

Challenges in the Implementation of Disruptive Innovations in Health Care Organizations

Carsten KAISER^{a 1}, Sophia ACKERHANS^a, Thomas HUYNH^a,
Jochen DENZINGER^b, Maurice RIEGLER^b, Daniel DUMITRESCU^c,
Denise GUCKEL^c, Anke SCHMIDT^c and Carsten SCHULTZ^a

^aKiel Institute for Responsible Innovation, Kiel University, Germany

^bIconstorm GmbH, Germany

^cInstitute of Applied Telemedicine, Herz- und Diabeteszentrum NRW, Ruhr-Universität Bochum, Bad Oeynhausen, Germany

ORCID ID: Carsten Kaiser <https://orcid.org/0009-0009-8539-8596>, Carsten Schultz
<https://orcid.org/0000-0002-5984-9872>

Abstract. Health organizations face barriers when seeking to deploy radical innovations, such as innovative telemonitoring approaches or AI based Clinical Decision Support Systems (CDSS) into their clinical workflow. However, these barriers are of various types and rarely known to organizations and their management. This study conducted a systematic literature review of 99 selected studies to identify the implementation barriers and factors encountered in this process. Using a hierarchical framework comprising of strategies, resources and capabilities, and processes, the study examined 16 barriers generated from the analysis of the individual studies. The findings highlight implementation barriers on all three levels of the proposed framework. By addressing these barriers comprehensively, health care organizations can successfully implement radical health innovations and enhance patient care outcomes and health care delivery.

Keywords. CDSS, innovation implementation, innovation barriers, acceptance

1. Introduction

Health care organizations, particularly hospitals, should strive to enhance patient care and outcomes by embracing innovative technologies and approaches in their health care provision. In recent years, the introduction of radical innovations in health care settings has gained significant attention, as it holds the potential to revolutionize the way health care is delivered and executed. However, health care organizations often fail to introduce those technologies into individual contexts [1].

One such radical innovation that has the potential to fundamentally improve outpatient health care is the integration of artificial intelligence (AI)-based sensor-equipped hearing aids which provide clinical decision support for both patients and health professionals to detect and treat cardiovascular diseases like heart failure. Traditional methods of cardiovascular diseases detection often involve costly, time-

¹ Corresponding Author: Carsten KAISER, E-mail: kaiser@bwl.uni-kiel.de

consuming and inconvenient diagnostic procedures. However, AI-based CDSS hearing aids are equipped with sensors for heart rate monitoring, heart rhythm analysis, blood pressure monitoring and fall detection. The acoustic nature of a hearing aid further enables the use of medication reminders, alerts and emergency alerts as well as the medical analysis of voice.

Nevertheless, despite the potential advantages, stakeholders including health professionals, patients, and operators may face challenges in accepting and implementing these radical innovations. One major factor is the disruption of established routines and workflows, which lead to resistance to change and threats concerning the professional identity among health professionals [2]. Additionally, concerns about the impact on patient care quality, increased workload, and the need for the development of new capabilities are common barriers that health professionals encounter when faced with the adoption of radical innovations [3]. Concerns related to privacy and data security further contribute to resistance [4]. Moreover, a lack of adequate information and education regarding the potential advantages and outcomes of innovative healthcare solutions spark skepticism and resistance among patients. Additionally, operators, such as hospital management and telemonitoring administrators experience challenges concerning the integration of radical innovations into the existing clinical workflow. Finally, concerns regarding the financial implications and resource allocation required for implementing innovations can impact operator acceptance [5]. Stakeholders like health professionals, patients and operators tend to exhibit even lower levels of acceptance towards novel innovations as the degree of radicalness increases [6].



Figure 1. A pyramidal framework of the three suggested hierarchical levels

In order to successfully implement radical health care innovations, it is crucial to ensure the acceptance of all of those stakeholders. Therefore, various barriers to innovation implementation have to be considered. In this study, we present a hierarchical framework that outlines the key implementation barriers that must be considered when introducing a radical system into the clinical workflow. This pyramidal framework as shown in Figure 1 consists of three levels. At the top level, the strategy level, the development of an effective implementation strategy is required. Moving to the middle level, capabilities and resources needed for the successful integration of an innovation need to be considered. Finally, at the bottom level, the focus lies on the implementation and change of processes and routines that are needed to accommodate the innovation. We argue that by systematically addressing the barriers associated with each level, the chances of achieving acceptance and overcoming implementation barriers are greatly enhanced. The objective of this study is therefore to identify the specific barriers

associated with each level of the framework in order to equip health professionals with the knowledge necessary to effectively overcome these barriers.

2. Methods

We conducted a systematic literature review on the academic databases PubMed and Web of Science, searching for studies published between January 2010 and December 2021. The systematic literature review focused on analyzing barriers related to the implementation and use of clinical decision support systems (CDSS) as the described sensor-equipped hearing aid would be part of such a system. CDSS provide decision support for health professionals to improve medical decisions by analyzing patient data and comparing it to existing clinical knowledge [7]. For the search string, we have included keywords such as “CDSS”, various related systems as well as their synonyms and combined them with the keyword “acceptance” and its synonyms. We included studies published in English language in the given timeframe. Studies that did not focus on the adoption of CDSS by health professionals, that did not address factors and barriers to CDSS adoption and use, and that were not empirical studies were excluded. In total, 99 studies were included for further analysis.

