, Sarkar and Smith (2017) identify a set of focal goals and associated near-term achievable actions that are critical to pursue in order to enable the health IT ecosystem to meet the acute needs of modern health care delivery.

Kajüter, Arlinghaus, Kus and Teuteberg (2022), with a case study on the German healthcare sector, identified six categories of barriers that inhibit digital linking in healthcare: individual, legal, financial, institutional, technological, and workforce-related

barriers. They were analyzed using the dimensions of level, IT influence, and perception and applying the actor-network theory.

Moetlhoa, Nxele, Maluleke, Mathebula, Marange, Chilufya, Dzinamarira, Duah, Dzobo, Kekana, Jaya, Thabane, Dlangalala, Nyasulu, Hlongwana, Dlungwane, Kgatle, Gxekea and Mashamba-Thompson (2024) presents the outcomes of a workshop conducted with key stakeholders, aiming to discern barriers and enablers in implementing digital-connected POC diagnostic models in South Africa.

The workshop, a component of the 2022 REASSURED Diagnostics symposium, employed the nominal group technique (NGT) and comprised two phases:

Phase 1 focused on identifying barriers, while

Phase 2 centered on enablers for the implementation of digital-linked POC diagnostic models.

Stakeholders identified limited connectivity, restricted offline functionality, and challenges related to load shedding or rolling electricity blackouts as primary barriers.

Conversely, ease of use, subsidies provided by the National Health Insurance, and 24-h assistance emerged as crucial enablers for the implementation of digital-linked POC diagnostic models.
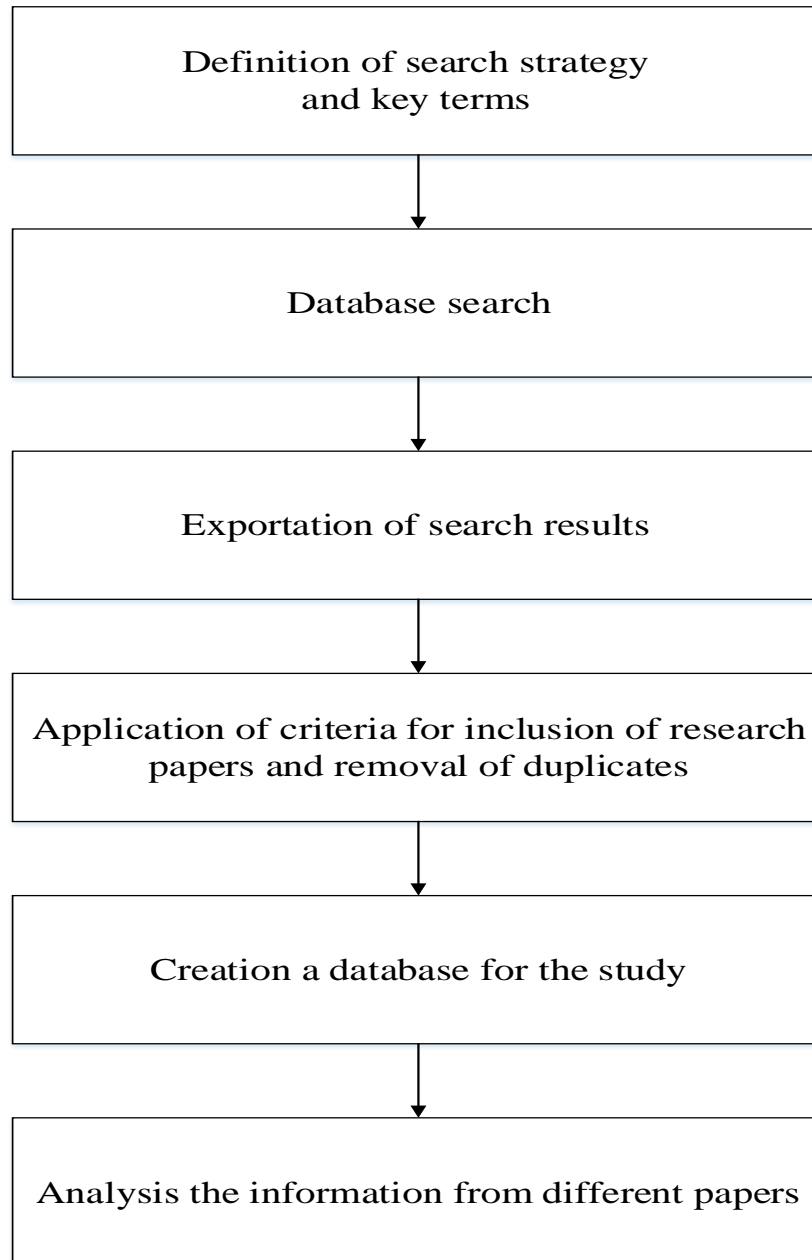
Inampudi, Rajkumar, Gopi and Sruthi (2024) attempted to identify the potential barriers to the implementation of digital transformation in the health sector of India. Barriers identified were mainly associated with limited technological and medical infrastructure, data security and privacy, and a lack of physical examination.

