VILNIUS UNIVERSITY
BUSINESS SCHOOL

DEEPTECH ENTREPRENEURSHIP PROGRAMME

Eglė Vaičiulytė

MASTER'S THESIS

VERSLO VALDYMO MODELIŲ ĮTAKA SVEIKATOS PRIEŽIŪROS INOVACIJOMS	***THE IMPACT OF BUSINESS MANAGEMENT MODELS ON HEALTHCARE INNOVATION***

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Prof. Dr. Saulė Mačiukaitė-Žvinienė

Vilnius, 2024

SUMMARY

VILNIUS UNIVERSITY BUSINESS SCHOOL

DEEPTECH ENTREPRENEURSHIP STUDY PROGRAMME

EGLĖ VAIČIULYTĖ

THE IMPACT OF BUSINESS MANAGEMENT MODELS ON HEALTHCARE INNOVATION

Supervisor – Prof. Dr. Saulė Mačiukaitė-Žvinienė.

The master`s thesis was prepared in Vilnius, in 2024.

The scope of the master`s thesis – 86 pages.

The number of tables used in the master`s thesis – 4 pcs.

The number of figures used in the master`s thesis – 7 pcs.

The number of references used in the master`s thesis – 260 pcs.

The problem – the existing literature on business management models in the healthcare sector is limited, which poses a challenge to fully understand their impact on innovation in healthcare.

The objective of the study is to contribute to the academic and practical understanding of the impact of business management models in fostering innovation processes in the healthcare sector, thereby creating a new framework that optimizes organizational capabilities in healthcare innovation.

The tasks are: 1. To systematically analyse relevant literature and compare different business management models promoting innovation processes in the healthcare sector; 2. Based on the findings of the literature review and case studies analysis, to assess the impact of business management models on healthcare innovation; 3. To develop a conceptual framework that provides insights into its practical applicability as a comprehensive innovation management system in the dynamic healthcare industry.

Research methods: the study applied literature research methodology and case studies analysis as research methods to develop a conceptual framework promoting innovation processes in healthcare.

Results: a systematic analysis based on the current literature and different case studies was conducted, leading to the creation of a conceptual framework to promote healthcare innovation.

Conclusions: 1. Each business management model has its advantages and limitations which require careful consideration of contextual factors. Lean management is characterised by efficiency and quality, Total Quality Management (TQM) is known for its continuous improvement, Six Sigma excels at achieving zero defects, and Agile management at rapid adaptability. To drive innovation and improve patient outcomes, healthcare organizations should adopt a customized approach to healthcare management. 2. The right business management model depends on the specific needs of each healthcare organization. This tailored approach can improve performance and drive innovation,

leading to better patient outcomes and higher quality of care. 3. The Integrated Healthcare Innovation Model (IHIM) framework provides a roadmap for healthcare organizations to drive healthcare innovation processes by integrating innovation into high-quality patient care. It empowers employees, which increases job satisfaction and retains talented professionals, emphasizes the need to align short-term performance goals with long-term innovation goals, recommends implementing reward systems to recognize innovative organizational efforts, and highlights the importance of fostering agile leadership, especially in times of change or during the crisis.

Recommendations for healthcare organizations: 1. Adopt a comprehensive approach; 2. Focus on patient-centred innovation; 3. Promote a continuous learning culture; 4. Ensure leadership engagement; 5. Empower healthcare professionals; 6. Optimize resources; 7. Implement reward and recognition systems; 8. Balance short-term and long-term goals; 9. Rely on adaptive leadership; 10. Implement crisis management with agility.

SANTRAUKA

VILNIAUS UNIVERSITETO VERSLO MOKYKLA

AUKŠTŲJŲ TECHNOLOGIJŲ VERSLO STUDIJŲ PROGRAMA

EGLĖ VAIČIULYTĖ

VERSLO VALDYMO MODELIŲ ĮTAKA SVEIKATOS PRIEŽIŪROS INOVACIJOMS

Darbo vadovė – prof. dr. Saulė Mačiukaitė-Žvinienė.

Magistro darbas parengtas Vilniuje, 2024 m.

Magistro darbo apimtis – 86 puslapiai.

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Magistro darbe naudotų literatūros šaltinių skaičius – 260 vnt.

Problema – ribotas verslo valdymo modelių sveikatos priežiūros sektoriuje ištyrimas esamoje literatūroje kelia iššūkį visapusiškai suprasti jų įtaką inovacijoms.

Tyrimo tikslas – prisidėti prie mokslinio ir praktinio suvokimo apie verslo valdymo modelių poveikį skatinant inovacinius procesus sveikatos priežiūros sektoriuje, taip sukuriant naują sistemą, optimizuojančią organizacinius sveikatos priežiūros inovacijų pajėgumus.

Uždaviniai: 1. Sistemingai analizuoti esamą literatūrą ir palyginti skirtingus verslo valdymo modelius, skatinančius inovacijų diegimo procesus sveikatos priežiūros sektoriuje; 2. Remiantis literatūros apžvalgos ir atvejų analizės išvadomis, įvertinti verslo valdymo modelių įtaką diegiant inovacijas sveikatos priežiūros srityje; 3. Sukurti konceptualią sistemą, kuri suteiktų įžvalgų apie jos, kaip visapusiškos inovacijų valdymo sistemos, praktinį pritaikomumą dinamiškame sveikatos priežiūros sektoriuje.

Tyrimo metodai: siekiant sukurti konceptualią sistemą, skatinančią inovacijų diegimo procesus sveikatos priežiūros srityje, tyrime buvo naudojama literatūros apžvalga ir atvejų analizė,

Rezultatai: remiantis esama literatūra bei atvejų analize atlikta sisteminė analizė ir sukurta konceptuali sistema, skatinanti inovacijas sveikatos priežiūros srityje.

Išvados: 1. Kiekvienas verslo valdymo modelis turi savų privalumų ir trūkumų, todėl yra būtina įvertinti veiksnius, susijusius su inovacinių procesų diegimu sveikatos priežiūros srityje. „Lean“ valdymas pasižymi efektyvumu ir kokybe, visuotinė kokybės vadyba (angl. *Total Quality* Management) yra žinoma dėl nuolatinio tobulėjimo, „Six Sigma“ puikiai padeda pasiekti nulinį defektų skaičių, o „Agile“ valdymo metodika padeda greitai prisitaikyti. Siekdamos skatinti naujoves ir pagerinti pacientų priežiūros rezultatus, sveikatos priežiūros įstaigos turėtų taikyti individualų požiūrį į sveikatos priežiūros valdymą. 2. Tinkamas verslo valdymo modelis priklauso nuo konkrečių kiekvienos sveikatos priežiūros įstaigos poreikių. Šis individualus požiūris gali pagerinti našumą ir skatinti inovacijų diegmo procesus, dėl ko pagerėtų pacientų priežiūra. 3. Integruoto sveikatos

priežiūros inovacijų modelio (angl. *Integrated Healthcare Innovation Model*) sistema teikia sveikatos priežiūros organizacijoms gaires, kaip skatinti sveikatos priežiūros inovacijų procesus juos integruojant į aukštos kokybės pacientų priežiūrą. Ši sistema propaguoja darbuotojų įgalinimą, didinantį jų pasitenkinimą darbu ir padedantį išlaikyti talentingus specialistus organizacijoje, pabrėžia svarbą derinti trumpalaikius veiklos tikslus su ilgalaikiais inovacijų tikslais, siūlo diegti skatinamąsias sistemas, siekiant pripažinti inovacijas skatinančius organizacijos veiksmus, ir pabrėžia judrios lyderystės (angl. *agile leadership*) skatinimo svarbą, ypač permainų ar krizės metu.

Rekomendacijos sveikatos priežiūros įstaigoms: 1. Taikyti visapusišką požiūrį; 2. Atkreipti dėmesį į inovacijas, orientuotas į pacientą; 3. Skatinti nuolatinio mokymosi kultūrą; 4. Užtikrinti vadovų įsitraukimą; 5. Įgalinti sveikatos priežiūros specialistus; 6. Optimizuoti išteklius; 7. Įdiegti atlygio ir pripažinimo sistemas; 8. Subalansuoti trumpalaikius ir ilgalaikius tikslus; 9. Remtis adaptyvia lyderyste; 10. Aktyviai vykdyti krizių valdymą.

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ABBREVIATIONS

AHF – Agile Healthcare Framework

AI – artificial intelligence

CHC – Commonwealth Health Corporation

ED – emergency department

EHR – electronic health record

IDC – Informatics and Development Center

IHIM – Integrated Healthcare Innovation Model

IMS – Intelligent Monitoring System

KPI – key performance indicator

OECD – Organisation for Economic Co-operation and Development

QMS – quality management systems

TIQM – Total Innovation Quality Management

TQM – Total Quality Management

UAE – United Arab Emirates

WHO – World Health Organization

DEFINITIONS

Business management model – a concept, theory or methodology that analyses different approaches to organizational change in the business industry.

Framework – the ideas, information, and principles that form the structure of an organization or plan.

Healthcare – the services provided by a country or an organization that involve caring for people's health and treating people.

Innovation – the process through which new products, concepts, services, methods, or techniques are developed.

Organization – a group of people who work together in an organized way for a shared purpose.

Stakeholder – a person such as an employee, customer, or citizen who is involved with an organization, society, etc., and therefore has responsibilities towards it and an interest in its success.

Technology – the use of scientific knowledge or processes in business, industry, manufacturing, etc.

INTRODUCTION

Relevance of the research

The success and development of healthcare depends on innovative leaders who ensure operational excellence and improve patient outcomes. Flessa and Huebner (2021) claim that healthcare organizations need to improve their ability to lead innovation processes. This is critical to ensure that healthcare organizations can meet the changing needs of patients, improve efficiency and cost-effectiveness, foster a culture of innovation, respond to competitive pressures and overcome complex healthcare challenges (Flessa and Huebner, 2021). In addition, Hieronimus, and Jenkins (2020) believe that the healthcare sector is being transformed by various factors, such as an aging population, changing patient needs, changing lifestyles, and a continuous cycle of innovation (Spatharou, Hieronimus, and Jenkins, 2020). Big data and mobile technologies are increasing the pressure on leadership and management in the healthcare sector. Patients are taking more responsibility for their own care and expect a faster response from their providers as well as more convenient, transparent and personalized care solutions (Kwame and Petrucka, 2021).

Stoumpos et al. (2023) find that various stakeholders in the healthcare sector have been actively seeking to develop novel and forward-looking healthcare delivery models in recent years. According to researchers, modern technological advances and the increasing adoption of value-based healthcare are leading to a shift from the traditional provider-centric model to more patient-centric healthcare systems characterised by greater decentralization (Stoumpos *et al*., 2023). At the same time, the demand for healthcare services has increased while resources remain scarce. Several factors have led to this increased demand, such as population growth, an aging population, and an increase in communicable diseases. According to the World Health Organization (WHO), 1 in 6 people are expected to be 60 years of age or older by 2030 (WHO, 2022).

In addition, the need for a holistic and coordinated approach is growing due to the increasingly complex needs of patients. Experts believe that healthcare leaders should move away from fragmented systems and adopt new models with shared responsibility and collaborative approaches (Iglesias *et al.*, 2018). However, academic research in the field of healthcare management tends to focus on a narrow range of business management models. But, the growing need for improved efficiency and quality in healthcare requires a more comprehensive study of the different management frameworks and their potential impact (Trisolini, 2002).

This master's thesis examines the critical interface between business management models and healthcare innovation and explores the impact of different approaches on the development, implementation, and sustainability of innovative practices. The research aims to shed light on the nuanced relationship between management frameworks and the capacity of healthcare systems to effectively innovate, which ultimately affects the quality and accessibility of healthcare services. The need to identify best practices in healthcare management is driven by this research. It is important to provide healthcare stakeholders (healthcare providers (including doctors, nurses, specialists,

pharmacists, and allied health professionals delivering care), pharmaceutical and medical device companies, healthcare institutions, insurers, research institutions, technology providers, and investors) and policymakers with information on the best management models to optimize innovation efforts. This would positively impact patient outcomes and improve healthcare delivery. Furthermore, the theoretical significance of this study is that it contributes to expanding knowledge about healthcare management and innovation to bridge the gap between these two fundamental aspects of health systems.

The problem – the existing literature on business management models in the healthcare sector is limited, which poses a challenge to fully understand their impact on innovation in healthcare.

The objective of the study is to contribute to the academic and practical understanding of effective business management models for fostering innovation processes in the healthcare sector, thereby creating a new framework that optimizes organizational capabilities in healthcare innovation.

The tasks are: 1. To systematically analyse relevant literature and compare different business management models promoting innovation processes in the healthcare sector; 2. Based on the findings of the literature review and case studies analysis, to assess the impact of business management models on healthcare innovation; 3. To develop a conceptual framework that provides insights into its practical applicability as a comprehensive innovation management system in the dynamic healthcare industry.

Methodology and methods of the research

The research project of this master's thesis is based on a methodology that includes a systematic literature review and case studies analysis. The aim is to systematically collect, summarize, and critically analyse the relevant contributions of business management models and their impact on healthcare innovation. The literature review and case studies analysis include a comprehensive analysis of existing scientific papers that examine theories, concepts, and empirical studies related to healthcare management, innovation, and the interplay of these elements. This study also analyses different business management models and their potential impact on innovation.

Structure and scope of the research

This master's thesis analyses the impact of different business management models in enhancing innovation in the healthcare sector. The structure of the study includes several key sections, starting with section one, a comprehensive literature review that provides the theoretical foundations and context for analysing the impact of business management models on healthcare innovation. This section explores conceptual foundations, the historical development of business

management models, business management models applied specifically in healthcare, and innovation in healthcare.

The second section outlines the methodological approach, including study design, eligibility criteria, information sources, search terms, study selection, data collection and synthesis, and ethical considerations.

The third section presents the analysis and research results, using case studies and a comparative analysis to assess the impact of different business management models (Lean, Agile, Total Quality Management (TQM) and Six Sigma) on healthcare innovation. The study aims to systematically analyse and compare these models, determine which business management model has the most advantages in healthcare innovation, and create a conceptual framework summarizing their advantages in promoting innovation capacity.

The thesis concludes with conclusions and recommendations that summarize the findings and provide insights. The research design of the study combines a systematic literature review and case studies analysis to provide a comprehensive overview and ensure a nuanced understanding of the impact of business management models on healthcare innovation.

The master`s thesis consists of 86 pages, 4 tables, 7 figures and 260 literature sources.

Hypothesis 1:

H0: There are no distinct advantages and limitations in terms of the impact of different business management models (Lean, TQM, Six Sigma, Agile) on healthcare innovation.

H1: Each business management model (Lean, TQM, Six Sigma, Agile) has unique advantages and limitations in terms of its impact on healthcare innovation, requiring a tailored approach based on contextual factors.

Hypothesis 2:

H0: The choice of business management model does not affect operational excellence, innovation, patient outcomes and quality of care in healthcare organizations.

H1: The choice of the right business management model tailored to the specific needs and challenges of each healthcare organization has a positive impact on operational excellence, innovation, patient outcomes and quality of care.

Research limitations

With a clearly defined structure and scope, the research project aims to analyse the impact of different business management models in enhancing innovation in the healthcare sector. However, some limitations may arise due to incomplete data availability, generalizability of case studies and the changing needs and challenges of healthcare organizations.

To summarize, this study aims to explore the complex dynamics of business management

models and healthcare innovation. By analysing its implications, this study contributes to the ongoing discourse on improving healthcare systems worldwide. Ultimately, the aim is to improve patient care and healthcare delivery through innovation.

Scientific and practical benefits

This master's thesis lays the theoretical foundations, from the historical development of business management models in healthcare and their application in this sector to the creation of a new conceptual framework to serve as a practical guide for the implementation of innovation in the dynamic healthcare industry. The results of the literature review and case studies analysis contribute to the scientific knowledge by evaluating the impact of different business management models, including Lean, TQM, Six Sigma, Agile on healthcare innovation, thus further contributing to the scientific knowledge on business management models in healthcare innovation. From a practical perspective, this master`s thesis offers valuable insights for healthcare organizations seeking to improve their innovation capacity. The recommendations offer practical solutions for healthcare organizations seeking to foster innovation and guide them in optimizing organizational capabilities for innovation in the healthcare sector to improve overall effectiveness.

