A Work Project, presented as part of the requirements for the Award of a Master's degree in Management from the Nova School of Business and Economics.

Digital Transformation for Healthcare Accounting:

a Systematic Literature Review

Rafael da Rocha Raimundo Pinheiro

Work project carried out under the supervision of:

Marta Almeida

16-01-2025

Abstract

With the rise in interest in digital transformation (DT), one vital field is that of accounting. This holds truer applied to a critical sector to society that is healthcare. For healthcare organizations, the adoption of digital accounting systems brings benefits in the realm of operational efficiency, such as improved cost control and performance management. Adopting the systematic review approach, literature evidencing the role of digital transformation in healthcare accounting is analyzed. The final selection of 23 studies allows the identification of research gaps and four key themes present in the literature: Automation/Standardization; Decision-making Support; Security; and Adaptability.

Keywords

Accounting; Healthcare Accounting; Digital Transformation; Healthcare; Systematic Literature Review

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

1. Introduction

Accounting plays a vital role in the success of any organization, providing relevant insights into the financial management and decision-making tasks within the organization. The concept has more recently been defined in the literature as “a technical, social and moral practice concerned with the sustainable utilisation of resources and proper accountability to stakeholders to enable the flourishing of organisations, people and nature” (Carnegie, Parker, and Tsahuridu 2021, 69).

The importance of accounting spans across a multitude of corporate sectors, and as expected, it is extended to public sector organizations. Indeed, with the public sector working towards for societal welfare, accounting proves to be a valuable tool for improving organizational performance and accountability (van der Kolk 2022). Given the relevance of the subject, there has been an increasing volume of literature covering the matter, with authors approaching the subject with a focus on environmental accounting (Tommasetti et al. 2023) and even the allocation of resources through budgeting (Anessi-Pessina et al. 2016).

In addition, one concept that has been increasingly present in organizations is that of digital transformation (DT). The literature has defined it as "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies." (Vial 2019, 118). This push towards DT in organizations is visible in multiple areas. Among the fields where this shift is observable, it is particularly relevant in the field of accounting. Together with these technological advancements comes the need to work with multiple larger and more complex sets of data that require new tools. That can be such as Artificial Intelligence, that facilitates the execution of administrative tasks and reduces accounting errors (Nóbrega et al. 2023); Cloud-Based Accounting, that allows for a better cost management, with greater

scalability (Hung et al. 2023); and Big Data Analysis, that can provide a contribution both for accounting and auditing practice as well as for education purposes (Aboagye-Otchere et al. 2021).

O'Leary (2023) suggests benefits of a digital transformation for accountants and internal auditors for applications with large volumes and constant streams of data. Additionally, it has also implied several benefits in terms of integration with operations inside the firm as well as with customers and suppliers.

Consequentially, this process of digital transformation has attracted multiple studies, not only on the lens of private business but, once again, also applied to the public sector. The public sector has the particularity of being subject to added scrutiny by its citizens and the need to consider additional stakeholders in its decision-making process (Huy and Phuc 2024). There are also considerations that a digital transformation would be a crucial enabling factor in unleashing all potential from public sector accounting, "both as a medium to account for public value and as one to represent public values" (Grossi et al. 2023, 24).

Among the branches of the public sector, one that carries a vital role is that of healthcare. It occupies a central spot in any economy and must be as efficient as possible. It is important to point out, however, that healthcare is not restricted to the public sector, and private companies operating in the field also exist.

In Cylus et al. (2018), as well as in a report from the European Observatory on Health Systems and Policies, the authors make the case for the importance of public investment on health. Aside from direct improvements in healthcare service quality, the arguments touch multiple factors, including how economic benefits result from improved labor productivity (in this sector or others), educational attainment, and financial savings. The authors conclude that such improvements in healthcare and economic conditions directly relate to societal

well-being. (Forman, Feil and Cylus 2024).

In addition, in a study conducted across European countries, it was concluded that there is evidence that the population registered increased level of satisfaction and higher perceived quality with the healthcare system if transparency is higher and corruption levels are lower (Nikoloski and Mossialos 2013).

With healthcare making a vital contribution to society's well-being, it is evident that one may direct research efforts into improving its efficiency on all fronts. One that stands to benefit from additional literature is accounting, and how it can be enhanced through digital transformation to achieve this end. The study of benefits of technology implementation, as well as challenges for it, and the potential shifts in how the accounting activity in healthcare develops from an integration of digital transformation stands in order. This project will therefore conduct an assessment of the current literature on the topic.

Research Question: *"What is the current body of knowledge on the role of digital transformation in healthcare accounting?"*

It is important to attempt at drawing conclusions on what the critical themes within the topic are, and which possible developments on the topic could be explored in future literature.

2. Methodology

To identify the selection of papers regarding the research question "What is the current body of knowledge on the role of digital transformation in healthcare accounting?", a systematic literature review was performed. So far, there are no systematic reviews on this research question, therefore this research is a relevant addition to the current body of knowledge of the accounting field. In order to produce a more complete analysis of papers, both the Web of Science (WoS) and SCOPUS databases were used, as they are source for a large collective of peer reviewed academic literature. No restrictions were placed regarding the year of publication

while language was limited to English. Despite having its focus on finding papers with relevant insights regarding accounting activities, the research was also not restricted to papers under the categories of Business, Management and Accounting. This decision stems from the possibility that some relevant literature may be included in publications related to healthcare or information systems, given the topic of this study. Given the specific nature of literature regarding the topic, appropriate conference proceedings were also included in the findings. Aiming to effectively limit the number of entries for the search, keywords were identified covering the main dimensions of the research question. The used search terms are identified in table 1:

DATABASE	QUERY	# RESULTS
SCOPUS	ALL ("accounting" AND "healthcare" AND "digital transformation") AND (LIMIT-TO (EXACTKEYWORD , "Health Care") OR LIMIT-TO (EXACTKEYWORD , "Healthcare") OR LIMIT-TO (EXACTKEYWORD , "Accounting") OR LIMIT-TO (EXACTKEYWORD , "Healthcare Sectors") OR LIMIT-TO (EXACTKEYWORD , "Hospitals") OR LIMIT-TO (EXACTKEYWORD , "Digital Transformation") OR LIMIT-TO (EXACTKEYWORD , "Healthcare Organizations") OR LIMIT-TO (EXACTKEYWORD , "Healthcare Services") OR LIMIT-TO (EXACTKEYWORD , "Health Care Cost")))	532
Web of Science	((ALL=(Accounting OR Management Accounting OR Accounting Information Systems OR Accountant OR Budgeting OR Costing)) AND ALL=(Healthcare OR Health Care OR Healthcare Cost)) AND ALL=(Digital Transformation)	348

Table 1: Search Inputs

The keyword use was limited to those directly related to the search of the topic. Aside from the initial keywords “accounting”, “healthcare” and “digital transformation”, synonyms to these words were utilized as to broaden the pool of potentially eligible results for this review. Other search terms, for example, pertaining to specific technologies (Artificial Intelligence, Blockchain, among others) were not used, aiming to limit the search terms towards those strictly connected with the research question

In addition, the use of the Field Tag “ALL” rather than “TOPIC”, “AUTHOR KEYWORDS” or “TITLE-ABS-KEY” relates to the possibility of studies covering relevant accounting uses of digital technologies in healthcare, without it being the focus of their research. Therefore, this choice helps reduce the risk of potentially not accounting for relevant papers.

