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An analysis of innovations in business models: the case of Medlife's sustainability report

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Abstract. This study examines how innovation within business models in the healthcare sector is reflected in sustainability reporting, particularly focusing on the impact of recent crises, including the SARS-CoV-2 pandemic. This research focuses on Medlife S.A., a public listed Romanian healthcare company, and on its first sustainability report issued in 2023, covering its 2022 performance. The report highlights the group's efforts to implement a sustainable business model during the pandemic, addressing key challenges such as innovation, digitalisation and environmental sustainability. The findings reveal that the innovation is emphasized through research conducted to combat the SARS-CoV-2 virus and through the adoption of digital technologies including telemedicine and robotic surgery. However, gaps remain in the use of emerging technologies such as artificial intelligence, blockchain, cloud computing, and the Internet of Medical Things (IoMT), which could further enhance sustainability efforts. This study contributes to the literature by providing insights into how business model innovation and sustainability reporting are interconnected during periods of crisis, emphasizing the need for healthcare companies to adopt emerging technologies to improve sustainability outcomes.
Keywords: *innovation, sustainability reporting, digitalisation, healthcare sector.*

Introduction

The European Union's healthcare sector has faced significant challenges and opportunities during the pandemic period, particularly in relation to environmental sustainability and climate actions for the communities. Public awareness of these issues along with regulatory pressures, has increased, emphasizing the need for sustainable practices that can address these challenges [2]. Despite these efforts, a gap remains in the literature regarding how the healthcare sector organisations have integrated sustainability into their business models, especially in the context of crisis management and innovation. This study addresses the gap by observing how healthcare companies, such as Medlife in Romania, incorporate sustainability innovation and digital transformation in their reports during crises.

In response to these challenges, the European Union has implemented sustainability reporting practices through various directives. However, the lack of standardization in these initiatives limited their effectiveness. The introduction of Corporate Sustainability Reporting Directive (CSRD) aimed to address this gap by establishing clear and detailed standards for sustainability disclosures [14]. Under CSRD companies are required to integrate financial and sustainability information within their reports [13]. Many challenges remain in how businesses adopt these directives, especially in countries like Romania, where the healthcare sector faces unique structural and digitalisation barriers.

The digitalisation incorporated in business models, accelerated by the SARS-CoV-2 (COVID-19) pandemic, represents a significant innovation. The pandemic highlighted the need for relevant and real-

time decision-making, driving companies to adopt digital transformation to manage threats and opportunities effectively [13]. In the healthcare sector, this digital shift has become a critical component, with emerging technologies such as artificial intelligence, blockchain, cloud computing, and the Internet of Things playing a key role in enhancing efficiency and accuracy in sustainability reports [16]. However, the application of these technologies in the healthcare sector reporting, particularly in Romanian companies like Medlife, are not yet explored. This study aims to provide new insights by focusing on how digitalisation is reflected in the sustainability reports of healthcare companies during crisis periods.

Within this context, stakeholder and legitimacy theories have become increasingly important. Businesses must demonstrate their commitment to sustainable development, with stakeholder theory emphasizing the need for companies to engage in sustainable practices that meet stakeholder expectations, including reducing carbon footprints and addressing patient and community needs [10]. Legitimacy theory, on the other hand, highlights the importance of voluntary disclosure of sustainability performance in accordance with sustainability initiatives [10, 2]. By applying these theories, this research investigates how Medlife as a healthcare provider has adopted these principles in sustainability reporting during crisis periods.

The aim of this research is to explore how innovation within business models in the healthcare sector is reflected in sustainability reporting, with a particular focus on addressing challenges and opportunities such as digitalisation, crisis management, and the application of stakeholder and legitimacy theories. To achieve this, three research questions have been established: (RQ1) How are stakeholder theory and legitimacy theory applied in the healthcare business model to address sustainable performance and meet patient needs during crises; (RQ2) How is business model innovation represented in Medlife's sustainability report during crisis periods, and what specific innovation actions have been undertaken?; and (RQ3) How is the digitalisation process presented in Medlife's sustainability report during crisis periods?.