Practical applicability and reliability

The study recognizes the advantages and limitations of Lean, TQM, Six Sigma and Agile business management models. It suggests that a customized approach can help healthcare organizations improve their performance, drive innovation and ultimately improve patient outcomes. To practically implement this, the thesis recommends using the IHIM framework, which provides a tangible roadmap for healthcare organizations looking to seamlessly integrate innovation into patient care. It provides a comprehensive system to optimize innovation processes, emphasizing patient-centred care, adaptive leadership and continuous learning. IHIM's structured approach also aligns with healthcare management and leadership training programs, contributing to the development of effective leaders. In addition, the adaptability of IHIM allows it to be integrated into public health initiatives, healthcare technology implementations and global health organizations. Consulting firms, medical education programs and start-ups can also use IHIM to lead innovation efforts and ensure a patient-centred and effective approach. Furthermore, IHIM can be applied in quality improvement initiatives, providing a systematic method for enhancing processes and overall healthcare quality. Ultimately, IHIM provides a versatile and holistic framework that can be used in a variety of healthcare settings.

To summarize, the master's thesis is a reliable and practically applicable resource for healthcare organizations seeking to optimize their innovation processes. The combination of evidence-based analysis, contextual understanding, and actionable recommendations ensures the relevance and reliability of this thesis in the ever-evolving landscape of healthcare management.

1. THE THEORETICAL FOUNDATIONS AND CONTEXT FOR ANALYSING THE IMPACT OF BUSINESS MANAGEMENT MODELS ON HEALTHCARE INNOVATION

1.1. Conceptual Foundations and Theoretical Frameworks

This section aims to provide a solid foundation for understanding the impact of different business management models on healthcare innovation and begins by defining key terms that are essential for this discussion. It also examines the functions of healthcare management, including the organizational functions of healthcare institutions, definitions of the business management model, healthcare, healthcare management and innovation, emphasizing the transformative nature of novel ideas and their impact on the healthcare industry. In addition, structural frameworks used to guide business management models and their impact on healthcare innovation are highlighted. This framework helps to comprehensively assess the impact of different business management models on healthcare innovation. It bridges the gap between theoretical understanding and practical application, enabling a better understanding of the critical challenges in healthcare innovation. By providing empirical evidence, this foundation contributes to the advances of knowledge about healthcare innovation and supports the development of effective healthcare management strategies.

1.1.1. Key Concepts and Terms

This subsection establishes definitions crucial to assessing the impact of different business management models on healthcare innovation. After clarifying these fundamental concepts, the subsection aims to provide a comprehensive understanding necessary for evaluating the impact of different business management models on the effective implementation of innovation in healthcare. Additionally, by understanding the specific challenges, goals, and nuances of healthcare, this thesis can better explore how different business management models contribute to or hinder innovation in this unique context.

A solid conceptual foundation and a robust theoretical framework are essential to understand the impact of business management models on healthcare innovation (Fox, Gardner and Osborne, 2014). In the context of this thesis, a *business management model* is defined as a concept, theory or methodology that analyses different approaches to organizational change in the business industry. As pointed out by Stoumpos et al. (2023), the healthcare sector is characterised by complexities and strict regulations that need to be well understood in order to accurately analyse the impact of different management approaches on innovation (Stoumpos *et al.*, 2023). The term *healthcare* refers to the systematic management of services, facilities, professionals and resources that contribute to maintaining, restoring and promoting the health of individuals and communities. It includes a wide range of activities for the prevention, diagnosis and treatment of illnesses and injuries provided by

doctors, nurses and other healthcare professionals, as well as preventive measures, health education and the coordination of various health-related activities. The goals of healthcare are to improve overall well-being, prevent diseases and ensure timely and effective treatment of health problems arise (WHO, 2018). Access to healthcare, quality of services, and the efficiency of healthcare delivery are key factors in assessing the impact of the healthcare system (Arah *et al.*, 2003).

Healthcare is an ever-evolving field and advanced technologies play a critical role in this transformation (Kraus *et al.*, 2021). Stoumpos et al. (2023) argue that healthcare systems must be able to adapt, evolve, and promote innovative solutions to address the complex challenges of the healthcare landscape (Stoumpos *et al.*, 2023). Healthcare innovation involves the development and implementation of novel solutions, technologies, and processes aimed at improving patient outcomes, increasing efficiency, and advancing the overall quality of healthcare delivery (Awad *et al.*, 2021). These innovations often use cutting-edge technologies, such as e-monitoring systems, telemedicine, artificial intelligence (AI) and digital health platforms. For example, e-monitoring systems, enable remote monitoring of patient vital signs and health metrics, improving real-time monitoring and facilitating proactive interventions (Khalil and Mahmoud, 2023). Telemedicine uses communication technologies to provide medical consultations and services remotely, improving accessibility and removing barriers to healthcare (Haleem *et al.*, 2021). AI plays a role in diagnostics, treatment planning and predictive analytics, offering personalized and effective healthcare solutions (Al Kuwaiti *et al.*, 2023). Digital health platforms integrate data, analytics and connectivity to optimize healthcare and empower people to actively manage their health (Awad *et al.*, 2021). Healthcare innovation collectively aims to improve efficiency, accessibility and patient outcomes while addressing the evolving challenges and complexities of healthcare (Lee and Yoon, 2021).

This thesis specifically explores the intersection of healthcare and business management models and seeks to understand how different approaches to organizational structure, leadership, and strategic planning influence innovation in the healthcare sector. In the context of this thesis, *healthcare management* includes the supervisory functions of a healthcare organization (Thompson, Buchbinder and Shanks, 2012). According to Faiz and Mahmoudi (2017), the responsibilities of healthcare managers include leading and managing healthcare organizations (e.g. hospitals or other healthcare institutions) to ensure the best possible delivery of available healthcare services (Faiz and Mahmoudi, 2017). In other words, healthcare management refers to "the management of hospitals, hospital networks, and/or healthcare systems, at the different levels of organization and planning of clinical activities and support processes". Healthcare management, also known as medical and health services or health administration, ensures that results are achieved, that the various parts of an organization function properly, that tasks are properly defined, and that they are evaluated so that resources are used effectively (Fotiadis, 2016).

Definitions of *innovation* also need to be established to ensure that similar data is collected on different elements of interest. Dziallas and Blind (2019) define innovation as "a term referring to

both innovative ideas that are intended to be commercialized in the market and ideas that have already been successfully commercialized" (Dziallas and Blind, 2019). Unlike invention, it can be as simple as implementing a new or significantly improved product, process or service (OECD, 2005). In the healthcare sector in particular, innovation enables the treatment of previously incurable diseases and the optimization of the use of limited resources. However, as a result, existing healthcare technologies become obsolete, requiring specialists to acquire new expertise and demanding high levels of investment (Flessa and Huebner, 2021).

To manage the administrative and strategic decision-making processes of healthcare organizations, different structured frameworks, methods, or approaches are used to guide business management models (Harrison et al., 2021). These models encompass a wide range of methodologies, including but not limited to Lean, Agile, Six Sigma, and TQM (Krohwinkel et al., 2021). The influence of different business management models on healthcare innovation is considered as an influencing factor for this thesis. This applies to healthcare system dynamics, patient outcomes, operational efficiency and the broader healthcare environment due to the implementation of different business management models.

A comprehensive understanding of key concepts and terms is crucial to understanding how business models and innovation interact in healthcare management. This knowledge provides a clearer understanding of the roles and responsibilities of healthcare managers and the potential of innovation to transform the field. Various frameworks and business models, including Lean, Agile, Six Sigma, and TQM help measure their impact on healthcare innovation. The aim is to bridge the gap between theory and practice by addressing the critical challenges of healthcare innovation by evaluating the impact of different business management models.

1.1.2. Theoretical Frameworks Shaping Healthcare Innovation

Examining the foundations of healthcare innovation, this subsection explores critical theoretical frameworks that have a significant impact on innovation in the healthcare sector. As the study aims to identify the business management model that has the most advantages in healthcare innovation, these frameworks serve as essential pillars and offer a conceptual foundation. They not only define the landscape for understanding the dynamics of innovation in healthcare organizations, but also analyse the impact, organizational adaptability and complexity of different business management models in enhancing innovation in the healthcare sector.

Theoretical frameworks play an important role in shaping the path of innovation in healthcare organizations as the healthcare system continues to evolve. These frameworks, including the Resource Dependence Theory, Institutional Theory, Diffusion of Innovations Theory and the Dynamic Capabilities Framework, provide the necessary conceptual foundation for understanding the dynamics of innovation implementation, the influence of business management models, organizational adaptation (Flessa and Huebner, 2021). They can also help understand the

complexities of interactions between healthcare organizations and their external environment, as well as how business management models interact with resource constraints, institutional rules or innovative practices (Jacob, Sanchez-Vazquez and Ivory, 2020). Finally, these frameworks provide valuable insights into the complexities of healthcare innovation, ultimately leading organizations to greater effectiveness and efficiency in healthcare, even as they face dynamic and evolving challenges, and serve as a platform for medical leaders, researchers, and practitioners (Hollick et al., 2019).

Resource Dependence Theory

The Resource Dependence Theory illustrates the importance of the internal and external environment for organizations as it can bring both opportunities and threats (Dixit and Sambasivan, 2020). Ansmann et al. (2021) emphasize the interdependence of healthcare organizations and their external environment through this theory, which also highlights the function of business management models in controlling resource dependencies for innovation. From a healthcare perspective, healthcare organizations focus their organizational strategies to obtain more resources when they perceive the environment to be uncertain (Ansmann *et al.*, 2021). For example, Fareed and Mick (2011) applied Resource Dependence Theory to formulate the hypothesis that hospitals with greater interdependence in resource-rich environments are more likely to adopt patient safety innovations than hospitals with less interdependence and fewer resources (Fareed and Mick, 2011).

The Resource Dependence Theory has been used by nursing homes for TQM (Weech-Maldonado, Zinn and Hamilton, 2001); the impact of regulation on hospitals (Cook *et al.*, 1983); analysis of the external environment and its relationship with contract management (Alexander and Morrisey, 1989); and electronic records initiatives (Kazley and Ozcan, 2007). Due to ongoing changes in healthcare, resource dependence and resource constraints are expected to become important subjects for healthcare research (Bloom, 2010).

Institutional Theory

The Institutional Theory emerged in the 1970s as a unique framework to explain the adoption and diffusion of formal organizational structures, including written policies, standard practices and new forms of organization (David, Tolbert and Boghossian, 2019). Its origins can be traced back to the work of John Meyer and Richard Scott, who set out to provide theoretical insights into a range of empirical findings in education and healthcare (Aksom and Vakulenko, 2023). The Institutional Theory examines how healthcare organizations comply with and are influenced by institutional pressures. According to Burnett et al. (2016), it reveals how business management models can be influenced by institutional norms and how these affect the adoption of innovations (Burnett *et al.*, 2016). Aksom and Vakulenko (2023) find that even after four decades, the relevance of this theory remains evident as it remains theoretically robust to be applied in the field of public sector organizations (Aksom and Vakulenko, 2023) and is still widely used to explain the adoption and

diffusion of formal organizational structures, including standard operating procedures, written policies and new organizational forms (David, Tolbert and Boghossian, 2019).

Diffusion of Innovations Theory

Diffusion of Innovations Theory provides insight into the adoption process of new ideas, technologies and innovations, particularly the impact of business management models on the dissemination of innovative practices in healthcare organizations (Dearing and Cox, 2018). According to this theory, adapters are grouped according to their willingness to embrace innovation and the characteristics of each adopter along a spectrum, ranging from innovators, early adopters, early and late majority, to laggards (Rogers *et al.*, 2014). It identifies key factors driving innovation adoption, such as the characteristics of the innovation itself, the communication channels used, the social systems in place, and the perceived benefits or barriers to adoption (Putteeraj *et al.*, 2022). According to Sanchez (2017), innovations that require complex implementation often include strategies such as opening branch offices, licensing subsidiaries as franchises, or partnering with distribution networks, similar to how healthcare providers expand their clinics or distribution networks to help expand healthcare initiatives (Sanchez, 2017). Diffusion of Innovation theory offers a range of concepts and approaches that can explain the receptivity of individuals and organizations to healthcare policies and practices. It could also be used to accelerate the adoption of advances in healthcare and broaden its scope (Dearing and Cox, 2018).

Dynamic Capabilities Framework

In the context of technological advances and market shifts, organizations need to demonstrate a rapid responsiveness, adaptability, and innovation capacity to undertake transformative processes of self-renewal and development (Teece, 2023). According to Fareed and Mick (2011), the specific capabilities that enable organizations to adapt and maintain a competitive advantage in a rapidly evolving environment are dynamic capabilities that are critical to long-term organizational success (Fareed and Mick, 2011). Loureiro, Ferreira and Simões (2021) argue that the Dynamic Capability Framework emphasizes the potential of business management models to support an organization's ability to adapt to changing circumstances and engage in healthcare innovation by integrating knowledge and reconfiguring its recourses and capabilities to take advantage of new opportunities and address emerging threats (Loureiro, Ferreira and Simões, 2021). According to Tecce (2023), this framework is based on the principle of being sufficiently general, making it easily applicable to a wide range of organizational settings. In the field of healthcare innovation, the Dynamic Capability Framework includes a set of fundamental principles that both practitioners and researchers can apply to effectively address specific circumstances (Teece, 2023). This framework emphasizes the importance for managers to develop an entrepreneurial mindset to have strong dynamic capabilities (Teece, 2023). This means that managers must play a role in developing and testing hypotheses about

emerging technologies and market trends, as well as business management models and directing the necessary resources into and out of the organization (Teece, 2023). In conclusion, Loureiro, Ferreira and Simões (2021) make a profound observation: dynamic capabilities play a critical role in assessing an organization's adaptability and ability to cope with rapidly changing health environments (Loureiro, Ferreira and Simões, 2021).

To summarize, academic contributions and empirical research have demonstrated that Resource Dependence Theory, Institutional Theory, Diffusion of Innovations Theory, and the Dynamic Capabilities Framework can help healthcare organizations navigate the complex and dynamic landscape of innovation. These theoretical frameworks provide practical relevance by addressing the complexities of resource dependencies, institutional pressures, adoption processes, and adaptation. By understanding these theories, healthcare managers, researchers, and practitioners can develop strategies to promote effective and efficient healthcare innovation and identify possible ways to address the dynamic challenges in the healthcare sector.

1.1.3. The Importance of Innovation in Healthcare

The healthcare industry has undergone major changes in recent years, driven by technological advances, changing patient needs and increasing demand for more efficient and effective healthcare services. According to Senbekov et al. (2020), this transformation emphasized the critical role that innovation in shaping the future of healthcare (Senbekov *et al.*, 2020). Botti and Monda (2020) note that as healthcare becomes more complex, the need for innovative solutions becomes more important, creating a mutually beneficial relationship between business management models and healthcare innovation (Botti and Monda, 2020).

Firstly, innovation in healthcare is critical as it can improve patient outcomes and quality of care. Advances in medical technology, pharmaceuticals and treatment modalities enable healthcare providers to offer more accurate diagnoses, personalized treatment plans and improved therapeutic interventions (Awad *et al.*, 2021; Liefaard *et al.*, 2021). Stasevych and Zvarych (2023) believe that this in turn leads to better patient experience, shorter recovery times and better overall well-being (Stasevych and Zvarych, 2023).

In addition, innovation in healthcare is an essential part of cost containment and resource optimization (Gentili *et al.*, 2022). Patil and Shankar (2023) state that by implementing cutting-edge technologies, optimized processes and novel business management models, healthcare organizations can increase their operational efficiency, reduce unnecessary costs and allocate resources more wisely (Patil and Shankar, 2023). This not only ensures financial sustainability, but also improves access to healthcare services, especially in underserved or remote areas (Chow *et al.*, 2023; Lawrence, Agnishwar and Vijayakumar, 2023).

Furthermore, effective management practices are the catalysts turning innovative ideas into tangible results, as noted by Rygh and Clatworthy (2019) (Rygh and Clatworthy, 2019). According

to Srisathan, Ketkaew and Naruetharadhol (2020), robust business management models provide the framework for fostering a culture of innovation in healthcare organizations (Srisathan, Ketkaew and Naruetharadhol, 2020). Schiavone et al. (2021) suggest that they facilitate strategic planning, resource allocation and risk management, creating an environment conducive to experimentation and the implementation of new solutions (Schiavone *et al.*, 2021).