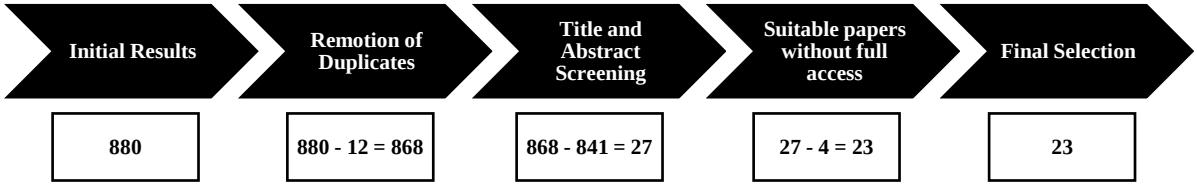

Figure 1: Selection Process

Resulting from the research following the above-mentioned criteria, 880 entries were obtained in total. The screening process is exemplified in Figure 1. This selection of studies was then cleared of 12 duplicates, remaining 868 available papers for this systematic review. The following step in gathering the right body of work for the research was screening the remaining works by the title and abstract. This step resulted in the largest cut in suitable works, with 841 papers being excluded from the review. This result was expected as a consequence of the search criteria, having to exclude a great portion of the results of medical research papers or information systems research, as well as other disciplines of the management field, which did not explore the topic with the adequate focus on accounting sought after for this research.

Finally, after removing the relevant papers to which there was no full access, the final selection of papers included in the literature review was set at 23. After all screening procedures, the final selection included only the works that contribute directly to reviewing the research question.

3. Findings

3.1. Descriptive analysis of the literature

A crucial step in this research is to elaborate a descriptive analysis regarding the literature on the topic. It is vital to understand the context regarding the research on the topic in order to elaborate a comprehensive review of the contents being explored.

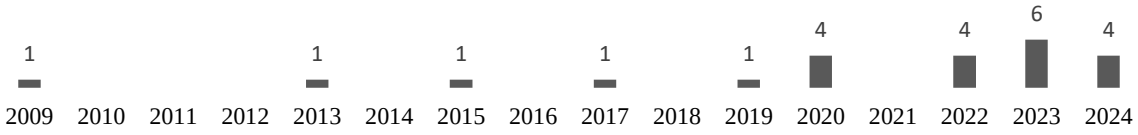

Figure 2: Publication year timeline

The timeline of publications, shown in Figure 2, reveals valuable insights regarding the evolution of the topic being researched. It is evident the collection of literature positioned towards the most recent years. With 13 out of 23 papers having been published after 2022, this parallels with both the development of new technologies at an increasing rate, as well as with the growing interest of academia in digital technologies and their capabilities in modern business. Notably, the earlier studies often cover technologies of an older generation, while later studies tend to mention more disruptive possibilities. Nevertheless, earlier technologies are still mentioned in recent literature.

Figure 3: Method of Research

As seen in Figure 3, most papers regarding the topic are of empirical character and only 3 papers are of purely theoretical nature. Similarly, only 5 studies adopt a case study methodology. As such, this sheds some light on the limited analysis following organizations' implementation of new digital technology systems, highlighting observed challenges and benefits of such implementation, as well as the early stage of research on the topic.

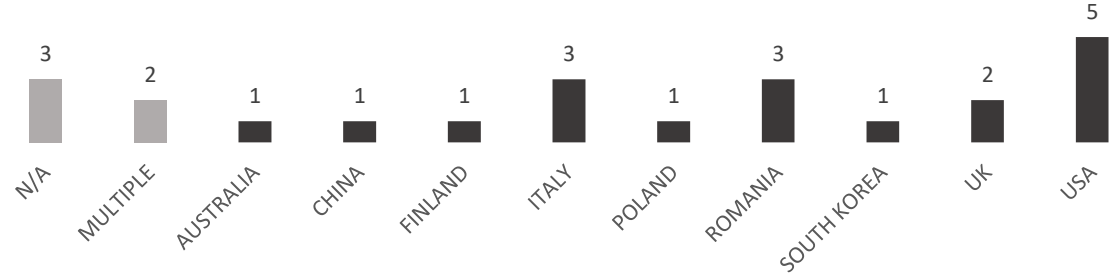

Figure 4: Country of research

Figure 4 highlights the geographic region under research of the publications on the topic. N/A applies to theoretical papers and Multiple refers to a group of European countries that was not specified. With regards to the location at which the papers are researched and prepared, one can note great diversity in the countries of origin of these studies. However, three countries show greater amounts of conducted research on the topic: USA, followed by Italy and Romania. Another point worthy of highlight is the heavier set of research conducted in European countries. This volume of studies among European countries is well justified, however. The European Union is at the forefront of the creation of projects incentivizing digital transformation and development in the healthcare sector such as the EU4Health Programme, Digital Europe Programme and Horizon Europe.

Publication Site	#
INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH	4
INFORMATION AND MANAGEMENT	2
JOURNAL OF MANAGEMENT INFORMATION SYSTEMS	2
BRITISH ACCOUNTING REVIEW	1
DECISION SUPPORT SYSTEMS	1
FINANCE RESEARCH LETTERS	1
INFORMATION (SWITZERLAND)	1
INFORMATION SYSTEMS RESEARCH	1
JOURNAL OF COMMERCIAL BIOTECHNOLOGY	1
JOURNAL OF GENERAL MANAGEMENT	1
JOURNAL OF MANAGEMENT AND GOVERNANCE	1
JOURNAL OF OPEN INNOVATION: TECHNOLOGY, MARKET, AND COMPLEXITY	1
MEDITARI ACCOUNTANCY RESEARCH	1
TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	1
TECHNOVATION	1
15TH INTERNATIONAL FORUM ON KNOWLEDGE ASSET DYNAMICS (IFKAD 2020)	1
2023 IEEE INTERNATIONAL CONFERENCE ON TECHNOLOGY AND ENTREPRENEURSHIP, ICTE 2023	1
INTERNATIONAL SCIENTIFIC CONFERENCE DIGITAL TRANSFORMATION ON MANUFACTURING, INFRASTRUCTURE AND SERVICE	1

Academic Journal
Conference Proceeding

Table 2: Site of Publication

Table 2 displays the site of publication of the relevant papers for this research. With this information, one can reach conclusions regarding the main outlets of interest for academics when they analyze and evaluate the role that digital transformation has for the accounting activity in the healthcare sector. A key factor to note is that, even analyzing only the literature

focusing on management themes, one can observe the presence of three main categories of journals, none of which accounting-focused: management, medical science and information systems and technology. This brings insights into the variety of ways authors can explore this topic. Even when not directing their research primarily towards accounting specifically, covering a broader spectrum, authors analyze and recognize the added value of transforming accounting activities in healthcare through means of innovative digital technologies.