This research uses a case study analysis of Medlife, a Romanian healthcare listed company to answer these questions. By analysing the integration of sustainable technologies and digitalisation presented in the reports, this study seeks to provide a deeper understanding of how healthcare companies navigate the complexities of sustainability reporting in a rapidly changing environment. The novelty of this study is reflected in the integration of the stakeholder and legitimacy theories in the analysis of business model innovation and sustainability reporting during crisis periods, as well as the integration of digitalisation and innovation in the company's reports.

This article is structured as follows: the literature review explores the impact of sustainability reporting, stakeholder and legitimacy theory, innovation and digitalisation on healthcare business models, while the methodology section describes the use and the limits of using the qualitative approach focused on Medlife, and suggests future research directions; the results sections presents the findings from the case study analysis, detailing how stakeholder and legitimacy theories are applied in sustainability reporting and how business model innovation, and digitalisation are represented during crisis periods; the discussion interprets the results in relation to the research questions providing insights into the implications of sustainability reporting on the business model innovation and comparing the findings with the existent literature, while the conclusion summarises the key findings and reflects the study's contribution to the literature.

Literature Review

During the pandemic period, Europe's healthcare sector faced unique challenges and opportunities related to environmental sustainability and climate actions. Increased public awareness and regulatory pressures highlighted the need for sustainable measures to address these challenges [2]. The European Union promoted the adoption of sustainability reporting practices through several directives which were ineffective due to a lack of standardisation within the businesses. The introduction of the CSRD sought to address this issue by establishing clear requirements for sustainability disclosures [14]. According to the CSRD, companies must now publish detailed sustainability information, focusing on the integration

of financial and sustainability report [13]. Despite these efforts, there remains significant challenges in how companies apply these regulations, especially in countries like Romania, where healthcare sector face distinct financial and operational constraints, income inequality and lack of access to healthcare education [17].

[4] observed significant growth in sustainability reporting as companies face increasing pressure to disclose non-financial information to stakeholders. In addition to meeting the international standards and frameworks on sustainability reporting such as Global Reporting Initiative (GRI), the European Financial Reporting Advisory Group (EFRAG), and the CSRD, businesses also report on their contribution to the 17 United Nations Global Compact (UNGC) Sustainable Development Goals (SDGs). These goals aim to eliminate poverty and hunger, ensure good health, quality education, gender equality, clean water, affordable energy, decent work, innovation, reduced inequalities, sustainable cities, responsible consumption, climate action, and preserve life on land and below water along with peace, justice, and strong partnerships [9]. In practice, many companies struggle to align their sustainability reports with these goals, especially in crisis situations where digital transformation is not fully adopted.

Achieving these goals requires upgrading industries and infrastructure by promoting innovative sustainable technologies [8]. This includes ensuring equal access to information, financial markets, prosperity, jobs and stable societies across the globe. For example, a [11] report on SDG Industry Matrix for Healthcare and Life Sciences analysed innovation opportunities associated with SDG 9 - building resilient infrastructure, promoting inclusive and sustainable industrialization and fostering innovation. This report highlights how collaboration with governments and other companies can unlock investments in healthcare including building environmentally resilient hospitals, health centres and production. Companies like AstraZeneca, Bristol-Myers Squibb, South African Medical Device Industry Association (SAMED) and Siemens AG have adopted SDG - 9 by implementing optimal heat technology, green building standards, zero carbon footprint investments and supporting local manufacturers of medical devices used for diagnosis, prevention, treatments and amelioration of diseases.

In the context of innovations in business models towards sustainability reporting, stakeholder theory and legitimacy theory play crucial roles as businesses demonstrate their commitment to achieve these goals [2]. Stakeholder theory emphasizes engaging in sustainable actions and meeting stakeholder expectations [10]. In the healthcare sector this can involve engagement in sustainable actions such as reducing carbon footprints and meeting the needs of patients, communities, healthcare staff, suppliers or regulators. [2] noted that healthcare organizations in Europe are actively implementing innovative environmental solutions to manage carbon emissions and exceed stakeholder expectations.

According to [10], legitimacy theory promotes the voluntary disclosure of sustainable performance by companies in accordance with national laws and regulations. In the context of sustainability reporting and disclosure within the healthcare sector, [2] found that organizations with larger boards of directors are more likely to demonstrate a greater interest in sustainability and seek to achieve legitimacy through their initiatives.