In addition, the integration of innovative technologies and methodologies into healthcare systems can help overcome long-term challenges such as interoperability, data security and information sharing (Taherdoost, 2023). Academics claim that the introduction of electronic health records, telemedicine and data analytics not only improves the efficiency of healthcare delivery, but also improves the ability to use valuable insights to make evidence-based decisions (Weerasinghe *et al.*, 2022; Patil and Shankar, 2023).

To summarize, healthcare innovation is a critical factor in the context of the impact of business management models. By understanding the symbiotic nature of these two elements, we can identify how effective management practices not only support but also drive innovation in healthcare. This interaction is the key to a future where healthcare is accessible, efficient and at the forefront of technological and organizational advances, ultimately benefiting both healthcare providers and patients.

1.2. Historical Development of Business Management Models

This section aims to provide a comprehensive overview of the evolution of business management models, exploring their impact on the implementation of innovation processes in the healthcare sector. Based on a historical context, this study assesses how different business management models have overcome the challenges and provides insights into their application in the healthcare industry. Evaluating the historical development of these models not only reveals their origins, but also demonstrates their adaptability and potential to address fundamental challenges of healthcare innovation by combining scientific knowledge with practical implementation to meet the evolving needs of the sector.

The historical development of business management models has gone through different stages, reflecting the changing demands and challenges faced by organizations (Lloyd and Aho, 2020). It began with traditional hierarchical structures that provided stability and predictability in organizational processes (Leal-Rodríguez *et al.*, 2023). Merkle (2023) finds that the development of business management theory led to more structured and systematic approaches, such as Taylor's scientific management, which encouraged the use of scientific methods to analyse work and identify ways in which production tasks could be performed more effectively (Merkle, 2023). However, not everyone believed that scientific management was the best solution to all business problems. This gave rise to Fayol's principles of management, which offer stability and predictability but are often criticized for their lack of adaptability and innovation (Hatchuel and Segrestin, 2019). Many of the

ideas of these early models influenced the development of the human relations approaches to group dynamics, leadership and work attitudes. While critics argued that scientific management focused too much on economic and formal aspects, the human relations approach was criticized for ignoring the rational worker aspect and organizational characteristics. However, Okolie and Oyise, (2021) claim that the human relations approach had a significant impact on the development of business management, encouraging managers and researchers to consider psychological and social factors that influence performance (Okolie and Oyise, 2021). This eventually led to the emergence of quality management models such as TQM, which is based on maintaining existing quality standards, and Six Sigma, which aim to make small fundamental changes to processes and systems to achieve better quality (Saxena and Rao, 2019).

The changing needs of organizations and market dynamics have recently influenced the development of business management models, each period reflecting current principles and practices aimed at improving operational efficiency and effectiveness (Errida and Lotfi, 2021). The healthcare sector worldwide faces growing external pressure to increase efficiency and reduce costs while providing the same or better quality of care (Kunnen, Roemeling and Smailhodzic, 2023). According to Lloyd and Aho (2020), this demand, driven by the need to increase productivity and efficiency due to technological progress, led to a growing interest in optimizing work practices, which ultimately led to the development of new business management models (Lloyd and Aho, 2020). As a result, contemporary business management models such as Lean, Agile, Six Sigma, and TQM have gained prominence, emphasizing flexibility, adaptability, and customer-centricity (Lalmi, Fernandes and Boudemagh, 2022).

The historical exploration of business management models shows how these models have evolved to meet the ever-changing demands placed on organizations, providing valuable insights into their potential application in the healthcare sector. By analysing the evolution from traditional hierarchical structures to modern ones, this study reveals the lessons learned from each phase. Scientific management`s emphasis on efficiency, focusing on human relations, laid the foundation for quality-orientated models. These models, such as TQM and Six Sigma, helped improve quality improvement processes. Moreover, the contemporary shift towards Lean, Agile, Six Sigma and TQM reflects a response to the healthcare sector's need to increase efficiency without compromising quality and recognizes the changing landscape of the industry. By acknowledging these historical milestones, this study provides a foundation for the crucial evaluation of different business management models in healthcare innovation. It recognizes the importance of adaptable, patient-centred, and effective models and provides a framework to address the pressing challenges of healthcare innovation by understanding operational effectiveness.

1.3. Business Management Models in Healthcare

This section aims to identify the business management model that has the most advantages in healthcare innovation. By analysing the strengths and weaknesses of each business management model, the gap between theoretical understanding and practical application in the healthcare sector can be bridged. It will ultimately enable healthcare organizations to make informed decisions and optimize their processes for the benefit of patients, employees, and stakeholders.

In a complex healthcare environment, it is very important to understand the applicability of different business management models and to select the most appropriate methods to optimize patient care, improve quality, and achieve efficiency (Elton and O'Riordan, 2016). Alloubani et al. (2019) find that in an increasingly diverse healthcare environment, healthcare organizations face unique challenges in addition to the need to deliver quality care and optimize operational performance (Alloubani *et al.*, 2019). Each business management model offers different strategies and approaches to address specific aspects of healthcare management. Knowledge of their applicability and effectiveness provides healthcare managers and professionals with a solid basis to making informed decisions about the selection and implementation of these models (Kakemam *et al.*, 2020). According to Bhati, Deogade and Kanyal (2023), adapting a specific business management model to the needs and goals of a healthcare organization creates an opportunity to improve the quality of patient care, use limited resources more efficiently, and simplify processes with the overall goal of quality healthcare at a reasonable cost (Bhati, Deogade and Kanyal, 2023).

1.3.1. Lean Management: Streamlining Efficiency

Lean management has become an important paradigm in healthcare management, especially as organizations seek to improve quality, flexibility, and delivery while reducing costs in an ever-changing landscape of organizational management (Prado-Prado *et al.*, 2020). Sinha and Matharu (2019) assert that at a time when healthcare organizations are facing challenges from competition, market dynamics and an increasingly institutional environment, Lean management is gaining prominence (Sinha and Matharu, 2019). In order to provide a clearer picture of its complex impact on the healthcare sector, this subsection discusses the characteristics, key components, advantages and limitations of Lean management.

Organizations today are constantly looking for solutions to overcome the challenges of competition, the market, and institutional environment in which they exist to rise in the dynamic market scenario (Sinha and Matharu, 2019). Lean production has become one of the most important paradigms of Operations Management pursued by organizations with the simple goal of improving quality, flexibility and delivery while reducing costs (Krafcik, 1988; Slack, Lewis and Bates, 2004; Pilkington and Fitzgerald, 2006; Hasle, Bojesen, Langaa-Jensen & Bramming, 2012; Jasti and Kodali, 2014). There are many ways to define Lean management, that emphasize different aspects of it. The key aspects of the definition noted by the authors are presented in Table 1.

Table 1

Lean manufacturing definitions: key aspects

Author	Lean manufacturing definition
Krafcik (1988)	Using less organizational resources as compared to resources deployed in mass production.
Womack, Jones and Roos (1990)	Fusion of mass and craft production consisting of a set of principles and best practices aiming at continuous improvement.
Shah and Ward (2003)	Lean is an integrated system consisting of interrelated elements and management practices aimed at delivering value to customers.
Shah and Ward (2007)	Lean production is defined as a socio-technical system with a focus on the elimination of waste throughout the organization as well as its supply chain network.

Source: Sinha and Matharu, 2019.

Characteristics and Key Components

Lean management is characterised by its focus on eliminating waste, streamlining processes, and improving the flow of work within an organization (Detyna, Detyna, 2022). These characteristics create a framework that helps organizations achieve operational excellence, increase customer satisfaction, and improve adaptability in a rapidly changing business environment (Usmani, Sami, Baig, Irfan, 2019). Key components include defining customers and determining their value, mapping value streams, enhancing workflow, meeting customer and stakeholder needs of, and maintaining an ongoing commitment to continuous improvement and development (Detyna, Detyna, 2022). Lean methodologies such as value stream mapping, 5S (Sort, Set in order, Shine, Standardise, Sustain), and Kaizen (continuous improvement) form the backbone of Lean management (Tiwari and Sharma, 2022). Alrashed (2020) states that the key principle is to identify and eliminate non-value-added activities to ensure that every aspect of healthcare contributes to improved patient outcomes (Alrashed, 2020).

Advantages and Limitations

The ability to improve operational efficiency is one of the main benefits of Lean management in healthcare (Prado-Prado *et al.*, 2020). By optimizing processes, eliminating unnecessary steps and reducing waste, healthcare organizations can achieve more with the same resources (Breen, Trepp and Gavin, 2020). Prado-Prado et al. (2020) state that Lean management focuses on continuous process improvement by eliminating non-value-added activities and aiming to create more value for patients with fewer resources, thereby improving efficiency, quality and overall customer satisfaction in healthcare (Prado-Prado *et al.*, 2020).

Moreover, Lean management in healthcare is closely linked to cost reduction efforts (Ramori *et al.*, 2021). According to Speer et al. (2020), by identifying and eliminating waste, healthcare organizations can avoid unnecessary costs, allocate resources more efficiently and create value for patients (Speer *et al.*, 2020). Coslett (2022) points out that Lean principles, such as Just-In-Time inventory control, emphasize the importance of maintaining minimal inventory to meet the requirements of healthcare processes (Coslett, 2022).

Commitment to quality is another essential element of Lean management in healthcare, as emphasized by Prado-Prado (2020) (Prado-Prado *et al.*, 2020). Trubetskaya, Manto, and McDermott (2022) highlights that continuous process improvement and error reduction enable healthcare organizations to provide higher quality services and ultimately improve patient outcomes (Trubetskaya, Manto and McDermott, 2022).

In addition, some researchers have described Lean management in healthcare as inherently patient-centred (Kressmann, Aldorf and Rüther-Wolf, 2019). Rodríguez Estrada (2022) states that it encourages healthcare organizations to align their processes with the needs and preferences of patients (Rodríguez Estrada, 2022). By reducing turnaround times, improving responsiveness, and optimizing processes, Lean management in healthcare enables organizations to meet patient needs more effectively, resulting in higher patient satisfaction and loyalty (Protzman *et al*., 2010).

While the benefits of Lean management in healthcare are numerous, healthcare organizations must also acknowledge and address its limitations. Cultural resistance, as noted by Tran, Pham, and Bui (2020), poses a significant challenge in healthcare, as employees accustomed to traditional work methods may resist adopting Lean principles (Tran, Pham and Bui, 2020; Allaoui and Benmoussa, 2020). According to Allaoui and Benmoussa (2020), resistance from employees who are used to traditional working methods can make it difficult for healthcare organizations to shift their mindsets and practices towards Lean principles (Allaoui and Benmoussa, 2020). Therefore, effective change management and continuous communication are emphasized as key strategies to overcome these barriers in healthcare (Tran, Pham, and Bui, 2020).

Implementing Lean management in healthcare requires specific resources, including training, time and expertise (Udod *et al.*, 2020). However, Alkhoraif, Rashid and McLaughlin (2019) note that investing in Lean initiatives can be particularly challenging for smaller organizations with limited resources (Alkhoraif, Rashid and McLaughlin, 2019). Furthermore, Tiso, Pozzan and Verbano (2022) claim that Lean practices can impose a significant burden on frontline healthcare workers who are required to perform improvement activities alongside their regular duties (Tiso, Pozzan and Verbano, 2022)

In certain cases, Lean management's focus on cost reduction can lead to an overemphasis on short-term financial gains rather than fundamental systemic change (Dombrowski and Mielke, 2014). As a result, members of healthcare organizations may not focus on Lean capability development, hindering long-term strategic initiatives and investments in R&D (Jørgensen *et al.*, 2007). The

balance between cost reduction and quality assurance is crucial for healthcare organizations to fully realize the benefits of Lean management (Ramori *et al.*, 2021).

In summary, Lean management offers significant advantages in terms of efficiency (Breen, Trepp and Gavin, 2020; Prado-Prado *et al.*, 2020), cost savings (Speer *et al.*, 2020; Ramori *et al.*, 2021; Coslett, 2022), service quality (Prado-Prado *et al.*, 2020; Trubetskaya, Manto and McDermott, 2022), and patient satisfaction (Protzman *et al*., 2010; Kressmann, Aldorf and Rüther-Wolf, 2019; Rodríguez Estrada, 2022). However, healthcare organizations must be aware of its limitations, such as cultural resistance (Tran, Pham and Bui, 2020; Allaoui and Benmoussa, 2020), resource intensity (Tiso, Pozzan and Verbano, 2022; Alkhoraif, Rashid and McLaughlin, 2019) and the risk of overemphasis on cost reduction (Jørgensen *et al.*, 2007; Dombrowski and Mielke, 2014; Ramori *et al.*, 2021) to ensure successful implementation and sustainable benefits. By understanding these advantages and limitations, organizations can make informed decisions about whether to implement Lean management and how to do so effectively.

1.3.2. Total Quality Management: Commitment to Quality

This part of the thesis delves into the comprehensive TQM framework – a strategic approach focused on continuous improvement and quality assurance in organizations. Understanding TQM is essential to assess its impact on the efficient implementation of innovation processes in healthcare. This subsection examines the purpose, characteristics, advantages, limitations of TQM and its role in fostering a culture of continuous improvement and customer satisfaction. In addition, it highlights the challenges and considerations that are necessary for the successful implementation of TQM and paves the way for a customized and effective implementation of the strategy in the healthcare sector.

TQM is a management strategy that emphasizes a “continuous, organization-wide effort to maintain quality customer service and satisfaction” (Helmold, 2023). According to Turner et al. (2020), it refers to ongoing activities that cover, record, inspect, organize, and control all areas of the organization and help establish and maintain control as a system objective (Turner *et al*., 2020). TQM represents a holistic approach that goes beyond mere quality control and encompasses all aspects of an organization`s processes (Liu *et al.*, 2023). Liu et al. (2023) argue that it has emerged as a comprehensive and universal approach to achieving organizational excellence (Liu *et al.*, 2023). This concept was introduced in the second half of the 20th century and has since become central to for organizations seeking to improve their products, services and overall performance (Luthra *et al.*, 2020).

Figure 1

TQM characteristics

Source: Helmold, 2023.

Characteristics and Key Components

TQM is the practice of promoting and ensuring the safety and quality of services by involving all relevant stakeholders in service improvement (Helmold, 2023). This holistic approach aims to improve not only the final product or service, but also the entire process that leads to its creation (Aquilani, Silvestri and Ruggieri, 2016), and TQM is only "total" if everyone is on the agenda of the executive board (Helmold, 2023). According to Ahmad et al. (2022), the success of TQM implementation depends on its seamless integration into an organizational culture and work processes (Ahmad *et al.*, 2022), which means that TQM principles often require a mindset shift, where quality is not seen as the responsibility of a single department, but as a shared commitment of all members of the organization (Al-Saffar and Obeidat, 2020).

Helmold (2023) claims that risk analysis, which considers the pros and cons of any decision and the potential costs (financial or otherwise), is the cornerstone of quality and good decision-making (Helmold, 2023). According to Ghodke (2023), the components of TQM refer to a wide range of interrelated concepts such as customer focus, process improvement, data-driven decision-making and employee empowerment (Ghodke, 2021). These components provide organizations with a strategic framework to systematically identify and address quality issues, reduce defects, and gain a competitive advantage in the marketplace (Daru, 2016).

Advantages and Limitations

TQM is a process-based management approach that focuses on the continuous improvement of service quality (Helmold, 2023). In the field of healthcare, ensuring exceptional quality is critical to the survival and competitiveness of an organization. Providing outstanding quality not only increases patient satisfaction but also enhances the overall productivity of healthcare organizations (Aburayya *et al.*, 2020). Many new approaches related to quality and performance improvement appear to represent different theories (Turner *et al.*, 2020). However, compared to other business management models, TQM has a more holistic approach. According to the TQM philosophy, TQM does not focus on specific departments, but involves each department in the continuous improvement of the organization`s performance. Therefore, Helmold (2023) states that the more an organization improves processes in each department, the easier it is to deliver high-quality services to customers (Helmold, 2023).