3. Methodology

The methodology used in this study was a Systematic Literature Review (SLR). This framework included planning, which involves the identification of the research questions; conducting the review; searching for relevant literature; and analyzing the literature through selection, extraction, and coding.

Following charts shows the Procedure of Systematic Literature Review (**Figure N°1** and **Figure N°2**).

Figure N°1. Stages for a systematic literature review.

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│     Definition of search strategy    │
│            and key terms             │
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┌─────────────────────────────────────┐
│          Database search             │
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│     Exportation of search results    │
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┌─────────────────────────────────────┐
│  Application of criteria for inclusion│
│  of research papers and removal of   │
│             duplicates               │
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┌─────────────────────────────────────┐
│     Creation a database for the study│
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┌─────────────────────────────────────┐
│  Analysis the information from        │
│        different papers              │
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Source: Tranfield, Denyer and Smart, 2003.

The first step in collecting information involved defining the key terms used in the search. The process of search done on Scopus and Google scholar as follow:

a) Search with (healthcare AND digitalization AND obstacles) in Scopus: 31 documents.

b) Search with (healthcare AND digitalization AND barriers) in Scopus: 97 documents.

c) Search with all-in-title: healthcare digitalization barriers in Google scholar 2 documents.

d) Search with all-in-title: healthcare digitalization obstacles in Google scholar 1 document.

e) Search with all-in-title: healthcare digitalization challenges: in Google scholar 20 documents.

Some of found documents in search were not relevant and useful for our purpose. So we omitted them.