3. Results

The included 99 studies were analyzed for their implementation factors and barriers regarding radical innovation implementation in health care. The findings were then integrated into the levels of the proposed framework (Table 1). A total of 859 distinct phrases were coded. From those, 16 codes were generated, representing the key themes, patterns, and factors that emerged from the reviewed studies.

Table 1. Implementation factors and barriers within the proposed framework

Processes	Resources and Capabilities	Strategies
Ease of Use (84)	Trust in System (68)	Endorsement / Championing (22)
Integration into Workflow (49)	IT Infrastructure (44)	Organizational Culture (19)
Work Time and Pressure (41)	Perceived Usefulness (36)	Organizing / Planning (17)
Internal Communication (29)	Experience (33)	
Technical Support (25)	Training and Supervision (30)	
System Reliability (23)	Workforce Competencies (21)	
	Financial Resources (13)	

3.1. Bottom level: Processes

At the bottom level of the hierarchical framework, the focus lies on the examination of the barriers related to processes in the implementation of radical innovations in health care. The barrier we found most for this level was concerning the ease of use of innovations for proper workflow integration (84 findings). This shows that an innovation’s ease of use alone can already play a large part in breaking down implementation barriers. Another significant barrier is associated with the integration into existing clinical workflows (49). Hurdles with the integration process may lead directly to lower acceptance rates. Another commonly reported barrier is the impact on work time and pressure (41), as health professionals may face increased workload and

time constraints when adapting to the new system. Other barriers include internal communication (29), where the lack of effective communication channels and coordination between different stakeholders can impede the seamless integration of the innovation into existing processes, the technical support for problems (25), and system reliability (23).

3.2. Medium level: Capabilities and Resources

At the medium level of the proposed framework, various frequently described findings shed light on the barriers and facilitators related to individual human factors and capabilities in the implementation of radical innovations in health care. Most common were individual human related factors like trust in radical health innovations (68) as well as perceived usefulness (36) and workforce competencies (21). This highlights the importance of another common barrier, the appropriate training and supervision (30) to enhance their capabilities and competence in utilizing an innovation. Another factor is the experience with the system (33) that may lead to higher acceptance rates in the long run. Furthermore, internal capabilities such as a robust IT infrastructure (44) is important.

3.3. Top level: Strategies

The top level of the proposed framework encompasses crucial factors related to internal organization and planning, as well as organizational culture, structure, policies, championing, endorsement, and management support for innovation. The most common factor was management endorsement and championing (22). The support from key individuals within the organization, including influential leaders and advocates, can greatly influence the acceptance and commitment to innovation. Organizational culture (19) plays a pivotal role in creating an environment that fosters innovation, encourages risk-taking, and promotes learning from failures. Organizational planning (17) is necessary to facilitate the adoption and integration of radical innovations, including frameworks for decision-making, protocols for evaluation, and mechanisms for feedback and continuous improvement.

4. Conclusion

The findings indicate the complex landscape surrounding the implementation of radical innovations in health care. The systematic literature analysis of 99 selected studies provided valuable insights into the implementation factors and barriers encountered by health care organizations. The hierarchical framework facilitated a comprehensive understanding of the challenges faced at different levels.

Overall, the study found that innovation success is still strongly determined at the process level. The prominence of the ease of use barrier emphasizes the need for user-friendly solutions that facilitate usability and workflow integration. Workflow integration policies as well as mitigating the impact on working hours and work pressure is critical, as they jeopardize the adoption of new systems. In addition, addressing issues related to internal communications, technical support, and system reliability will contribute to the seamless integration of healthcare innovations.

The medium level of the framework highlights the importance of individual human factors and capabilities in implementing radical healthcare innovations. Open-

mindedness, adequate training and supervision, experience with the system, and internal capabilities such as a robust IT infrastructure are essential factors to consider. To ensure successful implementation, health care organizations should foster a culture of innovation openness, provide extensive training and supervision, support continuous learning, and invest in the necessary resources, including financial support. When these factors are considered, health care organizations can overcome barriers and facilitate the integration of radical innovations to improve patient care and outcomes.

Although the top level has received relatively little attention in the literature compared to the other two levels, its importance should not be marginalized. The findings underscore the importance of several factors that contribute to the successful implementation of radical innovations in health care at the organizational level. In particular, management support and endorsement have a significant impact on the acceptance of innovations. Creating an innovative culture, establishing supportive policies and structures, and implementing effective internal organizational and planning strategies are critical to the seamless integration of radical innovation in health care organizations. By addressing these factors, health care organizations can foster an environment that encourages innovation, maximizes the potential benefits of radical innovation, and ultimately improves patient outcomes and experiences. However, further research is needed to grasp the full potential of the top-level domain.

In conclusion, this study provides valuable insights into the implementation factors and barriers associated with radical innovation implementation in health care. It emphasizes the need for a multi-faceted approach that encompasses processes, individual capabilities, and organizational support. By addressing these challenges and capitalizing on facilitators, health organizations can embrace radical innovations and contribute to the advancement of health services, benefiting both health professionals and patients.

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