Based on the above information the first research question is established as follows:

RQ1: How are stakeholder theory and legitimacy theory applied in the healthcare business model to address sustainable performance and meet patient needs during crises.

The digitalisation of business processes, accelerated by the COVID-19 crisis, represents a significant innovation in business models. The pandemic significantly accelerated companies' transition to digital transformation, highlighting the need for relevant and real-time decision-making to manage threats and opportunities effectively. Moreover, innovative sustainable technologies can be integrated into sustainability reporting. Effective data and information collection are crucial for stakeholders in this process. By leveraging digital technologies companies can manage the large volume of information related to environmental, social, and governance (ESG) factors and integrate it into their reporting systems [13]. Technologies such as artificial intelligence (AI), blockchain, cloud computing (CC) and Internet of Things (IoT) are increasingly used in accounting and reporting. These tools are valuable for

addressing the three key drivers of sustainability: ESG factors [16]. Many studies have highlighted the benefits as well as challenges related to AI, blockchain, CC and IoT [16, 1, 13, 7].

AI, for instance, can enhance efficiency through chatbots that improve customer support, machine learning algorithms for optimized matching, and predictive analytics for better resource allocation [7], AI reduces operating costs, and the time required to gather information for sustainability reporting, thus enhancing the efficiency and effectiveness of these activities. Additionally, AI technology supports sustainable strategy development and decisions enabling users to focus on multiple activities [16]. In healthcare, AI can optimize the allocation of medical resources, streamline patient inquiries, and improve operational efficiency, which is essential during crises [2]. [4] noted that AI can automate data collection and text generation saving time and reducing errors in non-financial reports. However, [1] identified challenges and risks associated with AI such as potential cyberattacks, ethical concerns, and risk of generating misleading information as well as issues with standardization and expertise.

The effective digitalisation of sustainable reporting is linked to the rapid growth of new technologies, with many academics highlighting opportunities associated with blockchain as an emerging tool in accounting and auditing processes. Blockchain offers opportunities for increased transparency and trust in non-financial reporting by providing secure data records and mitigating opportunistic behaviour [14]. Blockchain's application in the healthcare sector can enhance health checks, secure transactions, and safe data storage [15]. However, further research is needed to fully understand its potential to sustainability reporting [14].

IoT and CC facilitate data collection and processing, improving the ability to monitor organizational processes and manage the large volume of information available for sustainability reporting [16]. In the healthcare sector, these technologies enable faster patient service and real-time diagnostics. The Internet of Medical Things (IoMT) is revolutionizing healthcare by connecting smart medical devices, and communication infrastructures to boost operational productivity and provide timely predictions for critical diseases, thereby improving overall healthcare system responsiveness [15].

However, according to [1] the digitalisation process presents several challenges and risks. Implementing digital processes within business models can pose risks such as data privacy and protection concerns, cybersecurity attacks, and potential theft or manipulation of sensitive data. Additionally, challenges arise from the lack of system standardization, high costs, and limited human expertise. They also suggest measures to mitigate these risks, including data encryption to protect sensitive information, threat intelligence systems to identify potential dangers, auditing and monitoring to address security incidents, and staff training to ensure employees can work under optimal conditions.

Based on the information presented above, two additional research questions have been developed:

RQ2: How is business model innovation presented in Medlife's sustainability report during crisis periods, and what specific innovation actions have been undertaken?

RQ3: How is the digitalisation process presented in Medlife's sustainability repor during crisis periods?

Methodology

To investigate the research questions, a qualitative approach using a case study analysis of a published sustainability report was employed. This method allows for detailed analysis based on rich descriptions [6]. In this research, details on how innovation is incorporated into business models could only be obtained through the analysis of a corporate sustainability report. Corporate sustainability reports, published by companies, have been used as primary data in analyses of sustainability performance [6, 5].