As for the journals with the higher number of papers published, one can observe the *International Journal of Environmental Research and Public Health* in the first place. Although not being a management/accounting journal, this higher incidence is due mainly to the papers of Vărzaru's authorship. Following, stand *Information and Management* and *Journal of Management Information Systems*, now more oriented towards management practices.

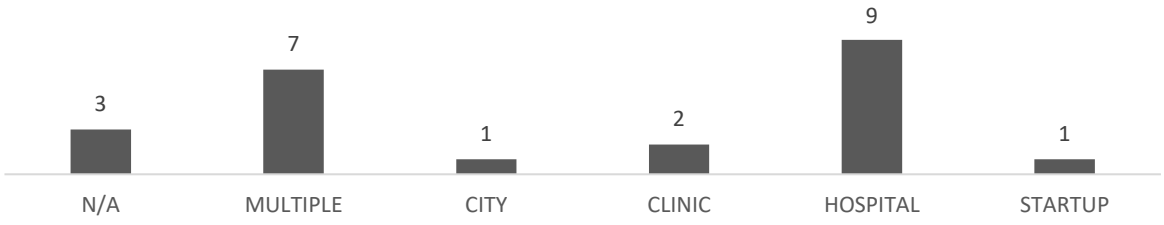

Figure 5: Type of organization analyzed

Finally, Figure 5 evidences the source of data that authors use when conducting their studies. Among the organizations studied, hospitals take the leading position with most papers published based on the insights from these institutions. Such is connected to the variety of information one can find there and the weight hospitals have in the healthcare system. On the other hand, clinics and the city project, while less recurring, favor a case-study approach that reveals additional depth in the understanding of the organization in study that different methodologies do not attain. Additionally, "Startups" stands as an outlier among a majority of medical establishments. This comes as a consequence of authors exploring directly the benefits these companies are trying to create in the healthcare field. N/A applies to theoretical studies.

Multiple refers to those papers where authors cover more than one type of organization and englobe results from different sources (mostly hospitals and clinics).

3.2. Analysis of the findings

Within the literature, there are several relevant themes being explored. Often, papers cover more than one theme and connect them together. One can make a selection of these themes according to the core benefit of digital systems being explored in the papers.

3.2.1. Automation and Standardization of Activities

A relevant topic mentioned in the literature is that of automation and standardization of activities. The current body of literature discusses how it may confer benefits to the users of these technologies and improve organizational performance.

Early literature often focuses on the application of less advanced digital technologies within healthcare organizations. Goo, Huang, and Koo (2015) explore the uses that an integration of electronic medical records (EMR) can have for administrative workers. The authors find benefits for exploitative use (standardized and repetitive tasks) of this technology to be prevalent in administrative work, such as financial reporting or account management.

Taking a different approach, other authors examine the integration of specialized digital systems dedicated to costing, budgeting, or performance measurement. Bardhan and Thouin (2013), evaluate the impact of health information technology on the quality of service and costs in healthcare. Among the technologies analyzed, the authors cover financial systems, including budgeting and general ledger systems. They find that the automation that comes with the utilization of budgeting systems positively impacts organizations. These systems allow “staff to identify opportunities for cost savings, track and recover delinquent accounts receivable in a timely manner” (Bardhan and Thouin 2013, 446).

In their case study, Fan et al. (2024) observe that the organization has a digitalized ecosystem for financial management, with automatic accounting among other innovations. Similarly to the remaining literature, findings relate directly to a facilitated system that minimizes resource waste. However, the authors also find the afore mentioned benefits result in aiding the decision-making process of the organization, another one of the themes explored. In a similar way, Secinaro et al. (2020), follow the case of a pediatric establishment in Rome, and how its respective implementation of digital tools healthcare brings changes to the organization. The authors find that the main changes are tied to the ability to standardize processes, with the enhanced management of relevant data and thus the possibility to have faster reporting.

There seems to be a consensus among the above-mentioned authors that connect organizational performance with the automation/standardization of digital transformation. Authors often refer to an increase in the speed at which traditionally repetitive tasks are performed, leading to cost savings and a timely response to job demands. Consequentially, these improvements lead to an increased operational efficiency.

In contrast, more recent studies have shifted towards including more disruptive technologies, and exploring their potential impact. Vărzaru (2022b), analyzes the impact of digital transformation across several Cost Accounting Tools, through a survey to senior accountants in Romanian healthcare. It aimed at assessing if digital transformation can create perceived benefits that would improve the likelihood of acceptance of a digital transformation. Among the features tested on their perceived utility, one key finding of the paper is that rapidity is one of the benefits more valued by accountants. Findings draw to the fact that digital technologies, such as Artificial Intelligence, enable repetitive and time-consuming tasks to be automated and allow data processing in real time.

Drawing focus towards Blockchain, Spanò, Massaro, and Iacuzzi (2023) explore the benefits of the integration of this technology in the healthcare sector. While the paper extends across several areas of the healthcare field, there are mentions of potential benefits for accounting activities. The possibility for automation of tasks, allied with minimized error rates, is a strong feature that can be utilized to realize and oversight transactions to a better degree, as well as improve the quality of the cost control task.

Aranyossy and Halmosi (2024) analyze how digital systems can bring improvements to the healthcare industry. The authors find a potential increase in the speed at which administrative and accounting tasks are performed through automation, made possible by Internet of Things, Cloud Computing or Artificial Intelligence systems, ultimately benefiting staff labor productivity and overall service quality.

These papers covering more innovative technologies seem to be in agreement with the findings of above-mentioned authors regarding the impact of automation/standardization. In more recent publications, increased speed is also presented as a valuable addition. In addition, the reliability brought by an automation of tasks is also pointed out to be vital. However, it is relevant to mention that no comparison is being made on how superior the benefits of these technologies may be, or even if these benefits are in fact greater.

In general, the literature covering this topic agrees on the added functionality of digital systems that allow for the fast processing and treatment of larger sets of data. Naturally, being directly related to the performance of accounting tasks, this feature is stated to increase accountants' resources to improve performance across a multitude of assigned tasks, from reporting to budgeting. Simultaneously, it does not limit organizations in the type of technology they must invest in, as this benefit can be achieved either from more basic systems or disruptive technologies.

Through the consistent identification of organizational improvements in the remaining papers, it is evident an alignment with the finding of Sharma (2024), that states consistency (repetitive tasks being performed identically, without faulty or different results) to be a key piece in improving the outcomes of information systems in healthcare accounting and finance, and also, how it plays a supporting role in improving the remaining factors identified, that are related with the themes identified next in this systematic review.

3.2.2. Decision-making Support

Another preeminent theme in the current body of literature is how digital technologies aid in supporting management in the decision-making process, mainly through added access to more detailed and relevant information.