Finally, relevant papers were investigated and searched for the answer to the research questions: What are the obstacles and barriers on healthcare digitalization? And, how to improve its management?
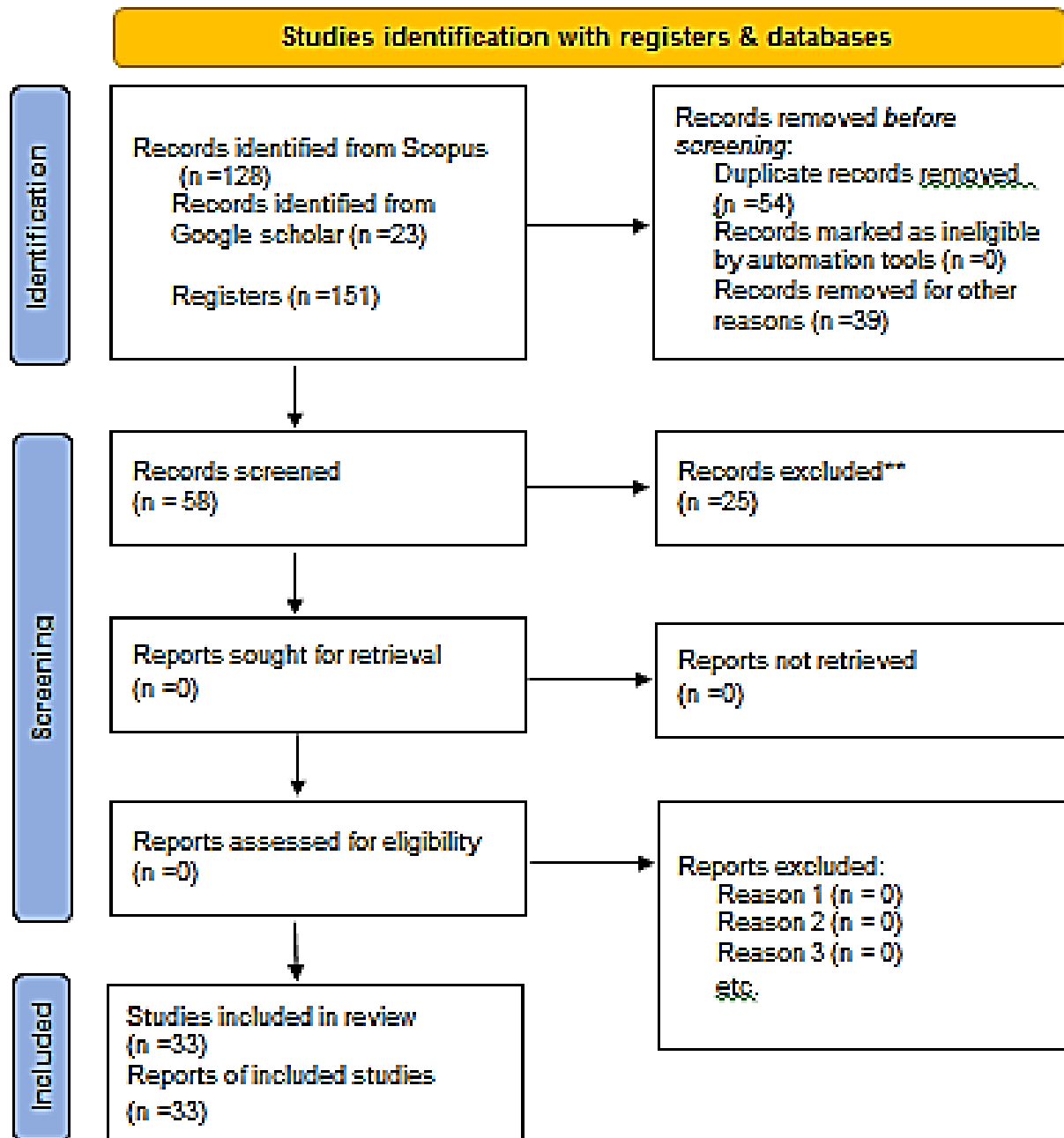
The following tables show the obstacles drawn from literature (see **Table N°1** and **Table N°2).** Many of them are repetitive and others overlap. Therefore, they were coded, and was presented a new category of barriers to digitalization of the healthcare system.

The literature review of this study based on the PRISMA method can be seen in **Figure N°2** (Preferred Reporting Items for Systematic reviews and Meta-Analyses or PRISMA).

This method has been designed primarily for systematic reviews of studies that evaluate the effects of health interventions, irrespective of the design of the included studies. However, the checklist items are applicable to reports of systematic reviews evaluating other non-health-related interventions (Trifu, Smîdu, Badea, Bulboacă and Haralambie, 2022).

Use of PRISMA 2020 has the potential to benefit many stakeholders. Complete reporting allows readers to assess the appropriateness of the methods, and therefore the trustworthiness of the findings (Page, McKenzie, Bossuyt, Boutron, Hoffmann, Mulrow, Shamseer, Tetzlaff, Akl, Brennan, Chou, Glanville, Grimshaw, Hróbjartsson, Lalu, Li, Loder, Mayo-Wilson, McDonald, McGuinness and Moher, 2021).

Figure N°2. PRISMA method for research on obstacles in healthcare digitalization.

Source: own elaboration (based on Page, McKenzie, Bossuyt, Boutron, Hoffmann, Mulrow, Shamseer, Tetzlaff, Akl, Brennan, Chou, Glanville, Grimshaw, Hróbjartsson, Lalu, Li, Loder, Mayo-Wilson, McDonald, McGuinness and Moher, 2021).