In addition to improving the quality of healthcare (Turner *et al.*, 2020), TQM implementation helps significantly reduce costs by minimizing errors and rework, which leads to higher profitability (Rezahoseini *et al.*, 2019). Lee and Lee (2022) emphasize the importance of risk analysis and process accuracy, as it not only contributes to improving the quality of healthcare, but also to significant cost savings (Lee and Lee, 2022). By reducing errors, rework and inefficiencies, healthcare organizations can reduce costs, allocate resources more efficiently and improve overall operational efficiency (Zehir and Zehir, 2023)

In healthcare, TQM is defined as a work environment that empowers employees to increase their productivity, meet patient needs and expectations, and achieve the goals of the healthcare organization (Besterfield *et al.*, 2014). According to Helmold (2023), employee engagement is critical to the success of TQM, which requires appropriate training and resources. In order to be committed to achieving the objectives on time, they must be sufficiently qualified and trained and have the necessary resources to complete their tasks (Helmold, 2023). Al-Saffar and Obeidat (2020) state that TQM fosters a culture of continuous improvement and teamwork that supports employee engagement, job satisfaction and motivation (Al-Saffar and Obeidat, 2020). Actively involving employees in decision-making processes and quality improvement initiatives leads to higher retention, individual and team innovation, and creativity in problem-solving in the healthcare sector (Mahadevan, 2022).

Ultimately, the essence of TQM in healthcare lies in improved patient satisfaction, which translates into customer loyalty and long-term success for healthcare organizations (Nguyen and Nagase, 2019). Research shows that focusing on patient satisfaction contributes to increased revenue, market share and stronger customer loyalty, which in turn drives repeat business (Zaid *et al.*, 2020). Aburayya et al. (2020) argue that the foundation of TQM in healthcare is the creation of an organizational culture focused on providing services that meet the needs of patients. As a result, satisfied patients are more likely to become advocates for the healthcare organization, which

increases its competitiveness in the healthcare market (Aburayya *et al.*, 2020).

Although TQM is widely used and has proven its benefits, the application of TQM in healthcare is not without limitations. Al-Saffar and Obeidat (2020) state that in order to reap the benefits of TQM, a lot of resources, rewards and training are needed to improve employee performance (Al-Saffar and Obeidat, 2020). According to Lee and Lee (2022), successful implementation of TQM in healthcare requires a lot of time, resources for training and continuous process monitoring and improvement (Lee and Lee, 2022). Toke and Kalpande (2020) note that it can be a challenge, especially for smaller organizations, to allocate the necessary resources to successfully implement TQM, which can lead to financial burdens and disruptions in daily operations (Toke and Kalpande, 2020).

Employee resistance, according to Turner et al. (2020), is another limitation that requires careful management strategies to ensure a smooth transition to TQM principles (Turner *et al.*, 2020). Tenji and Foley (2019) note that the transition to a TQM approach often involves significant changes to organizational culture and work processes (Tenji and Foley, 2019). Employees may find it difficult to adapt, fearing that their role and job security may be threatened (Dilawo and Salimi, 2019). Toke and Kalpande (2020) claim that this resistance can hinder the successful implementation of TQM and requires careful management strategies to reduce employees' fears and ensure a smooth transition (Toke and Kalpande, 2020).

Finally, TQM often relies on performance metrics and key performance indicators (KPIs) to monitor and improve quality, but it is important to note that an overemphasizing these metrics can lead to unintended consequences (Helmold, 2023). This can undermine the core principles of TQM by encouraging a culture of data manipulation rather than genuine quality improvement. In addition, there should evidence that the results of TQM implementation are measurable and long-term, not just limited to organizational, economic or business results that are the result of past success (Arokiasamy and Krishnaswamy, 2021).

To summarize, the application TQM in healthcare provides a solid framework for improving patient satisfaction (Nguyen and Nagase, 2019; Aburayya *et al.*, 2020; Zaid *et al.*, 2020), increasing operational efficiency (Zehir and Zehir, 2023), promoting a culture of continuous improvement (Al-Saffar and Obeidat, 2020; Mahadevan, 2022) and encouraging employees to take ownership of quality-related issues and contribute to their job satisfaction and motivation (Besterfield *et al.*, 2014; Helmold, 2023). However, the successful implementation of TQM requires careful planning (Al-Saffar and Obeidat, 2020), allocation of resources (Toke and Kalpande, 2020; Lee and Lee, 2022) and well-managed cultural change (Dilawo and Salimi, 2019; Tenji and Foley, 2019) within the unique context of each healthcare organization. Employee resistance and unwillingness to adapt to TQM principles are also potential hurdles that require effective change management strategies (Toke and Kalpande, 2020; Turner *et al.*, 2020). In addition, an excessive focus on performance metrics and KPIs should be avoided, as this can lead to superficial improvements and neglect the underlying

principles of true quality improvement (Arokiasamy and Krishnaswamy, 2021; Helmold, 2023). Overcoming these limitations and adapting TQM principles to the unique context of healthcare organizations is critical to the long-term success of quality management in healthcare.

1.3.3. Six Sigma: Sustaining Operational Excellence

The subsection of this master's thesis on Six Sigma management presents a comprehensive methodology that has had significant impact on various industries, including healthcare, since the 1980s. While examining the characteristics and key components of Six Sigma, it also provides insight into Six Sigma principles and practices for achieving operational excellence. In addition, this subsection aims to contribute to help understand how this methodology can improve both the quality of healthcare delivery and the financial viability of healthcare organizations by examining the benefits and limitations of Six Sigma, focusing on its application in healthcare.

Originally developed by Motorola and adopted by large industrial companies such as General Electric, Six Sigma has become a widely accepted method for reducing errors, unpredictability and inefficiency in various areas (Madsen, 2022). According to Parra et al. (2023), Six Sigma supports data-driven decision making by integrating statistical tools, disciplined project management and a cultural commitment to continuous improvement (Parra *et al.*, 2023). In the context of constant market demand, Samanta et al., (2023) believe that it is essential for organizations to understand and implement Six Sigma to maintain their competitiveness and resilience in their pursuit of excellence (Samanta *et al.*, 2023). The term *Six Sigma*, as described by Arunesh Patel et al. (2020), refers to a level of quality that is close to perfection and has no more than 3.4 defective parts per million (Arunesh Patel *et al.*, 2020).

Characteristics and Key Components

The Six Sigma business management model is characterised by a set of key principles and practices aimed at process improvement and operational excellence in an organization (Al-Tarawneh, 2019). Clancy, O'Sullivan and Bruton (2021) argue that Six Sigma is essentially a data-driven methodology that aims to reduce process variability and errors in order to improve quality and customer satisfaction (Clancy, O'Sullivan and Bruton, 2021). Antony et al. (2003) make a profound observation: the foundational principle of Six Sigma is 'to take an organization to an improved level of sigma capability through the rigorous application of statistical tools and techniques' (Antony *et al.*, 2003). In addition, Dong (2019) identifies five key principles of Six Sigma:

1. Define: clearly define the problem, project goals, and customer requirements;
2. Measure: data collection and analysis to understand current process performance;
3. Analyse: identify root causes of defects or variations through data analysis;
4. Improve: implementation of solutions to eliminate identified root causes and improve process performance;

5. Control: establish control measures to support improvements and monitor ongoing performance (Dong, 2019).

Table 2 summarizes the Six Sigma strategies, tools, techniques and principles.

Anbari (2002) also points out that Six Sigma is more comprehensive than TQM. According to the author, the Six Sigma methodology includes measured and reported financial results, the use of other, more advanced data analysis tools that focus on customer concerns. He summarizes the Six Sigma management method as follows:

Six Sigma = TQM + Stronger Customer Focus + Additional Data Analysis Tools + Financial Results + Project Management (Anbari, 2002).

Table 2

Six Sigma strategies, principles, tools and techniques

Six Sigma business strategies and principles	Six Sigma tools and techniques
Project management Data-based decision making Knowledge discovery Process control planning Data collection tools and techniques Variability reduction Belt system (Master, Black, Green, Yellow) DMAIC process Change management tools	Statistical process control Process capability analysis Measurement system analysis Design of experiments Robust design Quality function deployment Failure mode and effects analysis Regression analysis Analysis of means and variances Hypothesis testing Root cause analysis Process mapping

Source: Antony *et al.*, 2003.

Advantages and Limitations

In the context of healthcare, Six Sigma management has several advantages. One of the main benefits, according to van Dalen et al. (2021), focuses on data-driven decision-making that allows healthcare professionals to base their strategies on concrete evidence to reduce variability and consequently improve patient safety (van Dalen *et al.*, 2021). Researchers say that this emphasis on statistical analysis helps identify areas for improvement and enhance patient care. Niñerola, Sánchez-Rebull and Hernández-Lara (2020) explain that by reducing errors and standardizing procedures, Six Sigma aims to improve the overall quality of healthcare (Niñerola, Sánchez-Rebull and Hernández-Lara, 2020).

Furthermore, like the business management models presented earlier, Six Sigma can also bring significant financial benefits to healthcare organizations by identifying and eliminating inefficiencies, reducing errors and optimizing resources (Cima *et al.*, 2011). Thus, the application of Six Sigma in healthcare helps to reduce the excessive use of resources, such as redundant tests and procedures, which directly leads to cost savings (Sommer and Blumenthal, 2019). In addition, Kumar

and Steinebach (2008) suggest that focusing on error prevention and reduction can minimize costs associated with medical errors, rework and patient complications (Kumar and Steinebach, 2008). According to Moore (2010), cost savings achieved through Six Sigma in healthcare not only improve the financial viability of healthcare organizations but also enable further investment in better patient care, ultimately creating a more sustainable and efficient healthcare system (Moore, 2010).

In addition, Six Sigma's focus on customer satisfaction aligns well with a patient-centred approach in healthcare (Hlongwane *et al.*, 2019). The methodology encourages healthcare providers to better understand and meet the needs of patients, resulting in a better patient experience. According to Hlongwane, Ngongoni and Grobbelaar (2019), this patient-centred focus can lead to better outcomes and greater trust between healthcare providers and their patients (Hlongwane *et al.*, 2019).

However, implementing Six Sigma management in healthcare can present particular challenges compared to similar industries due to the complexity of the healthcare environment (Dong, 2019). Jain, Sharma and Jamali (2023) believe that one notable shortcoming is the potential overemphasis on cost reduction, which may lead to a focus on efficiency at the expense of patient care (Jain, Sharma and Jamali, 2023). Toussaint and Berry (2013) state that, like Lean management, Six Sigma methodology focuses primarily on process efficiency and waste reduction (Toussaint and Berry, 2013). However, in healthcare, the emphasis on efficiency should be balanced with the need for quality, patient safety and clinical judgement (Jain, Sharma and Jamali, 2023). In addition, Sehwail and DeYong (2003) made the profound observation that the time and resources required to implement Six Sigma can be perceived as a barrier, especially in a fast-paced healthcare environment where immediate response is often critical (Sehwail and DeYong, 2003).

Furthermore, the hierarchical structure of some healthcare organizations can pose a challenge to the successful implementation of Six Sigma. Rich and Piercy (2013) note that in order to successfully implement Six Sigma, healthcare professionals must be integrated into the project, learn Six Sigma management theory, be able to apply it in healthcare settings, and collaborate with other healthcare professionals to achieve organizational change (Rich and Piercy, 2013). However, Dong (2010) believes that it is a challenge for all healthcare professionals to get involved in the project and find those who are willing to act as consultants and demonstrate the results that can save more time for patient care and other related benefits (Dong, 2019).

In summary, Six Sigma management provides a solid foundation for improving the quality and efficiency of healthcare through a data-driven, evidence-based approach to decision-making. Emphasis on statistical analysis and process improvement, as emphasized by van Dalen et al. (2021) and Niñerola, Sánchez-Rebull, and Hernández-Lara (2020), suggest tangible benefits, including improved patient safety and overall higher quality healthcare (Niñerola, Sánchez-Rebull and Hernández-Lara, 2020; van Dalen *et al.*, 2021). The financial benefits of reducing inefficiencies and errors highlight the potential of the methodology to improve the financial viability of healthcare organizations and invest in better patient care, as noted by Cima et al. (2011), Sommer and

Blumenthal (2019), Kumar and Steinebach (2008) and Moore (2010) (Kumar and Steinebach, 2008; Moore, 2010; Cima *et al.*, 2011; Sommer and Blumenthal, 2019). Ultimately, these advantages and the overall Six Sigma methodology lead to higher customer satisfaction, which contributes to better outcomes and greater trust between healthcare providers and their patients (Hlongwane *et al.*, 2019).

However, the challenges in healthcare, such as the complexity of the healthcare environment (Rich and Piercy, 2013), the risk of overemphasizing cost reduction (Jain, Sharma and Jamali, 2023) and resistance to change (Dong, 2019), require a careful and balanced implementation of Six Sigma. The hierarchical structure of healthcare, as highlighted by Dong (2019), requires a tailored approach that engages healthcare professionals and recognizes the unique challenges of the industry (Dong, 2019). Although Six Sigma's emphasis on efficiency is consistent with a patient-centred approach, as discussed by Hlongwane, Ngongoni, and Grobbelaar (2019), its successful application in healthcare requires a nuanced understanding of the delicate balance between efficiency, quality and human elements that are critical to patient care (Hlongwane *et al.*, 2019). By addressing these challenges, healthcare organizations can reap the benefits of Six Sigma while ensuring a sustainable and patient-centred healthcare system.

1.3.4. Agile Management: Adaptability and Collaboration

As the thesis focuses on evaluating different business management models for the implementation of innovation processes in healthcare, this subsection specifically addresses the importance of Agile methodologies. The aim is to explore how agility bridges the gap between theoretical scientific understanding and practical implementation to ultimately address the fundamental challenges of healthcare innovation. In this regard, this subsection discusses the characteristics, key components, advantages and limitations of Agile methodologies, emphasizing how its iterative, customer-centric, and collaborative nature meets the innovation needs of the healthcare sector. By examining the adaptability and collaborative nature of Agile management, this subsection aims to provide insights into its practical application in the healthcare sector, facilitating an informed comparison with other business management models to assess their impact on healthcare innovation.

In today's fast-paced and constantly evolving environment, organizations need to be more adaptable, innovative, and responsive (Holbeche, 2019). While traditional business management models were once reliable and predictable, they are now being overtaken by rapid changes in technology, consumer behaviour and global market dynamics (Clauss *et al.*, 2021; Rajagopal, 2022). According to Attar and Abdul-Kareem (2020), the Agile business management model is the solution. It is a dynamic and flexible approach that redefines the way organizations navigate the complexities of today`s marketplace (Attar and Abdul-Kareem, 2020).

The Agile business management model breaks away from the rigid and linear methodologies of the past and embodies a paradigm shift (Dank and Hellström, 2020). It recognizes the inherent

unpredictability of markets and the limitations of traditional top-down predictive planning (Armanious and Padgett, 2021; Soundararajan *et al.*, 2021). According to Holbeche (2019) and Bailey (2021), it relies on an iterative, adaptive and collaborative framework that thrives on complexity and uncertainty (Holbeche, 2019; Bailey, 2021). As a result, the Agile business management model enables organizations to quickly adapt to changing circumstances, respond to customer needs, and stay one step ahead of competitors (Armanious and Padgett, 2021).

Characteristics and Key Components

Agile management is characterised by its iterative and incremental approach that emphasizes flexibility and responsiveness to change (Bailey, 2021). Riesener et al. (2021) claim that the iterative nature allows for frequent feedback loops that enable continuous improvement and adaptation (Riesener *et al.*, 2021). Furthermore, by prioritizing the customer`s needs and fostering a culture of transparency and open communication, Agile ensures that the end product meets customer expectations (Vanhala and Kasurinen, 2019). In addition, Jerab and Mabrouk (2023) find that Agile methodologies emphasize collaboration and encourage cross-functional teams to work together seamlessly and break down traditional hierarchical structures. According to them, cross-functional teams encourage self-organization and ownership, resulting in a better end product (Jerab and Mabrouk, 2023).

Agile management also includes several key components. Kakar (2023) makes a profound observation: the Agile Manifesto serves as a foundation for Agile philosophy, which prioritizes "individuals and interactions over processes and tools, working software over comprehensive documentation, customer collaboration over contract negotiation, and responding to change over following a plan" (Kakar, 2023). Additionally, Malakar (2021) argues that methodologies such as Scrum, Kanban, and Extreme Programming provide unique iterative business management frameworks that include specific roles, ceremonies and artifacts to streamline the process (Malakar, 2021). Finally, Montagna et al. (2022) claim that the concept of *sprints* or time-boxed iterations in Agile allows for gradual improvement and prioritization based on feedback that contributes to the development of the product (Montagna *et al*., 2022).