Among the literature, a common point that authors cover is the utilization of digital systems for performance monitoring practices. Most studies on this theme are based on the observation of organizations and their process of implementation and use of digital technologies.

Vărzaru (2022a) connects these digital advancements in aiding the improvement on the Balanced Scorecard (BSC) dimensions. The BSC tool was initially developed by Kaplan & Norton (1992) extending performance monitoring across four dimensions: financial; customer; internal process; learning and growth. The paper reveals that both digital transformation and development of Accounting Information Systems contribute positively to the Balanced Scorecard, especially towards the financial dimension. In addition, coordinating the above mentioned factors serves to a further impact by "aligning the organizational strategy with the objectives of increasing performance and sustainable development" (Vărzaru 2022a, 10).

The findings of Schiavone et al. (2023) do not differ much, when the authors analyze the introduction of digital technologies when constructing a Key Performance Indicator (KPI) system to monitor performance in a cancer network organization in Italy. The implementation

of a digital system translates into a better and more complete dashboard system to monitor financial performance (the same holds for clinical performance). For example, it allows the creation of indicators based on avoidable costs (costs arising from inappropriate or repeated diagnostic tests).

Begkos, Antonopoulou, and Ronzani (2024) assess in detailed manner the gradual process of implementation of increasingly digital technologies in the management systems of a healthcare provider from the UK, including those aiding performance measurement, and evaluating the benefits resultant of each upgrade. The paper evaluates the adoption of two main systems for the accounting activity. The Service Line Reporting (SLR) allowed for monitoring of revenues and costs of various service lines (top-down approach), helping to identify which activities were turning a profit. On the other hand, Patient-level Information and Costing Systems (PLICS) made a more complete measurement of patient costs at an individual level (according to ABC costing), that would be beneficial to benchmark treatment costs and "improving patient outcomes and linking costs with quality of treatment" (Begkos, Antonopoulou, and Ronzani 2024, 7).

The conclusions drawn in the literature are clear. Most mention an opportunity to increase efficiency and achieve organizations' goals, be that through the use of the BSC enhanced by digital transformation to achieve sustainable development, KPI dashboards that allow for better resource utilization, or even strengthening clinical decision-making made possible by improved information quality.

Research on additional types of innovative digital technologies study topics, such as leveraging the use of electronic health records, budget focused systems, or management support systems. Once again, authors identify multiple ways in which these systems come to aid in the decision-making process.

This aid can come mainly from the creation of databases that facilitate and align access to information within the medical establishment. This is the case of Bardhan and Thouin (2013), that in addition to Automation/ Standardization, also point out another characteristic of financial systems. The utilization of these systems "enables staff to plan and budget healthcare operations more efficiently and provide users with analytical tools to identify and eliminate redundant costs" (Bardhan and Thouin 2013, 446).

Kitsios and Kapetaneas (2022) reach similar conclusions. The authors describe Business Intelligence Systems as having a potential capability as a management support tool. One of these benefits is the integration of data sources, which allows to "prevent inconsistencies between departments' cost or benefit estimates" (Kitsios and Kapetaneas 2022, 6).

The benefits of costing analysis present potential utility for different categories of users, including managers and public regulators. Those are the findings of Hansen and James Baroody (2020) when focusing on the use of electronic health records (EHR) in the US healthcare system. Similar to findings presented before, the use of EHR is also capable of improving the "financial management: analysis and management of organizational finances" as well as an "analysis of public health costs and trends" (Hansen and James Baroody 2020, 68). The authors also draw a focus towards the added ability to compare and report different outcomes of procedures being measured by EHR systems.

Finally, blockchain technology is also mentioned when Ivanteev, Ilin, and Iliashenko (2020) point out to the relevance this technology can have in the healthcare industry, including the projects in accounting and finance sectors of healthcare organizations. Once more, a multitude of agents are mentioned, internal and external, that can benefit from the information brought by blockchain systems.

Upon the analysis of the literature covering the theme, one can observe the benefits are not tied to the speed at which professionals can analyze large data sets, but rather the information they can extract from it and its uses. Similarly, improvements can be achieved through a multitude of different systems focusing on the obtention of specific accounting information (performance monitoring, budgeting, coting data, etc.). However, one key difference is the agents' capability of taking advantage of this benefit. While accountants are the ones working the information, the knowledge taken from it can be utilized by general management of a medical establishment, public regulators, and even medical personnel, who can make use of accounting information to optimize their course of action. This leads to an improved organizational performance that authors agree upon and, naturally, translating into potentially optimized clinical results.

3.2.3. Security

Although mentioned with less frequency in the literature, studies also point out a crucial need for secure systems, for professionals and external stakeholders. Current research emphasizes the relevance of security in the healthcare field, considering the importance of protecting healthcare data, and agrees on its crucial role for proper implementation of digital systems.

Vărzaru (2022b), presents this feature to be a valued addition according to professionals, which serves as an incentive for accountants to accept and take part in the implementation of digital technologies. The author refers to the option of utilizing Blockchain technology due to its capacity for providing more security and transparency when dealing with larger amounts of information. Sharma (2024) also identifies cybersecurity to be of essential incorporation when designing digital systems for healthcare accounting and finance, not only for data storage purposes but also to maintain the reliability of analysis made with said data.

This added transparency and reliability mentioned by authors can be interpreted as an enabling factor to all tasks mediated though digital systems, ensuring their proper functioning to make

use of the many operational benefits, as well as protecting the integrity of medical and financial records that are utilized in the decision-making process.

3.2.4. Adaptability

Another core theme found in the literature is the adaptability that comes with digital transformation, as well as from it. Authors take various routes when exploring the theme, leading to a well-defined separation of issues presented in the literature. One key part of the development on this theme is how academia mentions adaptability as a core feature of accounting digital systems. This perspective is evident when Sharma (2024) advocates adaptability as one of the priorities when designing digital systems for healthcare accounting and finance. This perspective is corroborated by the benefits highlighted in the papers below, and once more, it is noticeable how benefits can span from a multitude of technologies.

This feature can be seen when directing the analysis towards budgeting, when Kruszyńska Fischbach et al. (2022) evaluate the readiness of a healthcare provider in regard to adoption of digital technologies. While the paper evaluates a multitude of technologies for several healthcare activities, the authors obtain insights from industry professionals, finding that 67% of the managers inquired say “the digital budget is flexible and allows them to change priorities” (Kruszyńska-Fischbach et al. 2022, 18).

In addition, Setia, Menon, and Srinivasan (2020) evaluate the impact of using electronic health records on hospital performance. Among the conclusions of the authors, it stands out the improvement of readmission rates in larger hospitals, stemming from the aid brought out by EHR to the more demanding administrative environment in these establishments. EHR can help decentralizing decision-making, allowing for a more suitable control over higher needs for “resource allocation and cost budgeting procedures” (Setia, Menon, and Srinivasan 2020, 6) that larger establishments tend to have. This benefit makes a connection with how the literature

also discusses that, rather than solely improving adaptability in accounting activities, there is also an adaptability component tied to organizational characteristics.