Table N°1. Systematic review of obstacles and barriers for healthcare digitalization (topics and references).

Source: own elaboration.

After omitting the duplicate and overlaps obstacles, our systematization offers 20 categories of barriers on healthcare digitalization (including new types detected):

Table N°2. Main categories of obstacles on healthcare digitalization.

1	Obstacles related to high cost of digitalization
2	Obstacles related to the fear of healthcare industry employees of reducing accuracy and productivity with the use of technology
3	Obstacles related to quantity and quality of data
4	Obstacles related to security and privacy of patients data
5	Obstacles related to complexity of using technology
6	Obstacles related to limitations of digital tools
7	Obstacles related to lack of education, skills and knowledge about digitalization
8	Obstacles related to inappropriate rules
9	Obstacles related to lack of strategy
10	Obstacles related to Infrastructure
11	Obstacles related to country culture and organizational culture
12	Obstacles related to lack of support
13	Obstacles related to lack of integrity and connectivity between technological tools
14	Obstacles related to healthcare management
15	Obstacles related to rolling electricity blackouts and internet weakness
16	Obstacles related to ethical concerns
17	Obstacles related to organizational structure
18	Obstacles related to workload and time limitation
19	Obstacles related to motivation of healthcare employees
20	Obstacles related to supply chain of technologies providers and healthcare organizations

Source: own elaboration.

4. Results and discussion

Although the obstacles and barriers to the digitalization of the health industry vary in different countries, many of these troubles are in common among all of them. In various studies, these obstacles have been examined and various categories have been made for them. Some of these barriers are related to the structure and culture of health organizations and the lack of skills to use digital tools in these organizations. Others are related to the culture of society and the degree of social acceptance of digitalization and technology. Another category of these obstacles is related to the cost of setting up and updating technologies. While the other part of these obstacles and barriers are related to the weakness of technology tools, the other is related to the lack of government and shareholders' support for digitalization. There are also concerns about patient data security and lack of appropriate rules to protect patient privacy. Various studies have suggested a variety of solutions to eliminate these barriers, the most common of which are the regulation of protocols and frameworks for protecting patient data and training the skills needed to digitize health care to industry employees.

5. Conclusions

Why there are not more improvements in the digitalization of the healthcare industry? According to the mainstream literature, the main obstacle and barriers are exogenous factors, related with the state of the art of technology and its popularization (to become part of the business culture and the labor relations). Under a heterodox analysis (specially, Austrian Economics and New-Institutional Approaches) the troubles are others: the main obstacle and barrier is the public interventionism, with bureaucracy and resistance to the change (Sánchez-Bayón, Sastre and Sánchez, 2024). Maybe, the problem is linked with the think-tanks of healthcare sector, because in Europe, the main patron is the public sector, for this reason there is not enough critics to the current system and proposals to improve it. There is a synchrony between the official speech and the literature review, as it was confirmed in this research.

Corollary: neo-Luddite risk

After analyzing the obstacles and barriers for healthcare digitalization and confirming their persistence and increase, a threat is now posed in this regard, such as the neo-Luddite risk. It turns out that, as long as it is applied the Neoclassical Synthesis and the welfare state model, with the incentives oriented towards public interventionism, especially with the mainstream consideration of Keynesian schools (including neo-Keynesians and post-Keynesians).

This implies resistance to change and distrust of digitalization, for fear of technological unemployment, as Keynes announced in the 1930s (Keynes, 1930; Keynes, 1936; Keynes, 1937). Hence we speak of the neo-Luddite risk or attack and control of technological advances that would favor the digital transition (Sánchez-Bayón, Sastre and Sánchez, 2024).

As in all previous industrial, technological and energy revolutions, adjustments have been necessary, but for each obsolete and disappeared job, others have emerged, it is enough to pay attention to the readjustment effect (Sánchez-Bayón, 2023), which in the care of the health would mean starting by reducing the obstacles and barriers to digitalization, so that new jobs adapted to change can emerge.

Acknowledgment

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