Advantages and Limitations

Agile management has become a transformative approach in various industries, especially those performing complex and creative tasks, providing unparalleled flexibility and adaptability (Hidalgo, 2019; Grass, Backmann and Hoegl, 2020). In the healthcare sector, where responsiveness and adaptability are critical, Agile methodologies such as Scrum and Kanban have shown promise in improving project management and delivery (Hofmann et al., 2018; Hidalgo, 2019). Besides, the iterative development promoted by Agile methodologies aligns well with the dynamic nature of the industry, as noted by Ahmad and Wasim (2023) (Ahmad and Wasim, 2023). Peek (2023) explains

that Scrum is an Agile framework that divides tasks down into sizable chunks known as *sprints*. Kanban, on the other hand, is a visual workflow management technique that emphasizes continuous delivery (Hofmann *et al.*, 2018). Together, these methodologies provide healthcare teams with tools to rapidly adapt to patient needs and technological advances (Hofmann *et al.*, 2018; Peek, 2023). According to Hofmann et al. (2018), it uses a visual board to represent work stages and boundaries, allowing teams to visualize and optimize their processes in real time (Hofmann et al., 2018). In summary, these methodologies encourage a more responsive approach that allows teams to quickly adapt to market changes, customer demands and technological advances (Holbeche, 2019).

Tyagi, Sibal and Suri (2022) note that Agile methodology emphasizes collaboration and self-organizing teams. This approach promotes better communication, transparency, and engagement among team members, which in turn fosters a culture of collective responsibility and problem solving (Tyagi, Sibal and Suri, 2022). According to Kohnova and Salajova (2021), trust is a fundamental element of Agile teams, and teamwork, collaboration and self-organization are essential characteristics (Kohnova and Salajova, 2021). At the end of each *sprint*, team members are expected to trust each other`s skills, knowledge and information sharing (Ó Conchúir et al., 2006; Hossain et al., 2009; Krishna, Sahay and Walsham, 2004). This collaborative approach fosters a sense of ownership and motivation among team members, increases overall employee satisfaction and productivity, and contributes to higher quality patient care (Govindaras et al., 2023).

Additionally, the iterative nature of Agile in healthcare allows for frequent and incremental delivery and facilitates early integration of patient feedback (Ahmad and Wasim, 2023). This iterative feedback loop, according to Shakhour and Obeidat (2021), reduces the risk of providing healthcare services that do not meet patients` needs and ultimately increases customer satisfaction and loyalty (Shakhour and Obeidat, 2021). This customer-centric approach therefore ensures that healthcare solutions are precisely tailored to the needs of users, leading to increased higher customer satisfaction and value creation (Ahmad and Wasim, 2023).

While Agile management has many advantages, it is also important to recognize its disadvantages. One significant obstacle is the substantial cultural shift required for the successfully implement Agile. Holbeche (2019) states that the application of Agile methodologies requires a fundamental change in organizational culture, business practices and stakeholder attitudes (Holbeche, 2019). In healthcare, where deeply entrenched practices and attitudes can resist change, the fundamental cultural shift required for successful Agile adoption, as indicated by Thomas and Suresh (2023), is particularly important (Thomas and Suresh, 2023). In addition, the self-organization of Agile teams can potentially create decision-making issues, especially if the teams lack experience or leadership (Przybilla, Wiesche and Krcmar, 2019). Some researchers argue that this can lead to conflicts or delays in decision-making, which can have a negative impact on overall progress (Sandstø and Reme-Ness, 2021; Elkhatib *et al.*, 2022).

Another limitation is scalability of Agile methodologies to larger healthcare projects or organizations. Although Agile works well in smaller and more cohesive teams (Gren and Lindman, 2020), its principles can struggle when applied to complex, enterprise-level projects involving multiple teams or departments (van Wessel, Kroon and de Vries, 2022). According to Berntzen, Stray and Moe (2021), there can be significant challenges in coordinating efforts, maintaining consistency across teams, and aligning them with organizational goals (Berntzen, Stray and Moe, 2021). In addition, Kula et al. (2022) make an insightful observation that the Agile approach to adaptation and flexibility can make it difficult to predict timelines and outcomes, which can be a concern in industries with strict regulatory requirements or set deadlines (Kula et al., 2022).

Finally, Agile`s iterative focus may prioritize short-term goals and frequent deliverables over long-term strategic visions (Sandstø and Reme-Ness, 2021), potentially leading to an overemphasis on immediate healthcare outcomes (Carroll, Conboy and Wang, 2023). Consequently, a focus on rapid iterations can lead to a misalignment between immediate progress and the organization`s most important goals (Byrne and Cevenini, 2023). Achieving a balance between continuous progress and constant alignment with the overarching strategic plan is a challenge that requires careful integration of short-term achievements into the organization's long-term vision (Dikert, Paasivaara and Lassenius, 2016; Gren and Lindman, 2020).

In conclusion, Agile methodologies offer significant benefits in healthcare such as greater flexibility, adaptability and a patient-centric approach (Hidalgo, 2019; Grass, Backmann and Hoegl, 2020; Shakhour and Obeidat, 2021; Ahmad and Wasim, 2023). Agile methodologies such as Scrum and Kanban, are ideal for healthcare as they encourage continuous feedback, early customer integration and a stronger focus on customer satisfaction (Hofmann *et al.*, 2018; Hidalgo, 2019; Holbeche, 2019; Peek, 2023). This patient-centric approach aligns well with the interconnected roles in healthcare, resulting in improved communication and problem-solving (Shakhour and Obeidat, 2021; Ahmad and Wasim, 2023). However, healthcare organizations must address challenges such as cultural shifts (Holbeche, 2019; Przybilla, Wiesche and Krcmar, 2019; Sandstø and Reme-Ness, 2021; Elkhatib *et al.*, 2022; Thomas and Suresh, 2023), scaling issues (Berntzen, Stray and Moe, 2021; van Wessel, Kroon and de Vries, 2022) and balancing short-term progress with long-term goals (Dikert, Paasivaara and Lassenius, 2016; Gren and Lindman, 2020; Sandstø and Reme-Ness, 2021; Byrne and Cevenini, 2023; Carroll, Conboy and Wang, 2023) to successfully apply Agile in healthcare. By acknowledging and addressing these limitations, healthcare organizations can maximize the benefits of Agile methodologies while ensuring sustainable long-term success in delivering high-quality patient care.

1.4. Innovation Dynamics in Healthcare

The impact of business management models on innovation in healthcare is complex, as these models play a crucial role in shaping organizational structures, decision-making processes and resource allocation (Keskinocak and Savva, 2020). Effective business management models not only simplify operations but also create a favourable environment for R&D in the healthcare sector.

On the other hand, innovation in healthcare has a transformative effect on business management models and requires adaptable frameworks that can keep pace with the rapidly changing medical technologies, patient care models and regulatory requirements (Schiavone and Ferretti, 2021; Kulkov *et al.*, 2023). This interdependent relationship emphasizes the important role that strategic business management in driving and sustaining innovation in the healthcare industry, ultimately leading to better patient outcomes and enhanced system efficiency (Singhal and Carlton, 2019).

This part of the thesis explores the relationship between business management models and healthcare innovation. It examines how effective business management models can influence innovation in the healthcare sector. The section highlights the transformative impact of healthcare innovation on business management models and emphasizes the need for adaptive frameworks to navigate the dynamic landscape of medical technologies, patient care models and regulatory requirements. It also examines the barriers to the transformative potential of healthcare innovation. The study highlights the many challenges faced, from complex regulatory requirements and resource constraints to interoperability issues, cultural resistance and data security and privacy concerns. The section examines how these challenges, such as regulatory complexities, financial constraints, workforce shortages, interoperability issues, cultural resistance, and data security concerns, affect the integration of innovative technologies and business management models.

1.4.1. Business Management Models Impact on Healthcare Innovation

The intersection of business management models and healthcare innovation is a critical aspect of the modern healthcare landscape (Santarsiero *et al.*, 2023). Schiavone and Ferretti (2021) note that as the healthcare industry continues to evolve due to technological advances, changing patient expectations, and global challenges such as pandemics, effective business management models play a critical role in driving and sustaining innovation in healthcare organizations (Schiavone and Ferretti, 2021). This thesis subsection explores the diverse impact of business management models on healthcare innovation and examines how different models help shape the changing healthcare landscape.

Business management models serve as a strategic foundation for healthcare organizations that guide decision-making processes and resource allocation (Keskinocak and Savva, 2020). To manage the complexity of the industry, it is important to align strategic objectives with healthcare innovation goals, as suggested by Berry (2019) (Berry, 2019). Established frameworks such as Lean, TQM, Six Sigma, and Agile, strategically applied to the unique challenges of healthcare, provide profound

insights into optimizing innovation pathways in the industry.

Lean principles, that originated in manufacturing, are being applied in healthcare to eliminate waste, improve processes and increase overall efficiency (Breen, Trepp and Gavin, 2020; Prado-Prado *et al.*, 2020; Suresh *et al.*, 2023). TQM, with its emphasis on continuous improvement and customer satisfaction, provides a systematic approach to improving the quality of healthcare services (Ahmed, Ahmad and Othman, 2019; Alkhaldi and Abdallah, 2021; Permana, Purba and Rizkiyah, 2021; Erkan and Unal, 2022; AL-Shameri, 2023). Based on statistical methodologies, Six Sigma enables healthcare organizations to identify and reduce variances, ensuring consistency and reliability in patient care (Dong, 2019; Niñerola, Sánchez-Rebull and Hernández-Lara, 2020; Jain, Sharma and Jamali, 2023). The Agile methodology, adopted from software development, brings flexibility and adaptability to healthcare projects, facilitating iterative progress and rapid response to changing patient needs (Boustani, Azar and Solid, 2020; Goel *et al.*, 2020; Holden, Boustani and Azar, 2021; Ahmad and Wasim, 2023). By integrating these frameworks into healthcare management practices, organizations can eliminate operational inefficiencies and create an environment conducive to innovation, ultimately optimizing pathways to breakthrough advances in healthcare.

In an era dominated by technological advances, the integration of innovative technologies and data-driven decision-making processes is paramount for enhancing healthcare outcomes (Sperger *et al.*, 2020; Bachmann *et al.*, 2022). Business management models are used as frameworks for the seamless integration of transformative technologies such as AI, big data analytics, and telemedicine into healthcare systems, thereby fostering efficiency, improving patient care, and driving continuous innovation (Bohr and Memarzadeh, 2020; Senbekov *et al.*, 2020; Amjad, Kordel and Fernandes, 2023). Models such as Strategic IT Alignment and Technology Governance ensure that the adoption of these technologies aligns with the goals of healthcare organizations by promoting strategic planning and resource allocation (Sha, Chen and Teoh, 2020; Hammami *et al.*, 2022). Additionally, frameworks that emphasize data-driven decision-making, such as Business Intelligence and Analytics, empower healthcare leaders to harness the potential of big data by extracting meaningful insights to improve clinical outcomes and operational workflow (Mohamed, 2021). Telemedicine integration is facilitated by models that prioritize organizational agility, allowing healthcare providers to quickly adapt to the changing landscape of telehealth delivery (Jonnagaddala, Godinho and Liaw, 2021; Immanuel Azaad *et al.*, 2022). As these technologies become an integral part of healthcare ecosystems, business management models play a key role in orchestrating their implementation to maximize benefits, ensuring not only efficiency gains, but also continuous innovation that positively impacts patient outcomes and overall healthcare delivery (Singhal and Carlton, 2019; Singhal *et al.*, 2020).

To summarize, the relationship between business management models and healthcare innovation plays a pivotal role in shaping the future of healthcare. According to Kulkov et al. (2023), as the healthcare sector rapidly evolves due to technological advances and changing societal needs,

effective business management models become critical for organizational success (Kulkov *et al.*, 2023). The models explored, including Lean, Agile, TQM and Six Sigma, provide strategic foundations for healthcare organizations and offer nuanced approaches to optimizing processes and resources. Their integration not only eliminates operational inefficiencies but also creates a favourable environment for fostering innovation. Fundamentally, the interdependent relationship between business management models and healthcare innovation will redefine the healthcare landscape, drive continuous improvement and ultimately improve patient outcomes (Singhal *et al.*, 2020).

1.4.2. Challenges and Barriers to Innovation in Healthcare

The healthcare sector is constantly evolving and innovation is an important driver of progress (Flessa and Huebner, 2021; Amjad, Kordel and Fernandes, 2023; Stasevych and Zvarych, 2023). By improving patient outcomes, streamlining processes and optimizing the use of resources, innovation has the potential to transform healthcare (Singhal *et al.*, 2020; (Patil and Shankar, 2023). However, there are many challenges and barriers that need to be carefully considered to achieve innovation in healthcare. This subsection delves into the various hurdles that hinder the progress of innovation in healthcare, from regulatory complexities to cultural resistance.

One of the main challenges hindering innovation in healthcare is complex regulatory requirements and compliance standards (Salguero-Caparrós *et al.*, 2020). Uravirta (2023) notes that while these regulations help ensure patient data, they also make it difficult for new technologies and business management models to navigate through the bureaucratic maze (Uravirta, 2023). Strict licenzing procedures, lengthy clinical trials and compliance with various standards often pose significant barriers to rapid adoption of innovative solutions, according to the researchers (Ahmad, Stoyanov and Lovat, 2020; Guo *et al.*, 2020; Brönneke *et al.*, 2021).

Healthcare organizations often face resource limitations, including budgetary restrictions and workforce shortages (Figueroa *et al.*, 2019). According to Keskinocak and Savva (2020), implementing innovative technologies and business management models requires a significant financial commitment, which can be a challenge for institutions experiencing financial constraints (Keskinocak and Savva, 2020). In addition, the lack of qualified professionals and the time-consuming training of employees in new technologies can further hinder the seamless integration of innovative practices (Sodhi, Singh and Singh, 2019; Al-Saffar and Obeidat, 2020; Udod *et al.*, 2020; Lateef and Mhlongo, 2021).

Another significant obstacle to innovation is the lack of interoperability and effective information exchange between different healthcare systems (Yang, Chou and Chen, 2019; Reegu, Daud and Alam, 2021; Esmaeilzadeh, 2022). As healthcare organizations rely on different electronic health record (EHR) systems and technologies, seamless data sharing becomes a challenging task (Colicchio, Cimino and Fiol, 2019; Dinh-Le *et al.*, 2019; Reegu, Daud and Alam, 2021). This hinders the development of comprehensive and integrated healthcare solutions, limiting the potential benefits

of innovative models (Yang, Chou and Chen, 2019; Esmaeilzadeh, 2022).

The healthcare industry is often characterised by a deeply ingrained resistance to change that stems from a traditional mindset and cultural norms. This resistance, both at the organizational and individual level, can hinder the successful implementation of innovative business management models (Dong, 2019; Allaoui and Benmoussa, 2020; Toke and Kalpande, 2020; Tran, Pham and Bui, 2020; Turner *et al.*, 2020). To overcome these cultural barriers, it is important to apply strategic change management approaches, provide training, and foster a culture that embraces adaptability and continuous improvement (Dong, 2019; Tran, Pham and Bui, 2020; Lateef and Mhlongo, 2021).

With increasing reliance on digital technologies and data-driven solutions, data security and privacy concerns have become paramount (Dinh-Le *et al.*, 2019; Keshta and Odeh, 2021). Some researchers find that patients and healthcare providers are concerned about potential breaches that could expose sensitive health information (Shen N. *et al.*, 2019; Keshta and Odeh, 2021). According to Stalla-Bourdillon et al. (2020), finding a balance between innovation and robust data protection measures is essential to gain the trust of stakeholders and ensure the ethical implementation of innovative healthcare solutions (Stalla-Bourdillon *et al.*, 2020).

In order to realize the full potential of business management models, it is necessary to address the challenges and barriers to healthcare innovation. This requires understanding regulatory frameworks, overcoming resource constraints, fostering a culture of adaptability, promoting interoperability and ensuring data security. By strategically overcoming these barriers, healthcare organizations can pave the way for transformative advances that positively impact patient care and operational efficiency.

2. METHODOLOGICAL APPROACH FOR ANALYSING THE IMPACT OF BUSINESS MANAGEMENT MODELS ON HEALTHCARE INNOVATION

The objective of the study is to contribute to the academic and practical understanding of effective business management models for fostering innovation processes in the healthcare sector, thereby creating a new framework that optimizes organizational capabilities in healthcare innovation.

The tasks are: 1. To systematically analyse relevant literature and compare different business management models promoting innovation processes in the healthcare sector; 2. Based on the findings of the literature review and case studies analysis, to assess the impact of business management models on healthcare innovation; 3. To develop a conceptual framework that provides insights into its practical applicability as a comprehensive innovation management system in the dynamic healthcare industry.