The aim of this study is to explore how innovation within business models in the healthcare sector is reflected in sustainability reporting during crisis periods. Therefore, the source material consists of corporate disclosures in the annual sustainability report of a Romanian listed healthcare provider. Given the limited availability of detailed sustainability reports in the Romanian healthcare sector, this study focuses on Medlife's 2022 sustainability report. While the use of a single report represents in-depth insights, it also poses a limitation in terms of generalising the findings. Medlife (Medlife), one of the

largest private medical operators in Romania that offers internationally certified high-quality medical services [12], was chosen for this analysis because no previous studies have examined innovation in sustainability reporting at this company or any other listed healthcare company.Among the healthcare companies listed on the Bucharest Stock Exchange, which includes several pharmaceutical companies and one hospital, analysing a healthcare institution that directly interacts with society and was heavily impacted by the crisis offers unique insights.

The research was conducted as follows: first, the report was downloaded from the Medlife's website and systematically analysed using Zotero. The Medlife's ustainability report, published in 2023, covering the group's performance for 2022 includes separate chapters on governance, supply chain, clients, management, innovation, human capital, community relations, environmental aspects and overall sustainability performance. At the time of analysis, this was the only report Medlife had published. Future research could focus on sustainability reports from other healthcare companies or compare future Medlife reports as they become available.

The next step involved content analysis, a method that codifies qualitative statements and data into pre-defined categories such as text fragments [5] These categories were developed to highlight the main themes in the sustainability report, particularly information on innovation and digitalisation processes at Medlife.. A total of 51 categories were identified during the analysis focusing on themes such as audit, benefits, corporate governance, digitalisation economic performance, GRI, innovation, materiality, medical management system, risks, and SARS CoV-2 pandemic. .

The last step involved extracting text fragments based on the assigned codes to present the prominent aspects of how innovation is presented within the business model.

Findings and Discussion

Medlife is a major brand operating as a private healthcare provider in Romania [3]. In its 2023 sustainability performance report, which cover its performance for 2022,Medlife acknowledges that the pandemic, global conflicts, inflation, and the energy crisis have placed pressure on business development both nationally and globally [12].

To answer the first research question, *How are stakeholder theory and legitimacy theory applied in the healthcare business model to address sustainable performance and meet patient needs during crises*?, the *Our Journey to Sustainability* section was examined. The report highlights that the group's efforts focus on maximising positive social and economic impacts presents how they manage sustainability issues by providing information about their efforts to maximize the positive impact on society and on the economy. Furthermore, it is considered appropriate and necessary to allow all interested parties to understand the impact of the group on aspects related to the ESG aspects [12:35]. An analysis performed on the US healthcare providers when sustainability reporting was voluntarily, revealed that the healthcare sector focus was to quantify and reduce their environmental impacts, lower costs and protect human health [18], which was also visible in Medlife's report. In fact, this is usually the main focus presented in each sustainability reports.

In the *Care for the Environment* section, Medlife, details its management system designed to keep stakeholders informed through consistent monitoring and reporting [12:86-87].The business model integrates stakeholder theory by creating a waste management system, reducing its carbon footprint through risk management , and enhancing energy management across the group. Additionally, the group has implemented greenhouse gas reduction plans and climate risks assessments. According to [2] carbon footprint reduction involves a comprehensive approach to decrease the amount of greenhouse emissions, and the healthcare sector strategies must address regulatory compliance and risk management in order to foster a transition to sustainable performance, which should be acknowledged in detail in Medlife's sustainability report.

, Medlife presents its commitment to patient and customer management in the *Care for the People* section, focusing on health promotion, innovative medical services, which are not detailed, and professional medical staff. Information on digitalisation, workplace environment, equal opportunities, non-discrimination, and the development of a health and safety management system are also provided [12:43-75]. During crisis periods such innovations could help the community to pass the pandemic.

However, exposing innovation on health is a sensitive topic, as it is still hard to achieve it due to increased investment costs and long-term testing of functionality [19]. Moreover, according to [20], the adoption of innovative practices and solutions could enable healthcare sector to improve its performance, and the quality of services provided to patients. For example,the *Care for the Community* section reflects Medlife's efforts to engage with disadvantaged communities through its Mobile Caravan project, and plans for expanding research in oncology and young doctor education.