Authors also evaluate the possibility of tailoring digital transformation according to each organization and discuss the potential consequences. Menon, Yaylacicegi, and Cezar (2009) finds the use of administrative IT to have noticeable positive results in the long-term on supporting tasks. Similarly, the authors point out the role of management in adapting the implementation of digital systems according to the conditions and strategy of the hospital.

Singh, Mindel, and Mathiassen (2017), the authors make the case for the implementation of administrative IT, based on the above-mentioned study conducted by Menon, Yaylacicegi, and Cezar (2009).However, this study takes a novel perspective on the adaptability of systems, as it explores the option of implementing administrative IT in resource-constrained hospitals, introducing how it is also a task of management to adapt the digital systems to the conditions of the organization. It introduces how it may not be a priority in comparison to medical grade IT for the success of the establishment, and managers could opt for less capable systems in the short term.

Generally, among the previously mentioned papers, conclusions agree with the findings mentioned in the previously mentioned topics. The tasks improved are once more related to budgeting, planning, control and reporting. However, aside from identifying beneficial outcomes, the perspective adopted by authors puts in perspective the conditions that make an accounting digital transformation a desirable change in organizations, or if establishments should favor other investments directly tied with their service.

On the other hand, the literature also analyzes carefully how adaptability may not be a feature of systems but rather of organizations as a whole. The following studies explore how accounting practices can be leveraged to fit a more digital environment in healthcare institutions. Biancone

et al. (2019) introduce the utilization of electronic health records for an improved cost accounting through a combination of cycle of innovation and micro costing (time driven activity-based costing) theories. The authors find that the proposed model creates "a positive impact in terms of economic/financial planning of individual health departments" (Biancone et al. 2019, 12). In addition, the authors point out a necessary improvement in the levels of detail of electronic health records in order to improve identification and disclosure of costs of the patient treatment cycle, that could potentially lead to a possible shift from financing based on historical costs towards a system of financing based on micro costing.

Korhonen, Sillanpää, and Jääskeläinen (2023), explore a different method of controlling and monitoring the integration of digital technologies in public healthcare, through horizontal financial performance measurements as anchor practices to evaluate the costs and benefits of the implementation of a digital healthcare system. The study finds that in the case-study, this new performance management system was beneficial by increasing visibility of the financial component. This is likely to improve performance not only emerging from the digitalized systems but also improved efforts coming from practitioners. This is another example of how accounting practices can shift to better adapt to digital transformation in healthcare, and also improve the quality of information for decision-making process. Vesty et al. (2023) introduce the issue that accounting practices are outdated in relation to the current digital healthcare sector, researching what changes need to be made in order to successfully adapt to the modern paradigm. The findings point out to the issue that the current Activity Based Funding model used by Australian healthcare providers does not account for digital health interventions in its entirety, leaving the presence of various costs and potential savings unaccounted for, and an open space for organizations to fully integrate DT in their activity.

Gimzauskiene et al. (2023) also explore the issue of how to correctly adapt accounting techniques to suit technological advancements in healthcare. The authors propose the adaptation

of the Activity Based Costing framework in accounting for digital health services. In the proposed model, the authors “have applied activity-based costing (ABC) modeling around multi-sided patient pathways, integrating multiple stakeholders’ efforts into a single digital healthcare value chain” (Gimzauskiene et al. 2023, 140). It can also be true that organizations adapt according to their goals, and Vărzaru et al. (2023) explores role of integrating aspects of digital transformation in managerial accounting to better fit a sustainable strategy. The authors find that “digital transformation has increased the role in the sustainable development of managerial accountants” (Vărzaru et al. 2023, 10). This comes with the need to include financial, social, and environmental measures in the accounting activity, and digital technologies have come to aid the gathering of information, allowing for real-time reporting for stakeholders, as well as increasing accountants´ IT capabilities.

Once again, one can note that this segment of the literature evidences situations in which development derives from external pressures rather than focused digital advancements to the accounting practice, involving different stakeholders. Naturally, this comes tied with the potential to revolutionize the healthcare management paradigm, one where there is a clear understanding of how to account for digital health practices or a shift towards sustainable development. This opportunity to leverage existing knowledge in the transition towards better suiting business models, making an active contribution for their implementation, leads to an agreement among scholars regarding improvements in the performance of organizations.

4. Discussion & Conclusions

4.1 Discussion

Digital transformation is changing the way the healthcare industry operates. While this is evident for medical advancements, it also holds true when considering the potential held within the accounting of healthcare organizations. Covering a focused topic, this paper systematically

reviews what is still a reduced body of scholarly work, which has been increasing together with the interest for digital transformation in the business landscape.

An initial valuable conclusion is the general consensus of the improvement in organizational efficiency in healthcare organizations through digital transformation, with some even raising the potential of strengthening clinical outcomes. However, as expected, organizational performance improvements derive from management enhancements. This is similar to the findings of different industries, such as Nurmagambetova et al. (2020) regarding hospitality, Anderson and Van Der Merwe (2021) and Klymenko, Halse, and Jæger (2021) for the manufacturing business sector, or Al-Okaily et al. (2023) on to the banking sector.

Similarly, it is relevant to mention how substantial the connection is between the themes surrounding DT in healthcare accounting. A visual representation is found below in Figure 6.

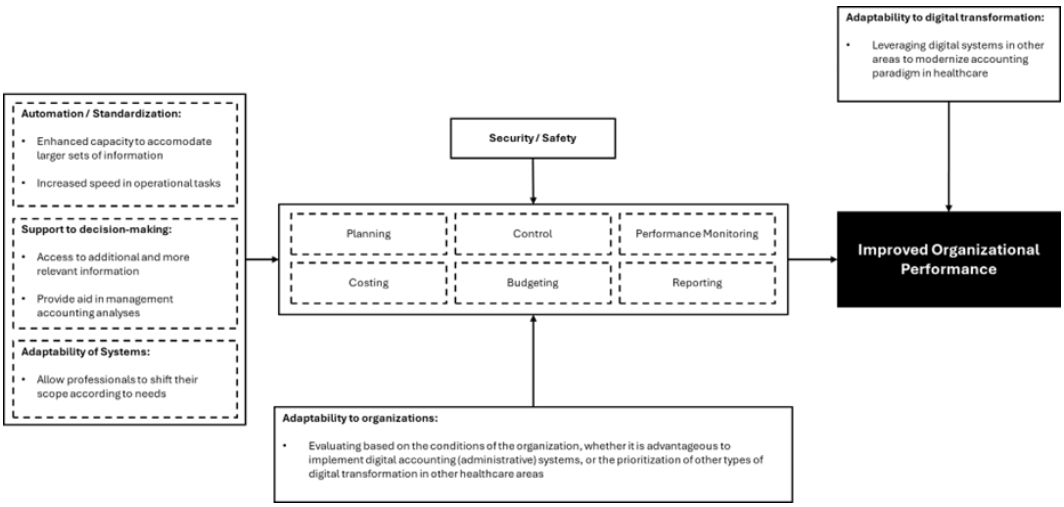

Figure 6: Visual representation of connections among core themes

Many papers make multiple appearances as they delve into multiple themes rather than isolating them. Such structure allows for a more detailed and comprehensive view of the potential benefits of implementing digital technologies in healthcare accounting. One can exemplify it taking directly from the case study of Fan et al. (2024), evidencing a direct relationship between

automation and support towards decision-making, illustrating a connection between two of the core themes identified or Sharma (2024) where all features are interrelated.