Hypothesis 1:

H0: There are no distinct advantages and limitations in terms of the impact of different business management models (Lean, TQM, Six Sigma, Agile) on healthcare innovation.

H1: Each business management model (Lean, TQM, Six Sigma, Agile) has unique advantages and limitations in terms of its impact on healthcare innovation, requiring a tailored approach based on contextual factors.

Hypothesis 2:

H0: The choice of business management model does not affect operational excellence, innovation, patient outcomes and quality of care in healthcare organizations.

H1: The choice of the right business management model tailored to the specific needs and challenges of each healthcare organization has a positive impact on operational excellence, innovation, patient outcomes and quality of care.

Research design

This master's thesis uses a methodology defined as a systematic literature review based on a literature-based research design and case studies analysis. The systematic literature review approach, which is meant for the systematic acquisition, synthesis and critical evaluation of existing scientific contributions relevant to a given topic matter, stands out for its rigorous and methodically constructed framework. By combining a literature-based research design with case studies analysis, a more comprehensive view of the research subject is achieved. This methodology ensures a thorough investigation of the researched phenomena, leading to meaningful insights and a nuanced understanding. It was chosen due to its ability to enable a detailed study of the existing literature on management models in the healthcare sector and their impact on the dynamics of innovation in healthcare.

Methodology and methods of the research

The research project of this master's thesis is based on a methodology that includes a systematic literature review and case studies analysis. The aim is to systematically collect, summarize, and critically analyse the relevant contributions of business management models and their impact on healthcare innovation. The literature review and case studies analysis include a comprehensive analysis of existing research articles that address theories, concepts and empirical studies related to healthcare management, innovation and the interactions between these elements.

Eligibility criteria

Studies were eligible for inclusion if they provided both empirical and conceptual evidence, were directly related to business management models in healthcare settings (hospitals, clinics, and medical centers), and at least 75% of the literature was published between 2019 and the current date to ensure that the information is current and relevant.

It is important to keep in mind that using outdated literature alone may have limitations due to potential obsolescence or lack of current perspectives. However, strategically incorporating this literature into a literature review can improve the depth and context of the study and provide a more comprehensive understanding of the topic. For example, certain studies published before 2019 were selected for the master's thesis because they proved valuable in providing historical context. This allowed us to trace the evolution of business management models, provide a solid foundation for the thesis, and show how current ideas build on previous research. In addition, these studies show the pioneering work of scientists who introduced certain ideas in their field. Also, in some cases, more recent research does not sufficiently cover certain aspects of a topic. Older literature can fill these gaps and provide insights and perspectives that are not available in more recent studies.

Studies that were written in a language other than English or Lithuanian or were not available in full text were excluded to avoid gaps in understanding. In addition, studies that did not contribute to the objectives of the thesis or contained outdated information or methodologies that were not consistent with the research objectives were not included. Duplicate studies were also avoided to prevent redundancy in the literature review.

Information sources

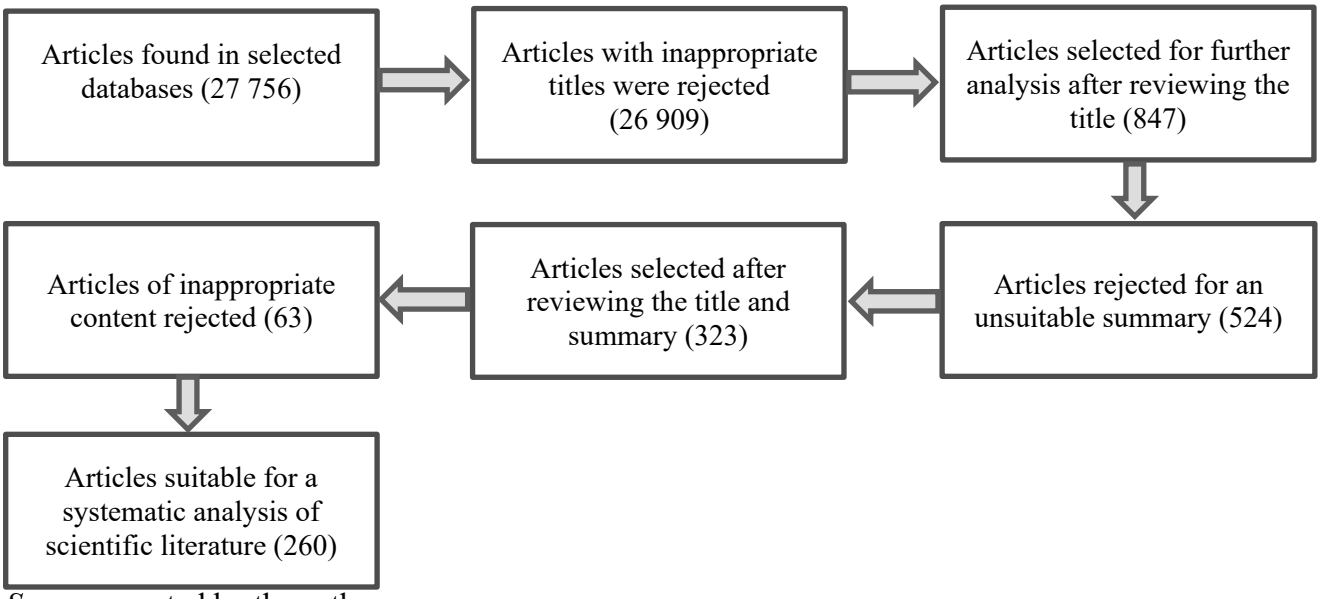
The research included electronic databases such as PubMed, Vilnius University Library, EBSCO*host*, JSTOR, and Google Scholar. Data for this research was collected from academic journals, books, conference proceedings, activity reports and reputable online databases. Also, publications of professional organizations (e.g., the WHO). To ensure quality and rigor, priority was given to studies published in credible, peer-reviewed journals.

Search terms

The following keywords and combinations thereof were used to retrieve relevant literature: Business management models; Innovation in healthcare; Healthcare innovation strategies; Impact of management on healthcare innovation; Healthcare organizational models; Healthcare leadership and innovation; Strategic management in healthcare; Adoption of business strategies in healthcare; Leadership styles in healthcare innovation; Lean management in healthcare; Agile management in healthcare; Total Quality Management in healthcare; Six Sigma management in healthcare; Organizational effectiveness in healthcare innovation; Healthcare technology innovation; Entrepreneurship in healthcare organizations; Patient-centred innovation in healthcare; Disruptive innovation in healthcare; Ethical considerations in healthcare management and innovation; Data analytics and business intelligence in healthcare.

Figure 2

Stages of selection of scientific articles



Source: created by the author.

Study selection

This master`s thesis consists of two main research parts, each focusing on the evaluation of business management models in the healthcare sector, which were included in the selection of studies for this master's thesis. Based on the literature review, the first part compared the four business management models (Lean, Agile, TQM and Six Sigma) most widely used in the healthcare sector on the successful implementation of innovations. The aim was to analyse how well-established business management models from other industries can be adapted to healthcare settings. A systematic review of the current literature was used to analyse the contribution of each model to innovation and their advantages, limitations, and practical applicability in healthcare.

The second part of the study examined specific cases of successfully implemented innovative

solutions in the healthcare sector under certain business management models. The focus was on the role of leadership and organizational culture in fostering a culture of innovation in healthcare.

The first selected case study is Joniškis Hospital, recognized as the most successful example of the application of Lean management in the healthcare sector in Lithuania. The hospital`s annual activity reports since the implementation of Lean management are available online, allowing for precise observation. The case study represents a typical Lithuanian healthcare landscape, proving that Lean management approach can be successfully implemented in other healthcare organizations in Lithuania.

The case studies of 108 Military Central Hospital and Maastricht University Medical Center were selected because these hospitals applied Lean methodology to solve very specific problems, such as the overcrowding of emergency department (ED) at 108 Military Central Hospital and surgical cancellations at Maastricht University Medical Center. The problems were evident and measurable, and the results achieved clearly defined the impact of the Lean application on long patient waiting times and surgical procedures cancellations.

The interesting case study of AtlantiCare was selected as one of the most well-known examples of the application of TQM, which is not only widely studied in the current literature, but also presented as an example in academic institutions and as an analysis assignment or exam task for college students (Integrated Institute of Professional Management, 2020; Aditya Engineering College, 2023). This case study is also known as one of the most successful examples of TQM in healthcare, where a very specific "Plan-Do-Check-Act" approach was used to identify gaps in employee communication.

The case study of a hospital in the United Arab Emirates (UAE) was taken as an example to demonstrate that TQM enhances the positive impact of total quality excellence in the healthcare sector. The comprehensive literature review revealed that the UAE healthcare sector recognizes continuous professional development and training as one of the key components of success in the healthcare sector. Recognizing that TQM principles form the basis of healthcare professionals' training programs and promote a culture of accountability and continuous improvement, the UAE aims to create a sustainable healthcare system that meets the changing needs of a diverse population by investing in skills development (Aburayya *et al.*, 2020). Finally, the use of TQM methodology is becoming more common in UAE hospitals to make processes more efficient, reduce errors and improve patient satisfaction (Eideh *et al.*, 2022).

The country-wide study was taken as an example in assessing the impact of TQM application in Lithuanian hospitals. The largest up-to-date survey conducted in 58 Lithuanian hospitals was selected to assess the quality management systems (QMS) impact on patient safety. However, it is important to note that the results of this study may now be outdated due to the lack of recent research on QMS implementation in Lithuania, leaving a gap in understanding the current dynamics and challenges in this field.

A case study of a Six Sigma implementation at Scottsdale Healthcare was selected for comparison. This healthcare facility applied Six Sigma to solve the problem of an overcrowded ED, similar to the previous case study of 108 Military Central Hospital, where Lean methodology was applied to combat the same problem by streamlining operations. In the case of Scottsdale Healthcare, the facility identified that the root cause of the problem was not, as originally thought, recourses constraints, but a reduced number of steps in the transfer process.

Another case study of the application of Six Sigma was chosen using the example of King Fahd University Hospital. Here, the Six Sigma methodology was selected to reduce the number of errors in the entry of prescription data, medicines with manufacturer`s errors and mislabeled medicines. Since the aim of this model is to achieve zero process defects, this case study seems to be an excellent example for the healthcare sector, as defects and errors cannot be tolerated and even the smallest mistake can cost a person`s life (Dong, 2019). The case study demonstrates the significant benefits of Six Sigma in healthcare, not only as an error reduction method, but also as an essential tool for overall improvement that would have a positive impact on patient safety and organizational productivity. It highlights Six Sigma`s ability to drive change in healthcare, aligning it with the healthcare industry's commitment to continuous improvement, and provides an action plan for more healthcare organizations seeking to improve their performance (Alkuwaiti, 2016). Unfortunately, no case studies of Six Sigma application in the healthcare sector were found in Lithuania.

There is also a lack of research on the relationship between innovation and organizational agility in healthcare. For this reason, a case study on the application of Agile management in the eHealth Intelligent Monitoring System (IMS) is very valuable as an exceptional example. It was chosen because it provides a very clear explanation of Agile application in healthcare, considering each phase of the Scrum implementation. In addition, to create a picture of the Lithuanian healthcare landscape, the Informatics and Development Center (IDC) was chosen as an example to support the implementation of the most advanced information technologies and improve the availability and quality of medical services in Santara Clinics.

Finally, some of the best and most recent examples of the Agile application in healthcare are the ones addressing the unprecedented challenges posed by the COVID-19 pandemic, which required a rapid and adaptive response to ensure a safe and healthy human population (Filip *et al*., 2022). Countries were encouraged to be agile and adaptive, particularly in terms of the timing of policy measures, the degree of centralization of decisions, the autonomy of decisions and the balance between change and stability (Janssen and van der Voort, 2020). In this case, the Agile methodology was recognized as the most effective management model and the Netherlands became one of the first countries to implement the Agile in the healthcare sector during the COVID-19 pandemic, which determined this study case to be presented in the master`s thesis.

Data collection and synthesis

Data collection and synthesis for this master's thesis involved qualitative research methods. First, a comprehensive review of the existing literature on business management models and their impact on healthcare innovation was conducted. This involved identifying and comparing key theories, concepts and frameworks related to business management and healthcare innovation.

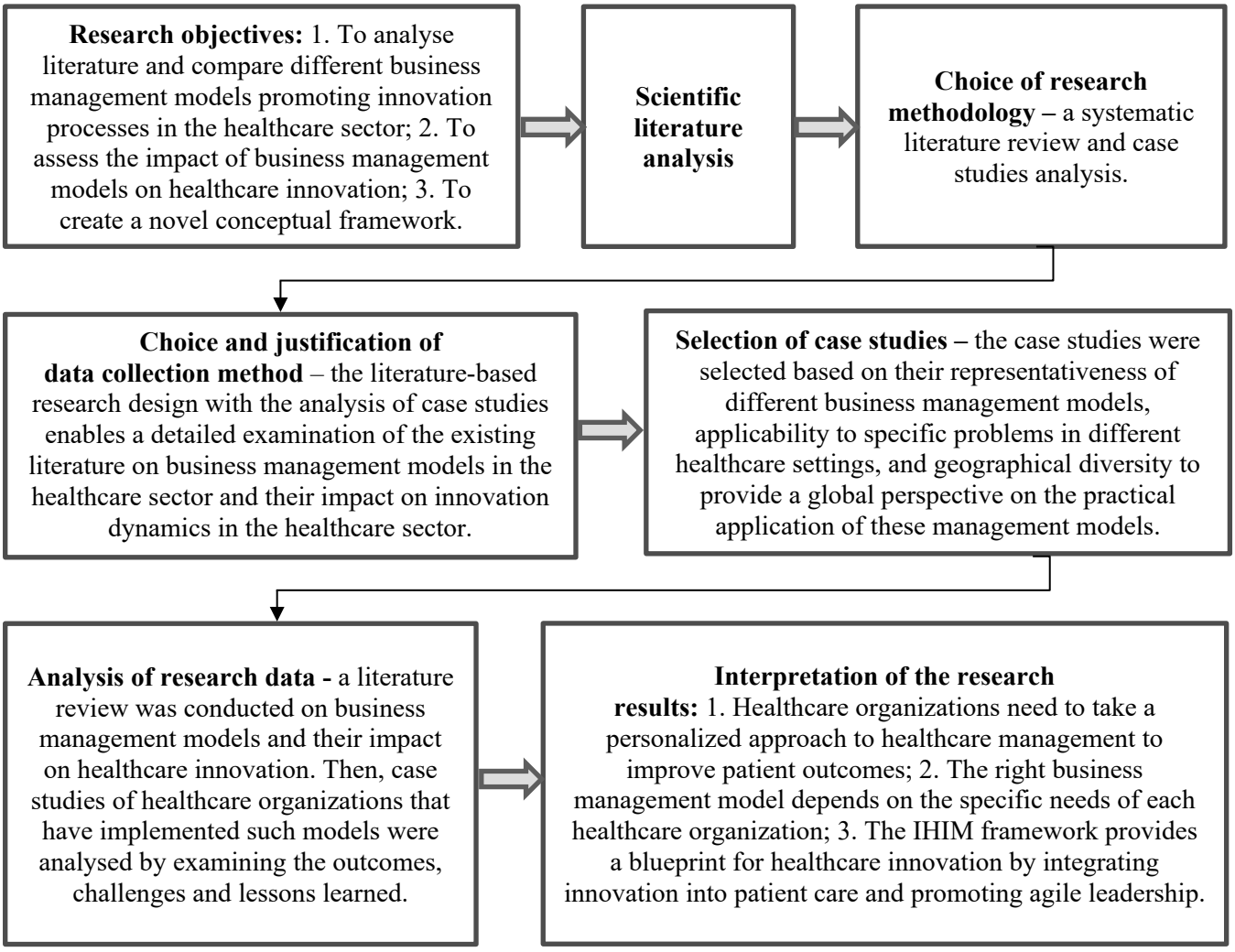
In addition, case studies analysis of healthcare organizations that have implemented certain business management models to enhance innovation was conducted. This involved examining the outcomes, challenges and lessons learned from these case studies.

Ethical considerations

Ethical approval does not need to be obtained as this study is based solely on a review of the existing literature. However, to ensure the integrity of the research, it was strictly ensured that the sources were correctly cited and referenced.

Figure 3

Stages of the Qualitative Research process



Source: created by the author.