Medlife's adherence to legitimacy theory is reflected in the business model by referencing the use of GRI and SASB standards for the report, and through the detailed disclosures about governance systems, supply chain, journey to sustainability, patient care and environmental impact. . Among the GRI standards available, Medlife has chosen to highlight data with a strong emphasis on employees (GRI 2-7, 2-8, 401-1, 403-3, 405-1), followed by energy consumption (GRI 302-1), water withdrawal (GRI 303-3), waste management (GRI 306-3, 306-4, 306-5, 306-6), and economic performance (GRI 201).

In terms of employee data, several aspects were observed. Notably, the group reported zero employees in leadership roles under the age of 30. This gap, particularly during crisis periods where digitalisation and medical innovation play key roles — areas where younger generations tend to excel — may influence the decision-making process within the group. Another observation concerns the increase in female employees, rising from 4,116 in 2021 to 5,276 in 2022, marking a 28.18% increase. Despite ongoing controversies surrounding women's representation in leadership, Medlife has shown progress in this area. Studies, such as [21] indicate that women in leadership can improve company environmental, social and governance performance as well as reduce risks. In fact, in France, regulations mandate female representation in senior management positions. While Medlife demonstrates this shift, the report lacks sufficient detail regarding corporate governance and the contribution of female leadership to the company's sustainable performance.

From a legitimacy perspective, this selective disclosure aligns with GRI standards, but the absence of younger leaders and the limited information on gender diversity in senior management raise questions. The report could further benefit from more comprehensive disclosures on how female leadership contributes to sustainability, particularly in governance, decision-making, and performance outcomes. Enhancing these areas would strengthen the legitimacy of Medlife's sustainability initiatives by addressing broader societal expectations and providing a more complete picture of the company's governance structure.

To answer the second research question *How is business model innovation presented in Medlife's sustainability report during crisis periods, and what specific innovation actions have been undertaken?* the *Care for the People* section was re-examined.[12:60] states: "*As a leader in the private healthcare services market, we have laid the foundations for a local research centre, aimed at deepening medical topics and contributing to the development of local solutions tailored to the specific needs of our country. We plan to launch research projects with relevant objectives and strong added value to address public health issues we face.*" Innovation in the Medlife's business model is reflected in research projects, partnerships with academic institutions, and studies on SARS-CoV-2, including research on natural immunity against the virus, immunization rates, antibody evolution in positive cases, virus sequencing, and studies on population immunity. These efforts are considered innovative, as they have contributed to gaining insights into SARS-CoV-2 and combating the pandemic in the country.

However, beyond these immediate research responses to the pandemic, Medlife's report could enhance its focus on other emerging technologies. For example, while robotic surgery and telemedicine are highlighted, the report lacks mentioning information on the implementation of technologies such as AI, blockchain, cloud computing, or the Internet of Medical Things (IoMT), which are rapidly transforming healthcare globally. Moreover, a comparison with other healthcare providers, especially in markets with similar crisis experiences, would allow for a more robust evaluation of how Medlife's innovations rank in comparison to other healthcare providers.

To answer the final research question, *How is the digitalisation process presented in Medlife's sustainability report during crisis periods?*,? the information on digitalisation in *the Care for the People* section was analysed. Beyond operational digitalisation, the report does not mention AI, blockchain,

cloud computing, or the Internet of Medical Things. In 2022, Medlife implemented innovative solutions through the digitalisation of processes and medical solutions to improve the quality of patient treatments. These include robotic surgery systems for treating a wide range of conditions, upgrading equipment and facilities across the country, advanced medical systems that enable accurate diagnosis through pathology identification and monitoring, as well as virtual clinics, telemedicine services, and the development of a mobile app for online appointments, access to imaging results, lab analyses, and online consultations [12]. Despite these benefits, challenges were noted by the group in rural areas of Romania, where digital access is limited. As part of the digitalisation process, the group reported that in 2022, they introduced robotic surgery with the Da Vinci Xi system at their medical hub, upgraded medical equipment, and expanded regenerative therapies at their facilities. The group also continues to develop its virtual clinic and mobile application to enhance patient services and accessibility, with plans for continued digital expansion post-pandemic. However, since the digitalisation process in rural areas remains a significant challenge, as noted by the group, limited access to technology poses barriers for patients. Furthermore, Medlife's digitalisation efforts, do not currently address technologies like AI, blockchain, or IoMT, which could significantly enhance healthcare services and patient outcomes in the future. The lack of these technologies may limit the group's ability to optimize healthcare security, data management, and personalised treatments.