One can bridge the afore mentioned with findings regarding specific technologies, and where they present more than a single benefit. The literature often mentions how the use of non focused systems, mainly EHR, lead to improvements across different activities (budgeting and reporting for example), englobing also improvements from various of the core themes. Nevertheless, literature on dedicated systems created for accounting activities often provides more detail in the functionalities these possess and outcomes they yield.

An additional takeaway is how among the different types of establishments being studied, the benefits seem to exist. Both research upon hospitals and clinics yields similar conclusions about improvements in operational performance stemming from digital transformation in accounting. Nevertheless, one cannot assume these benefits to be uniform, and in fact, the literature also provides evidence that organizations must make their adoption of these systems according to their context. Similarly, there is also no evidence of a difference in outcomes in public compared to private medical organizations, as both seem to bear improvements following a digital transformation. In addition, there is no evidence of a more proactive implementation in one type of organization. Even with Begkos, Antonopoulou, and Ronzani (2024) mentioning a proactive adoption of digital systems in the NHS, there is supporting evidence, provided mainly by consultancy reports that the public sector seems to lag behind its private counterpart when it comes to the adoption of digital transformation (Eggers and Bellman n.d.).

Furthermore, the tendency to integrate the role of accounting systems in studies with a broader scope reveals a push towards a better understanding of organizations as a whole. Some authors mention how accounting information is not only useful to accountants, and refer to a need for non-accounting personnel to be familiarized with these systems, namely medical staff

(Biancone et al. 2019). Similarly, this push towards personnel education must also be done with accountants, familiarizing them with digital transformation trends in healthcare as means to adapt the practice to better fit the new healthcare paradigm. Academia tends to associate these needs for change with a shift in business models or strategic objectives. In its majority, the literature approaching this shift appears from the theme covering adaptability. This section of the literature seems to be particularly relevant considering the general trend towards the study of Sustainable development (Nosratabadi et al. (2019); Rodriguez, Svensson, and Eriksson (2021); Oderanti et al. (2021)). Accordingly, sustainable development occupies a central spot among the novel business models, being presented multiple times in the papers analyzed, and mentioned as a goal to achieve and to guide business practices' shifts.

To place accounting in a central spot in healthcare, one must assess how the findings cover the three dimensions of accounting, technical, social and moral. Especially, the last two dimensions hold a decisive place in the healthcare field. While the technical side is evidenced by benefits to accountant´s efficiency, the social facet is translated into the potential improvements in decisions of agents, such as clinical personnel and regulators. Finally, the moral perspective lies once again on accountants ensuring the safety if digital systems for their activities. The social and moral perspectives evidence a strong contribution towards transparency and accountability in the field. By improving society's trust in healthcare systems, it can facilitate this process of elevating accounting's contribution in healthcare, made possible by digital transformation.

4.2 Theoretical and Practical Contributions

This research contributes to the academic literature in the field of management, more precisely to accounting. To the best of my knowledge, this is the first study exploring systematically the role of digital transformation in healthcare accounting. Through the approach taken on this paper, four themes were identified in the literature: Automation / Standardization; Decision-

making support; Security; and Adaptability. Among the above-mentioned themes, the coverage of multiple classes of technology together with their features and benefits helps to consolidate the current knowledge on the topic. In addition, this systematic review makes a practical contribution to management of healthcare organizations and governance members responsible for public healthcare systems. Primarily, by emphasizing the multiple benefits of a digital transformation, allowing to target specific needs of an organization and reinforcing the confidence to adopt digital systems in healthcare accounting. Moreover, this research contributes with insights for the use of information systems providers, through the identification of the core themes that highlight the features sought after by accountants to improve their tasks.

4.3.Limitations

While this project retrieves the existent literature from two reliable and comprehensive databases of academic knowledge, it is not free from limitations. Potentially, relevant literature could be found through research in additional platforms such as Google Scholar, by including published Book Chapters, or extending the language selection past English in the scope of this systematic review. In addition, a further expansion of the search terms, as well as the inclusion of keywords, relative to individual technologies or accounting methods, could have resulted in additional relevant literature. Finally, overcoming the limitation regarding access to papers could have resulted in further potential papers to be included in this review.

4.4 Agenda for future research

One key observation about the contents of this work is how many of the studies analyzed cover broader topics other than isolating the role of digital transformation in healthcare accounting. Although identifying multiple core themes, this review evidences the existence of a clear gap in focused research that can be explored in future studies. Similarly to the extent of the current literature, future research can be pursued from the lens of multiple disciplines.

As evidenced, the case study approach is largely underused. The adoption of this research format for several types of organizations can bring valuable insights from closely following the implementation of digital systems. An interesting set of potential general research questions derived from this approach could be: “What are the enabling factors in healthcare organizations for a digital transformation in accounting?”; or “What are the factors causing resistance to the implementation of digital transformation in healthcare accounting?”. However, when covering these research questions, it is encouraged to adopt a more focused approach, with the opportunity to explore these questions looking at the public or private sector, as well as delving into research on hospitals or clinics. Alternatively, researchers can analyze “Under which business model does a digital transformation process in healthcare accounting yield better results?”, conducting a stakeholder analysis of an adoption of digital transformation in healthcare accounting, mainly for innovative business models.

Alternatively, academia can look past the managerial side of the topic, and direct future research towards the identification of direct links between digital efforts in healthcare accounting and the effects it can have on the public perception of this essential service. Among the possibilities, two key questions arise: “How can digital transformation in healthcare accounting directly contribute towards the improvement of clinical outcomes?” or, picking up on the identified reporting benefits, “How can digital transformation in healthcare accounting increase accountability and transparency levels in the sector?”.

Finally, future research may skew towards evaluating which specific features would prove more useful to integrate into systems. Logically, it can take a theoretical route to initiate research on novel, unexplored technologies. Among the potential research questions, authors could study: “What are the most useful features to integrate in digital systems for healthcare accounting?”. Finally, when pursuing this path, authors could also explore which tasks seem to be viewed as more beneficial by accountants, obtaining valuable insights for the creation of these systems.

References

"A Mapping Exercise: Making the Case for Public Investment in Health TSI2022/MCP/164: Resources Hub for Sustainable Investment in Health." 2024. www.healthobservatory.eu.