3. ANALYSIS AND RESEARCH RESULTS OF THE IMPACT OF BUSINESS MANAGEMENT MODELS ON HEALTHCARE INNOVATION

3.1. Case Studies and Best Practices

Lean Management Application in Healthcare

In the literature on Lean management in healthcare, the implementation of Lean management is associated with increased organizational effectiveness and cost-effectiveness (D'Andreamatteo *et al.*, 2015; Costa and Godinho Filho, 2016; Hallam and Contreras, 2018). According to Dunsford and Reimer (2017), the fundamental idea of Lean management in healthcare is to eliminate non-value-added activities such as waiting times or unwanted treatments, to improve efficiency and the overall quality of healthcare while focusing on patient-centred care. This approach has proven to be highly relevant and applicable in healthcare, where the pursuit of cost-effectiveness and quality care is crucial (Dunsford and Reimer, 2017). Letelier et al. (2021) claim that by using Lean management in healthcare, the efficiency of processes and user satisfaction can be increased (Letelier *et al*., 2021). For example, value stream mapping can help healthcare organizations identify operational bottlenecks that impede patient care, resulting in better resource allocation and reduced waiting times for patients (Henrique *et al*., 2016).

Another important application of Lean management in healthcare is the use of performance metrics and data-driven decision-making (Schretlen *et al.*, 2021; Singh, Verma, and Koul, 2022). To evaluate and measure the efficiency of processes and activities, healthcare organizations may apply leading performance indicators such as KPIs and other data analysis techniques (Burlea-Schiopoiu and Ferhati, 2021). The focus of Lean management on eliminating waste, optimizing processes, and increasing effectiveness has led to the development of a more systematic and data-centric approach (Suresh *et al.*, 2023) which enables healthcare leaders to make informed decisions and allocate resources more efficiently (Stefanini *et al.*, 2020; Yu *et al.*, 2023).

Case study: Lean management application at the Joniškis Hospital

Several public hospitals in Lithuania, including the Abromiškės Rehabilitation Hospital, the Kėdainiai District Polyclinic, and the National Center of Pathology have introduced Lean management strategies. As a result, healthcare professionals at the Kėdainiai District Polyclinic were able to significantly reduce patient queues, paperwork, and waiting times for access to specialists (up to 35 days in some cases). They also accelerated the response of the emergency medical service to patient calls (Rutkauskaitė 2016; LEAN projektai, 2022).

However, the best-known example of Lean management application in the healthcare sector in Lithuania is the Joniškis Hospital. In 2021, the public hospital introduced Lean management and

has been constantly updating its methodology ever since (Joniškio ligoninė, 2022). According to the hospital's activity reports for 2021 and 2022, daily meetings were held in the various departments, to discuss KPIs and emerging issues. The daily objectives measurement and evaluation of the facility`s activities enabled the hospital to recognize problems earlier and respond more quickly (Joniškio ligoninė, 2022; Joniškio ligoninė, 2023). To improve the quality of patient service, the hospital conducted anonymous patient surveys throughout the year and analysed patient satisfaction levels, which were 0.98 in 2021 and 0.99 in 2022 (Joniškio ligoninė, 2022; Joniškio ligoninė, 2023). In addition, an increasing number of medical documents began to be processed electronically: patient registrations in the consultation polyclinic and the ED, referrals, medical histories, orders and results of laboratory tests, images of instrumental tests and their results, certificates of incapacity for work, medical death certificates and electronic prescriptions. Furthermore, several departments were equipped with wireless call systems that patients can use to call personnel and nurses if necessary. A hybrid cabinet was also installed, which allows specialists to consult patients remotely, while maintaining the essential elements that determine the quality of healthcare services (Joniškio ligoninė, 2022).

As a result, in 2021, the Joniškis Hospital was the only hospital in Lithuania that exceeded the actual level of provision of specialized services, which reached 112% that year. However, due to the challenges related to the COVID-19 pandemic, including increased labour costs and medical equipment needs, the Joniškis Hospital faced a financial burden that resulted in a loss of 211,395.32 euros. Despite these challenges, the hospital continued its activities, ensured and developed the provision of comprehensive, high-quality healthcare services and pursued its strategic operational goals. Effective organization of work through the application of Lean management ensured the main indicators of the hospital`s functioning (Joniškio ligoninė, 2022).

Finally, according to the 2022 activity report, the hospital generated a financial surplus of 503,103.81 euros, which increased by 337.9 percent compared to 2021. The hospital had also successfully expanded – the ED and priority services outside the hospital were extended. Furthermore, the Ministry of Health of the Republic of Lithuania honoured the municipality of Joniškis in the nomination "For Leadership in Healthcare" (Joniškio ligoninė, 2023).

Case study: Lean management application at the 108 Military Central Hospital

A compelling case study on how a Lean management approach can lead to a significant reduction in waiting times is presented by 108 Military Central Hospital in Hanoi, Vietnam (Duong *et al.*, 2021). EDs at public hospitals in Vietnam are often overcrowded and populated by a variety of diseases which often leads to increasing patient dissatisfaction (Tran *et al.*, 2017; Thi Thao Nguyen *et al.*, 2018). To alleviate these problems, this hospital has implemented value stream mapping and Lean strategy approaches to streamline operations and eventually achieved remarkable outcomes (Duong *et al.*, 2021). In their survey Duong et al. (2021) stated that after implementing Lean

management, the average waiting time for patients requiring medical procedures/operations decreased from 134.4 minutes to 89.4 minutes. A similar conclusion was drawn for those requiring vascular interventions, where the average waiting time of 54.6 minutes decreased to 48.9 minutes. Finally, for patients admitted to the ED but eventually transferred to other hospital departments, the results also showed that there was sufficient evidence to conclude that the average waiting time of 59.8 minutes after the implementation of the Lean strategy, was significantly shorter than before its implementation (118.3 minutes). Patients had quicker access to healthcare services, which led to faster treatment decisions. This not only improved patient satisfaction, but also contributed to better healthcare outcomes, especially in critical cases where timely decisions are essential (Duong *et al*., 2021).

Case study: Lean management application at the Maastricht University Medical Center

At Maastricht University Medical Center, a data-driven Lean process improvement methodology was applied to reduce surgical cancellations. To ensure more timely, efficient, equitable, patient-centred, and safer care, a multidisciplinary project team followed the 'DMAIC' Improvement Cycle (Define, Measure, Analyse, Improve, Control). By implementing a data-driven approach, the medical center was able to reduce last-minute surgical cancellations by 50%, repeated preoperative diagnostics – by 67%, referral to treatment time – by 35%, and increase patient Net Promoter Score by 14%. Key success factors were the use of a structured data-driven problem-solving approach, focus on patient value and process flow, leadership support, and engagement of involved healthcare professionals throughout the care pathway (Schretlen *et al.*, 2021).

However, some academics come to contradictory findings. For example, Mazzocato et al. (2014) claim that the complexity and uniqueness of each patient's case can become a significant challenge when implementing Lean management in healthcare (Mazzocato *et al.*, 2014). Unlike in manufacturing, where standardized processes can be streamlined (Benton and Shin, 1998; Vamsi Krishna Jasti and Kodali, 2014; Mohanty, Yadav and Jain, 2007), healthcare often involves complex, individual patient needs that cannot always be neatly categorized or optimized through standardization (Daultani, Chaudhuri and Kumar, 2015). According to Sacristán (2013), Lean principles may struggle to adapt to variability, including a patient's medical history, current condition, and personal preferences, and attempting to enforce strict standardization can lead to a misalignment with patient-centred care, compromising the quality of healthcare (Sacristán, 2013).

To fulfil Lean principles and provide high quality care, the well-being of the personnel must also be taken into account and healthcare professionals must be provided with the necessary conditions and professional development opportunities (Maijala *et al.*, 2018). As Drotz and Poksinska, (2014) claim, empowering employees to solve work-related problems can significantly improve their job satisfaction and overall productivity (Drotz and Poksinska, 2014). Such an approach is widespread in higher-income countries. To establish clear goals, values, visions and

KPIs, in Sweden, for example, doctors were asked each working day to mark the problems they encountered during working hours (e.g. waiting time for the patient, time from referral examination to presentation of results, a measure of patient satisfaction). This information was regularly reviewed to discuss how to address problems and improve the quality of healthcare services (Drotz and Poksinska, 2014). In comparison, such an approach is not commonly applied in low-income countries. For example, a case study conducted in primary healthcare facilities in Nigeria shows that nurses face various challenges in implementing patient-centred care (Lateef and Mhlongo, 2021). Alves et al. (2021) note that healthcare professionals need to be adequately prepared to deal with the complex individual needs and preferences of patients, which is another challenge in implementing Lean management in healthcare (Alves *et al.*, 2021). In Lateef and Mhlongo (2021) opinion, Lean management requires a workforce with a profound understanding of the principles and tools, as well as the skills to implement them effectively (Lateef and Mhlongo, 2021). Otherwise, Lean initiatives can falter if healthcare organizations fail to fully educate and train their staff. This often leads to incomplete or incorrect implementation, which cannot be expected to lead to increased efficiency and quality of care (Sodhi, Singh and Singh, 2019).

To summarize, a Lean system is designed to eliminate waste, variability, and inflexibility (Breen, Trepp and Gavin, 2020; Detyna, Detyna, 2022; Suresh *et al.*, 2023), though given the variety and complexity of healthcare processes (Mazzocato *et al.*, 2014; Alves *et al.*, 2021), resistance to change (Allaoui and Benmoussa, 2020; Mohanty, Yadav and Jain, 2007; Camagu, 2010; Benton and Shin, 1998), and delayed cost savings (Jørgensen *et al.*, 2007; Dombrowski and Mielke, 2014; Todorovic, Cupic and Jovanovic, 2022), its application may not always deliver the expected benefits. For a comprehensive analysis of the application of Lean management in healthcare, it is crucial to recognize these limitations and conduct a thorough analysis of the specific context. To improve the quality of primary care, adequate management support as well as education and training of healthcare professionals should be strengthened (Lateef and Mhlongo, 2021). However, despite its limitations, the principles of Lean management have become a valuable framework for improving healthcare operations, enhancing the quality of care (Dunsford and Reimer, 2017; Rachh, Davis and Heilbrun, 2023), increasing patient satisfaction (Duong *et al.*, 2021; Letelier *et al.*, 2021), and controlling costs (D'Andreamatteo *et al.*, 2015; Costa and Godinho Filho, 2016; Dunsford and Reimer, 2017), thus becoming a cornerstone for healthcare improvement. As the healthcare system evolves, the application of Lean management will remain an important strategy to achieve these goals and ensure sustainable, patient-centred care.

Total Quality Management Application in Healthcare

TQM is a management philosophy that aims to improve the quality and efficiency of processes in various industries, including healthcare (Permana, Purba and Rizkiyah, 2021). As patients become increasingly concerned about the quality of healthcare, organizations should strive

to improve their existing product or service by incorporating innovation into their processes (Akkaya and Bagieńska, 2022). As far as TQM implementation in healthcare is concerned, there is a constant need for it to identify consumer needs, create a standard of best practice, and develop methods for appropriate healthcare delivery (Ghanem *et al.*, 2021). AL-Shameri (2023) claims that TQM principles applied in healthcare emphasize continuous improvement, patient-centred care, and employee involvement, which improve the overall quality of healthcare services (AL-Shameri, 2023). Originally developed in the manufacturing industry, TQM also has applications in healthcare, where service quality is particularly important due to its impact on patients' well-being and safety (Rooney and Van Ostenberg, 1999; Erkan and Unal, 2022). In this context, the "customer" is the patient, and the ultimate goal is to ensure the best possible quality of care. Since the focus is on patient outcomes and satisfaction, TQM seamlessly fits into the core mission of healthcare (Ahmed, Ahmad and Othman, 2019), as the quality of patient care, safety, and service delivery is non-negotiable in the healthcare sector (Alkhaldi and Abdallah, 2021).

Case Study: TQM application at the AtlantiCare

AtlantiCare, a healthcare provider based in New Jersey, United States, has proven the effectiveness of TQM in improving organizational performance. With 5,000 employees spread across 25 locations, AtlantiCare has achieved a remarkable turnaround in the healthcare industry for nearly two decades (Integrated Institute of Professional Management, 2020). However, to further increase its profit margins, the management team decided to introduce improvements throughout the organization. Since patient satisfaction is the most important aspect of the healthcare industry, the team decided to refocus on TQM and implement a "Plan-Do-Check-Act" cycle to identify gaps in employee communication. This cycle helped to identify that communication gaps among employees led to longer patient waiting times and increased complaints. To address this issue, managers introduced a horizontal method of internal communication, empowering employees to provide feedback at every level of the organization (Rohit *et al.*, 2021).

To ensure that all new employees understand the importance of quality culture, AtlantiCare has implemented a crash course that pairs interns with a senior resident to mentor and support them during the transition from medical school to residency. This framework organizes the company's processes into five key areas: quality, customer service, people and workplace, growth, and financial performance. As employees progress through the ranks, the focus continues to be on improvement, and managers follow the organization`s tight-loose-tight process management style (AtlantiCare, 2021).

After setting benchmark goals for employees at all levels, including improving engagement in service delivery, improving clinical communication, and identifying and prioritizing service opportunities, AtlantiCare's performance improved significantly. The number of repeat customers tripled and the company's market share reached a six-year high. As expected, profits also increased

significantly. The company's revenue increased by $370 million from $280 million to $650 million after implementing quality improvement strategies, and the number of patients served far exceeded the state's numbers. The case study emphasizes the importance of creating a culture of quality and ensuring that employees understand it in order to implement TQM effectively. It also emphasizes the importance of TQM training for employees and the use of performance indicators to measure progress (Rohit *et al.*, 2021).

Case Study: TQM application in the hospitals in the UAE

The UAE, known for its rapid economic development and multicultural society, has made significant progress in implementing TQM principles within its healthcare system (Facchini, Jaeck and Bouhaddioui, 2021). One notable initiative is the Dubai Quality Award, which encourages various sectors, including healthcare, to promote organizational quality and excellence (Aburayya *et al*., 2020). The emphasis on TQM is evident across the UAE`s healthcare sector as the integration of international quality standards becomes more common. In line with the commitment to adhere to globally recognized standards, many healthcare institutions in the UAE have received accreditation from leading organizations such as Joint Commission International and Dubai Health Authority. (Vaz *et al.*, 2023). This commitment not only ensures the delivery of high-quality healthcare but also strengthens the country's reputation as a hub for medical tourism (Al-Talabani *et al.*, 2019).

In addition, the UAE's healthcare sector recognizes the importance of continuous professional development and training (Aburayya *et al.*, 2020). According to Lebcir and Sideras (2021), training programs for healthcare professionals are based on TQM principles and promote a culture of accountability and continuous improvement (Lebcir and Sideras, 2021). Aburayya et al., (2020) state that by investing in upskilling its workforce, the UAE aims to create a sustainable healthcare system that adapts to the changing needs of its diverse population (Aburayya *et al.*, 2020).

Finally, healthcare facilities in the UAE are increasingly using TQM tools and methods to streamline processes, reduce errors, and improve overall patient satisfaction (Eideh *et al.*, 2022). To investigate the impact of TQM elements on the service quality of hospitals in the UAE, empirical data was collected from 480 senior hospital employees. According to the results of the analysis, which showed a response rate of 60.8% (292 correctly completed questionnaires), TQM enhances the positive effects of comprehensive quality excellence. The results of this study support the positive effects of organizational culture, continuous improvement, customer focus, teamwork and participation, process management, and top management commitment as independent variables on improving the quality of services provided by hospitals as dependent variables. In this study, Aburayya et al. (2020) also found that among the eight TQM implementation factors, organizational culture has the strongest effect on hospital service quality with the highest coefficient value of 0.373 (Aburayya *et al.*, 2020).

To summarize, the application of TQM in the healthcare sector is a critical component of the

UAE's commitment to providing world-class healthcare services. Through initiatives such as the Dubai Quality Award (Aburayya *et al*., 2020), adherence to international standards (Vaz *et al.*, 2023), and continuous professional development (Aburayya *et al.*, 2020; Lebcir and Sideras, 2021), the UAE exemplifies how TQM can be successfully implemented in a multicultural and dynamic healthcare environment (Facchini, Jaeck and Bouhaddioui, 2021). As the country continues to invest in TQM practices, it is expected to further improve the quality of healthcare services and contribute to the global discourse on excellence in healthcare management (Aburayya *et al.*, 2020).