The report highlights Medlife's innovative efforts, but also presents some gaps. While the report emphasizes digitalisation and innovation through robotic surgery and telemedicine, it fails to address the need of implementing emerging technologies such as AI, blockchain, cloud computing, or the Internet of Medical Things (IoMT) in the business model. These technologies have the potential to transform healthcare by enhancing security, optimizing patient outcomes and improving overall efficiency [1].

According to [2], digitalisation in healthcareintroduces significant benefits such as improved patient care,and operational efficiency, but also poses substantial risks. A key challenge is the lack of standardization across digital platforms which can lead to human error and difficulties in integrating systems across different healthcare providers [1], Furthermore, less digitally prepared communities may struggle to use these new technologies effectively, intensifying existing inequalities in access to healthcare.

In terms of sustainability reporting there is room for improvement. A more detailed exploration of how these emerging technologies are being incorporated or planned for integration within Medlife's operations would be beneficial. Furthermore, addressing the inclusion of digitalisation challenges and their direct impact on healthcare accessibility and patient outcomes would provide a clearer picture of the effectiveness of these innovations.

In conclusion, Medlife's first report successfully integrates stakeholder theory, legitimacy theory, innovation and digitalisation into its business model. However, the innovation in the healthcare sector business model could include AI, blockchain, and IoMT, along with better metrics for measuring the success of digitalisation initiatives, which could provide greater transparency and a stronger foundation for future innovations.

6. Conclusion

The pandemic period, the increased public awareness and regulatory pressures have highlighted the need for sustainable practices to face these challenges within the healthcare sector [2]. In response, the European Union has implemented sustainability reporting directives, such as CSRD that established clear standards for sustainability disclosure [14]. Under the CSRD, companies are required to integrate financial and sustainability information in their reports [13].

Digitalisation has emerged as a critical component of business model innovation during crisis withtechnologies such as AI, blockchain, cloud computing, and the Internet of Medical Things (IoMTviewed as beneficial for improving healthcare services and sustainability reporting [16]. However, the full potential of these innovations was limited by challenges such as higher costs, accessibility issues, and the lack of system standardization.

This research explored the application of stakeholder and legitimacy theories in the healthcare sector, particularly in the context of business model innovation and digitalisation during crisis periods, using Medlife's 2022 report as a case study. Medlife has demonstrated its commitment to sustainable development by adopting practices aligned with takeholder expectations and voluntarily disclosing their sustainability performance in accordance both with national and international standards such as GRI and SASB.

The report highlights various research projects aimed at addressing public health concerns, with special attention to SARS-CoV-2 studies, immunization rates, and population immunity. Medlife's efforts in virus sequencing and research partnerships with academic institutions demonstrate its innovation in dealing with the pandemic. These innovative activities reflect Medlife's contribution to advancing healthcare solutions in the face of the pandemic, particularly through research and development, which represents a significant shift in its business model to respond to emerging crises. The introduction of robotic surgery systems, telemedicine services and the development of virtual clinics, as well as the launch of a mobile application for patient services mark key milestones in digitalisation [12]. However, the absence of advanced technologies such as AI, blockchain, cloud computing, or IoMT represent a missed opportunity that could be enhanced in further innovation.

While the report reflects significant progress, particularly in areas like robotic surgery and virtual clinics, the lack of reference to advanced technologies suggests that there is room for improvement in both sustainability practices and reporting. Enhancing sustainability reporting by incorporating detailed discussions on the integration emerging technologies could strengthen transparency and provide a stronger foundation for future innovations.In conclusion, Medlife's sustainability report provides a comprehensive overview of its innovations during the pandemic and highlights the need for adopting emerging technologies. This study contributes to the literature by offering insights on how business model innovation and digitalisation are presented in sustainability reporting within the healthcare sector during crisis periods. Future reports could benefit from including a more thorough exploration of both the challenges and opportunities presented by digitalisation, particularly in disadvantaged communities, and providing more detailed metrics on the impact of these innovations.

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