Aboagye-Otchere, Francis, Cletus Agyenim-Boateng, Abdulai Enusah, and Theodora Ekua Aryee. 2021. "A Review of Big Data Research in Accounting." *Intelligent Systems in Accounting, Finance and Management* 28 (4): 268–83. https://doi.org/10.1002/isaf.1504.

Al-Okaily, Manaf, Dmaithan Al-Majali, Aws Al-Okaily, and Tha'er Majali. 2023. "Blockchain Technology and Its Applications in Digital Accounting Systems: Insights from Jordanian Context." *Journal of Financial Reporting and Accounting*. https://doi.org/10.1108/JFRA-05-2023-0277.

Anderson, A. M., and A. Van Der Merwe. 2021. "Time-Driven Activity-Based Costing Related to Digital Twinning in Additive Manufacturing." *South African Journal of Industrial Engineering* 32 (1): 37–43. https://doi.org/10.7166/32-1-2271.

Anessi-Pessina, Eugenio, Carmela Barbera, Mariafrancesca Sicilia, and Ileana Steccolini. 2016. "Public Sector Budgeting: A European Review of Accounting and Public Management Journals." *Accounting, Auditing and Accountability Journal*. Emerald Group Publishing Ltd. https://doi.org/10.1108/AAAJ-11-2013-1532.

Aranyossy, Marta, and Peter Halmosi. 2024. "Healthcare 4.0 Value Creation – The Interconnectedness of Hybrid Value Propositions." *Technological Forecasting and Social Change* 208 (November). https://doi.org/10.1016/j.techfore.2024.123718.

Bardhan, Indranil R., and Mark F. Thouin. 2013. "Health Information Technology and Its Impact on the Quality and Cost of Healthcare Delivery." *Decision Support Systems* 55 (2): 438–49. https://doi.org/10.1016/j.dss.2012.10.003.

Begkos, Christos, Katerina Antonopoulou, and Matteo Ronzani. 2024. “To Datafication and beyond: Digital Transformation and Accounting Technologies in the Healthcare Sector.” *British Accounting Review* 56 (4). https://doi.org/10.1016/j.bar.2023.101259.

Biancone, Paolo, Silvana Secinaro, Valerio Brescia, and Davide Calandra. 2019. “Management of Open Innovation in Healthcare for Cost Accounting Using EHR.” *Journal of Open Innovation: Technology, Market, and Complexity* 5 (4). https://doi.org/10.3390/joitmc5040099.

Carnegie, Garry, Lee Parker, and Eva Tsahuridu. 2021. “It’s 2020: What Is Accounting Today?” *Australian Accounting Review* 31 (1): 65–73. https://doi.org/10.1111/auar.12325.

Cylus, Jonathan, Govin Permanand, Peter C Smith, Hans Kluge, and Josep Figueras. 2018. “INCLUDE INNOVATE Making the Economic Case for Investing in Health Systems What Is the Evidence That Health Systems Advance Economic and Fiscal Objectives? POLICY BRIEF INVEST HEALTH SYSTEMS FOR PROSPERITY AND SOLIDARITY.” http://www.euro.who.int/en/about-us/partners/.

Fan, Cunbin, Guohao Zou, Chufeng Yang, and Ziqiang Zhao. 2024. “Can the Digital Transformation of Pharmaceutical Enterprises’ Finance Improve Healthcare Equity?” *Finance Research Letters* 67 (September). https://doi.org/10.1016/j.frl.2024.105911.

Gimzauskiene, Edita, Lukas Geryba, Jurgita Giniuniene, Rima Sermontyte-Baniule, Laura Pekiene, and Asta Pundziene. 2023. “Towards Digital Healthcare Services Activity-Based Costing and Value Measurement Framework.” In *2023 IEEE International Conference on Technology and Entrepreneurship, ICTE 2023*, 134–41. Institute of Electrical and Electronics Engineers Inc. https://doi.org/10.1109/ICTE58739.2023.10488530.

Goo, Jahyun, C. Derrick Huang, and Chulmo Koo. 2015. “Learning for Healthy Outcomes: Exploration and Exploitation with Electronic Medical Records.” *Information and Management* 52 (5): 550–62. https://doi.org/10.1016/j.im.2015.04.002.

Grossi, Giuseppe, Ileana Steccolini, Pawan Adhikari, Judy Brown, Mark Christensen, Carolyn Cordery, Laurence Ferry, et al. 2023. “The Future of Public Sector Accounting Research. A Polyphonic Debate.” *Qualitative Research in Accounting and Management* 20 (1): 1–37. https://doi.org/10.1108/QRAM-09-2022-0135.

Hansen, Sean, and A. James Baroody. 2020. “Electronic Health Records and the Logics of Care: Complementarity and Conflict in the U.S. Healthcare System.” *Information Systems Research* 31 (1): 57–75. https://doi.org/10.1287/ISRE.2019.0875.

Hung, Bui Quang, Tran Anh Hoa, Tu Thanh Hoai, and Nguyen Phong Nguyen. 2023. “Advancement of Cloud-Based Accounting Effectiveness, Decision-Making Quality, and Firm Performance through Digital Transformation and Digital Leadership: Empirical Evidence from Vietnam.” *Heliyon* 9 (6). https://doi.org/10.1016/j.heliyon.2023.e16929.

Huy, Pham Quang, and Vu Kien Phuc. 2024. “Optimization of Accounting Information System in Public Sector for Sustainable Risk Management under Big Data Analytics. Does Forensic Accountants’ Skill Generate Differences?” *Foundations of Management* 16 (1): 67–82. https://doi.org/10.2478/fman-2024-0005.

Ivanteev, Alexander, Igor Ilin, and Victoria Iliashenko. 2020. “Possibilities of Blockchain Technology Application for the Health Care System.” In *IOP Conference Series: Materials Science and Engineering*. Vol. 940. IOP Publishing Ltd. https://doi.org/10.1088/1757-899X/940/1/012008.

Kaplan, Robert S, and David P Norton. n.d. “The Balanced Scorecard-Measures That Drive Performance.”

Kitsios, Fotis, and Nikolaos Kapetaneas. 2022. “Digital Transformation in Healthcare 4.0: Critical Factors for Business Intelligence Systems.” *Information (Switzerland)* 13 (5). https://doi.org/10.3390/info13050247.

Klymenko, Olena, Lise Lillebrygfjeld Halse, and Bjørn Jæger. 2021. “The Enabling Role of Digital Technologies in Sustainability Accounting: Findings from Norwegian Manufacturing Companies.” *Systems* 9 (2). https://doi.org/10.3390/systems9020033.

Kolk, Berend van der. 2022. “Performance Measurement in the Public Sector: Mapping 20 Years of Survey Research.” *Financial Accountability and Management*. John Wiley and Sons Inc. https://doi.org/10.1111/faam.12345.

Korhonen, Tuomas, Virpi Sillanpää, and Aki Jääskeläinen. 2023. “Anchor Practices That Guide Horizontal Performance Measurement: An Interventionist Case Study of the Financial Aspect of New Technology Implementation in Healthcare.” *Journal of Management and Governance* 27 (3): 787–816. https://doi.org/10.1007/s10997-023-09675-8.

Kruszyńska-Fischbach, Agnieszka, Sylwia Sysko-Romańczuk, Tomasz M. Napiórkowski, Anna Napiórkowska, and Dariusz Kozakiewicz. 2022. “Organizational E-Health Readiness: How to Prepare the Primary Healthcare Providers’ Services for Digital Transformation.” *International Journal of Environmental Research and Public Health* 19 (7). https://doi.org/10.3390/ijerph19073973.

Menon, Nirup, Ulku Yaylacicegi, and Asunur Cezar. 2009. “Differential Effects of the Two Types of Information Systems: A Hospital-Based Study.” *Journal of Management Information Systems* 26 (1): 297–316. https://doi.org/10.2753/MIS0742-1222260111.

Nikoloski, Zlatko, and Elias Mossialos. 2013. “Corruption, Inequality and Population Perception of Healthcare Quality in Europe.” *BMC Health Services Research* 13 (1). https://doi.org/10.1186/1472-6963-13-472.

Nóbrega, Vitor, Renato Lopes da Costa, Rui Gonçalves, Álvaro Dias, Leandro Pereira, and Klaus Dorner. 2023. “The Impact of Artificial Intelligence in Accounting: Application in SMEs.” *International Journal of Electronic Finance* 12 (2): 192–214. https://doi.org/10.1504/IJEF.2023.129923.

Nosratabadi, Saeed, Amir Mosavi, Shahaboddin Shamshirband, Edmundas Kazimieras Zavadskas, Andry Rakotonirainy, and Kwok Wing Chau. 2019. “Sustainable Business Models: A Review.” *Sustainability (Switzerland)*. MDPI. https://doi.org/10.3390/su11061663.

Nurmagambetova, Azhar, Sariya Baimukhanova, Ryszard Pukala, Karlygash Kurbanova, and Anar Kidirmaganbetova. 2020. “Improvement of Accounting in the Hotel Business in the Transition to a Digital Economy.” In *E3S Web of Conferences*. Vol. 159. EDP Sciences. https://doi.org/10.1051/e3sconf/202015904019.

Oderanti, Festus Oluseyi, Feng Li, Marija Cubric, and Xiaohui Shi. 2021. “Business Models for Sustainable Commercialisation of Digital Healthcare (EHealth) Innovations for an Increasingly Ageing Population: (A New Business Model for EHealth).” *Technological Forecasting and Social Change* 171 (October). https://doi.org/10.1016/j.techfore.2021.120969.

O’Leary, Daniel E. 2023. “Digitization, Digitalization, and Digital Transformation in Accounting, Electronic Commerce, and Supply Chains.” *Intelligent Systems in Accounting, Finance and Management*. John Wiley and Sons Inc. https://doi.org/10.1002/isaf.1524.

Rodriguez, Rocio, Göran Svensson, and David Eriksson. 2021. “Priorities Determining Future Directions of Sustainable Development in Business Models of the Healthcare Industry—Findings and Framework.” *Sustainability (Switzerland)* 13 (11). https://doi.org/10.3390/su13116507.

Schiavone, Francesco, Giorgia Rivieccio, Daniele Leone, Andrea Caporuscio, Mariacristina Pietronudo, Anna Bastone, Maria Grimaldi, et al. 2023. “Structuring the Basis for Performance Measurement in a Cancer Network. An Explorative Analysis.” *Journal of General Management* 48 (4): 386–93. https://doi.org/10.1177/03063070231173511.

Secinaro, Silvana, Valerio Brescia, Giovanni Paride Verardi, and Angel Iunco. 2020. “Digital Transformation for Health Care Could Be Supporting by Innovative Accounting?” In *15TH INTERNATIONAL FORUM ON KNOWLEDGE ASSET DYNAMICS (IFKAD 2020)*, edited by Giovanni Schiuma, 1404–17. Matera: Proceedings IFKAD.

Setia, Pankaj, Nirup Menon, and Sankara Subramanian Srinivasan. 2020. “EHR Application Portfolio and Hospital Performance: Effects across Hospitals with Varying Administrative Scale and Clinical Complexity.” *Information and Management* 57 (8). https://doi.org/10.1016/j.im.2020.103383.

Sharma, Narayan. 2024. “Maximizing the Benefits of Information Technology in Healthcare Finance and Accounting: A Quantitative Exploration of Organizational Practices.” *Journal of Commercial Biotechnology* 29 (1): 102–13. https://doi.org/10.5912/jcb2217.

Singh, Rajendra, Vitali Mindel, and Lars Mathiassen. 2017. “IT-Enabled Revenue Cycle Transformation in Resource-Constrained Hospitals.” *Journal of Management Information Systems* 34 (3): 695–726. https://doi.org/10.2307/26613896.

Spanò, Rosanna, Maurizio Massaro, and Silvia Iacuzzi. 2023. “Blockchain for Value Creation in the Healthcare Sector.” *Technovation* 120 (February). https://doi.org/10.1016/j.technovation.2021.102440.

“The Journey to Government’s Digital Transformation A Deloitte Digital Global Survey.” n.d. www.deloittedigital.com.

Tommasetti, Aurelio, Gennaro Maione, Andrea Bignardi, and Pietro Lentini. 2023. “Environmental Accounting in the Public Sector: A Systematic Literature Review.” *Int. J. Business Environment*. Vol. 14.

Vărzaru, Anca Antoaneta. 2022a. “An Empirical Framework for Assessing the Balanced Scorecard Impact on Sustainable Development in Healthcare Performance Measurement.” *International Journal of Environmental Research and Public Health* 19 (22). https://doi.org/10.3390/ijerph192215155.

———. 2022b. “Assessing Digital Transformation of Cost Accounting Tools in Healthcare.” *International Journal of Environmental Research and Public Health* 19 (23). https://doi.org/10.3390/ijerph192315572.

Vărzaru, Anca Antoaneta, Claudiu George Bocean, Maria Magdalena Criveanu, Adrian Florin Budică-Iacob, and Daniela Victoria Popescu. 2023. “Assessing the Contribution of Managerial Accounting in Sustainable Organizational Development in the Healthcare Industry.” *International Journal of Environmental Research and Public Health* 20 (4). https://doi.org/10.3390/ijerph20042895.

Vesty, Gillian, Olga Kokshagina, Miia Jansson, France Cheong, and Kerryn Butler-Henderson. 2023. “Accounting, Valuing and Investing in Health Care: Dealing with Outdated Accounting Models.” *Meditari Accountancy Research* 31 (1): 52–77. https://doi.org/10.1108/MEDAR-06-2021-1334.

Vial, Gregory. 2019. “Understanding Digital Transformation: A Review and a Research Agenda.” *Journal of Strategic Information Systems*. Elsevier B.V. https://doi.org/10.1016/j.jsis.2019.01.003.