Case Study: TQM application in Lithuanian hospitals

While TQM has had considerable success in improving operational efficiency and quality of care in the healthcare sector worldwide, its application in the Lithuanian context presents a unique set of challenges. Back in 1998, 58 Lithuanian hospitals specializing in difficult long-term care began to introduce quality QMS to improve patient safety. A survey conducted by management teams in 2005 to assess the implementation status revealed that QMS were in operation in 39.7% of the hospitals and had been put into practice in 46.6%. The main challenges faced during the implementation process included limited financial resources, lack of knowledge and the need to establish protocols. However, the researchers found that QMS helped to improve accountability and delegation of authority, service quality, and overall patient satisfaction in these hospitals (AlHarshan *et al.*, 2023).

According to the study, respondents considered QMS to be highly significant, with an average score of 5.8 out of seven. The main challenges faced during implementation were the procedure development (5.5), the lack of financial resources (5.4) and information (5.1), and the development of work guidelines (4.6). On the other hand, the main benefits of the QMS were a better distribution of power-sharing (5.2), better service quality (5.1), and higher patient satisfaction (5.1). Interestingly, the management of the surveyed hospitals had only a mediocre (3.6) level of satisfaction with QMS. However, respondents who were more knowledgeable about quality management and had a higher number of trained employees reported higher satisfaction levels (Buciuniene *et al.*, 2006).

In conclusion, QMS is considered successful only in one third of Lithuanian supportive treatment and nursing hospitals. According to the researchers, the success of implementation depends on the size of the hospital, with larger hospitals having more success. Common challenges faced by hospitals include lack of financial resources, information, training, and difficulties in procedure development. Nevertheless, management awareness of QMS importance and the existence of employee training systems and audit groups in hospitals are key factors contributing to the successful implementation (Buciuniene *et al.*, 2006). However, it is important to note that the findings of this study may now be outdated due to the lack of recent research on QMS implementation in Lithuania, which leaves a gap in understanding the current dynamics and challenges in this area.

Six Sigma Management Application in Healthcare

The implementation of Six Sigma in healthcare has been recognized in recent years as a useful strategy for improving quality, efficiency and patient outcomes (Jain, Sharma and Jamali, 2023). Niñerola, Sánchez-Rebull and Hernández-Lara (2020) assert that in healthcare, the use of quality management systems is essential to ensure efficiency, as the commission of errors can seriously harm patients (Niñerola, Sánchez-Rebull and Hernández-Lara, 2020). With the goal of zero defects in the processes, Six Sigma seems to be a good choice for healthcare where defects and errors cannot be tolerated as even the smallest mistake can cost a human life and therefore defects or errors in healthcare service processes must be eliminated (Dong, 2019). In addition, Jain, Sharma and Jamali (2023) note that the application of Six Sigma in healthcare holds great promise in identifying and mitigating potential risks, improving workflow efficiency, and enhancing patient outcomes. According to the authors, by integrating Six Sigma principles into healthcare processes, organizations are seeking to reduce medical errors, increase patient safety measures, improve patient care, and optimize resource utilization (Jain, Sharma and Jamali, 2023).

Case Study: Six Sigma application at Scottsdale Healthcare in Arizona, the United States

The Commonwealth Health Corporation (CHC) became a Six Sigma pioneer in the healthcare industry by implementing Six Sigma practices under General Electric in 1998 (Feng and Manuel, 2008). Following the success story of the CHC, which benefited from the implementation of Six Sigma practices, many healthcare organizations followed it by focusing on direct care delivery, administrative support, and financial management (Khaidir *et al.,* 2014).

Several researchers studied Scottsdale Healthcare in Arizona, which implemented Six Sigma practices in the ED. The facility began a Six Sigma project to work on the overcrowded ED, as it was taking 38% of the total patient's time in the department to find a bed and transfer the patient from the waiting room. Prior to the implementation of quality efforts, there were several intermediate steps in the process that inevitably took more time from start to finish and reduced potential yield. As a result of the successful Six Sigma application, the facility identified the root cause of the problem was not, as originally thought, finding a bed, but rather reducing the number of steps involved in the transfer process. The result of this study was that the time to transfer a patient from the ED to an inpatient bed was reduced by 10%, resulting in increased capacity in the ED. In addition, patient throughput in the ED increased by 0.1 patients/hour, and variations in outcomes, length of hospital stay, and treatments were reduced. As a result, Scottsdale Healthcare noticed improvements in its profitability, both directly through a $600,000 increase in profit and through a reduction in length of stay and increased productivity (Revere, Black and Huq, 2004; Drake *et al.*, 2008; Etienne, E. C. and Etienne, M. E., 2021).

In summary, the application of Six Sigma at Scottsdale Healthcare in Arizona has proven to be highly effective in optimizing the overcrowded ED. The success of this Six Sigma project

underscores the importance of process optimization in healthcare management. After all, it proves one of the key points of Six Sigma, that inspection is not productive enough and instead quality control should be implemented from the beginning of a product or service to reduce non-value-added activities (Drake *et al.*, 2008).

Case Study: Six Sigma application at the King Fahd University Hospital in Saudi Arabia

The outpatient pharmacy of the King Fahd Hospital of the University in Saudi Arabia applied Six Sigma principles to reduce medication errors thereby increasing patient satisfaction, creating a safe environment for patients, and saving lives. A multidisciplinary team was formed consisting of pharmacists, technicians, information technology and administrative staff. Accordingly, several approaches were explored and ultimately the Six Sigma approach was selected to reduce medication errors in hospital`s outpatient pharmacy.

This case study of implementation of Six Sigma methodology showed a significant reduction in medication errors in the outpatient pharmacy department. Considering the number of errors found in prescription data entry, medications with manufacturer errors and improperly labelled medications, the results showed that the quality of services increased after the application of Six Sigma principles and the Sigma score (considering 1.5 σ shift) improved accordingly from 3.09, 3.60, 3.35 to 4.08, 3.83, 4.08. In particular, prescription/data entry errors have been significantly reduced, as evidenced by a consistent and simultaneous improvement in sigma scoring. A control plan was also developed to maintain these improvements. By reducing medication errors, problems such as adverse drug reactions, unnecessary hospitalizations, disabilities or deaths, rework, longer patient/staff waiting times, legal issues and patient care costs were reduced, and patient safety and staff productivity improved (Alkuwaiti, 2016).

In summary, the case study of this hospital provides compelling evidence of the effectiveness of Six Sigma in healthcare, not only as a technique for reducing errors but also as an explicit catalyst for overall improvements that positively impact patient safety and organizational productivity. It underscores the potential of Six Sigma to play a transformative role in healthcare by aligning with the healthcare sector's commitment to continuous improvement and providing a roadmap for other healthcare organizations seeking to improve their operational excellence (Alkuwaiti, 2016).

Six Sigma application in the healthcare sector in Lithuania

When analysing foreign scientific literature on the implementation of the Six Sigma concept in Lithuanian healthcare, not a single article or book on this topic was found. There are also no foreign scientific sources and market research information on the implementation of the Six Sigma concept in other sectors. When analysing articles by Lithuanian authors on the implementation of Six Sigma in the healthcare sector in Lithuania, several articles were found. Janušonis and Asadauskienė (2006) wrote an article on the analysis of the implementation and possibilities of Six Sigma in healthcare

organizations. The article states that the concept of Six Sigma is suitable for improving quality in healthcare organizations. Another important analysis of the Six Sigma concept is the master's thesis "Implementation of the Six Sigma Concept in the Lithuanian Service Sector". The results of this study also show that it is possible to implement the Six Sigma concept in the Lithuanian service sector (Šimaitytė, 2014).

Currently, many companies on the Lithuanian market offer consulting services for the implementation of the Six Sigma concept. Although there are not many scientific articles on this topic in Lithuania, it can be said that there is a demand and interest in the analysed concept in the Lithuanian market. Nevertheless, there is no scientific literature analysis and no reliable market research proving the possibilities of implementing the Six Sigma concept and the application of possible methods in the Lithuanian healthcare sector.

Agile Management Application in Healthcare

The healthcare sector has seen a significant shift in management approach in recent years and the adoption of an Agile business management model has gained popularity (Sharma *et al.*, 2022). Originally developed for software development, the Agile methodology has proven to be versatile and effective in the dynamic and complex environment of healthcare (Ahmad and Wasim, 2023). Boustani, Azar and Solid (2020) claim that by incorporating principles such as iterative development, collaboration, and adaptability, Agile provides a framework that fits seamlessly into the ever-changing nature of healthcare (Boustani, Azar and Solid, 2020). According to Holden, Boustani and Azar (2021), this approach improves responsiveness to changing patient needs, enhances team communication, and utilizes resources more efficiently (Holden, Boustani and Azar, 2021). Moreover, Agile is incredibly valuable when facing unprecedented health challenges such as pandemics, requiring an urgent emergency response (Goel *et al.*, 2020).

Case Study: Agile management application in the eHealth systems

The agility of healthcare organizations has a significant positive impact on the innovation process. By being agile, organizations can improve their innovation process which is crucial for healthcare organizations to assess their performance as well as identify areas for improvement in their innovation process (Akkaya and Bagieńska, 2022). While many studies have shown a correlation between organizational agility and innovation in healthcare (Ravichandran, 2018; Brand *et al.*, 2021; Wanasida *et al.*, 2021), there is still a lack of research on the relationship between innovation and organizational agility in healthcare. Therefore, this current study is of immense value for future studies.

To facilitate eHealth innovation projects, innovative business management approaches must be adopted, management support must be ensured, user self-efficacy must be strengthened, and emergence must be enabled (Burnes, 2004). From a software development perspective, the Agile

methods developed for innovative projects with uncertain outcomes and user involvement are particularly suitable (Balje, Carter and Velthuijsen, 2015). The IMS, for example, is a pilot eHealth system that was developed between 2010 and 2011 by the NOVO Foundation, the Hanze University of Applied Sciences, and a system integrator. This case study shows how a healthcare organization with limited experience in such projects attempted to develop an innovative eHealth system that would have a positive impact on management, specialists, and care staff (Balje, Carter and Velthuijsen, 2015).

The product development process was divided into twelve *sprints*, each lasting three weeks. Every sprint had a clear *sprint goal* that was planned for several sprints in advance but was adjusted after each sprint based on new findings. The work in each sprint was based on the prioritized requirements listed in the *product backlog*. The most important meeting at the end of each sprint was the *sprint demo*. During this meeting, the developers presented their results directly to NOVO employees. The management specialists took part in the first demos, while the personal coaches and IT specialists joined in later. The demo then triggered a discussion about the pros and cons of the implemented solution, possible exception scenarios, impact on NOVO and its customers as well as new ideas for features. All observations and suggestions were noted on the spot to prevent them from getting lost in the following discussion. After the demonstration and discussion, the *sprint planning* for the next sprint was carried out. The product backlog was re-prioritized together with the newly generated ideas. The long-term sprint planning was reviewed, and it was decided which backlog elements should be developed in the next sprint. Any organizational actions or obstacles identified during the discussion were addressed by management. The development team applied typical Scrum practices such as *daily stand up, scrum board* and *burn down chart* internally, but did not include them in their interaction with NOVO.

This case study shows that Agile methodologies, particularly Scrum, allow for emergence through short development cycles, the creation of working deliverables that incrementally are further developed, and the ability to prioritize the development process according to emerging needs. The sprint demos facilitate repeated discussion among the product owner, users and the development team on visible and tangible results that are meaningful to both parties and lead to a common understanding and shared language. Agile practices also enable an increase in user self-efficacy as they effectively become co-creators of the product being developed.

The findings from the study show that a key factor for success is management's support. In this case, there was a pre-existing sense of urgency established by management before the project commenced. In all aspects of the project, management provided significant support but did not engage consistently to have an effect which impacted the project's decisiveness and ultimately resulted in its cancellation. Essentially, it is important to recognize that limited reliance on an Agile approach does not sufficiently mitigate this deficiency, emphasizing the importance of continuous and active management support throughout the project life cycle.

Scrum is one of the most frequently used Agile methodologies in the Lithuanian healthcare landscape (Jarmalavičius and Ragaišis, 2015). The IDC at Vilnius University Hospital Santara Clinics, for example, has been applying the Agile methodology since 2016. The IDC aims to contribute to the implementation of the most advanced information technologies, enchasing the availability and quality of medical services at Santara Clinics. They aim to create and maintain an efficient, comfortable and reliable working environment, ensure secure and accurate accounting, create technological opportunities for the development and training of medical science and help medical and other personnel to ensure smooth process management between all departments of the hospital. They use Agile to focus on the key areas of strategic activities, which include:

1) Optimizing IDC activities, for example, maintenance and development of engineering infrastructure;

2) Supporting and developing hospital information systems, including system stability and business continuity and information systems development;

3) Improving data management and control processes;

4) Enhancing the quality of services.

The IDC`s most important responsibility is to ensure the smooth functioning of the hospital`s information systems and subsystems by consistently maintaining and improving them. New information systems are created, and existing systems are improved as required (Santaros Klinikos, 2019).

Case Study: Agile management application in the healthcare sector during the COVID-19 pandemic in the Netherlands

The COVID-19 pandemic has posed unprecedented challenges to healthcare systems worldwide, requiring rapid and adaptable responses to ensure the safety and well-being of the population (Filip *et al*., 2022). Despite limited information and uncertainty, all countries around the world have had to respond to COVID-19 (OECD, 2020). Countries were encouraged to be agile and adapt, especially with regard to the timing of policy measures, the degree of centralization of decisions, the autonomy of decisions and the balance between change and stability (Janssen and van der Voort, 2020).

The healthcare sector in the Netherlands introduced an Agile framework, known for its iterative and collaborative approach, to help with crisis management (Janssen and van der Voort, 2020). Agile management enabled quick decision-making, improved communication channels, and empowered healthcare teams to adapt to changing circumstances. To counter the threat of COVID-19, the government had to adapt quickly and correctly, otherwise, there was the a risk of the virus spreading uncontrollably (Janssen and van der Voort, 2020).

The Dutch government proved to be agile and was able to respond quickly. However, in some cases, agility is at odds with adaptability. The Dutch COVID-19 response suggests that agility and

adaptability can go hand in hand but can also come into conflict in practice. In particular, the question can be raised as to whether the government has set the right priorities given its rapid response to identified problems. Therefore, Agile and adaptive management should not be confused, as they have different origins, objectives, and impacts (Janssen and van der Voort, 2020).

In summary, applying the Agile management model is a promising strategy to drive innovation, increase operational efficiency, and ultimately improve the quality of patient care as healthcare organizations strive to meet the challenges of an ever-evolving landscape (Willie, 2023). Indeed, successful adaptive management requires both rapid decision-making and sound analysis, both centralized and decentralized decision-making, both innovation and bureaucracy, and both science and politics (Janssen and van der Voort, 2020).

3.2. Comparative Analysis

In the healthcare industry, the implementation of Lean management has proven its advantages in terms of improving organizational effectiveness and cost-effectiveness. The key principle of Lean management is to eliminate non-value-added activities in order to improve productivity and quality healthcare while focusing on patient-centred care. This approach is particularly important in healthcare, where cost-effectiveness and quality of care are critical. Lean management helps improve process efficiency, increase customer satisfaction, and identify operational bottlenecks using tools such as value stream mapping. The use of performance metrics and data-driven decision-making processes allows healthcare organizations to evaluate and improve their processes, which allows for the rational allocation of resources.

Joniškis Hospital in Lithuania is an excellent example of successful Lean implementation. Despite the challenges posed by the pandemic, it has achieved financial gains and improved the quality of patient services. Vietnam`s 108 Military Central Hospital and Maastricht University Medical Center also achieved positive results, such as a significant reduction in waiting times and improved surgical care, respectively. However, some researchers have highlighted challenges, emphasizing the uniqueness of patient cases in healthcare and potential conflicts with patient-centred care. Addressing these challenges requires consideration of healthcare professionals` well-being, providing the necessary conditions and professional development, and empowering employees to solve work-related problems.

TQM is a widely used management method in the healthcare sector to improve the quality and efficiency of processes, mainly due to patient concerns about quality of healthcare. In healthcare, TQM principles emphasize continuous improvement, patient-centred care and employee involvement. The AtlantiCare case study in the United States is a perfect example of the effectiveness of TQM in improving organizational performance with a focus on patient satisfaction. The implementation involved a "Plan-Do-Check-Act" cycle that identified communication gaps and led to corrective actions that significantly improved performance and profits.

Similarly, the UAE has effectively integrated TQM into its healthcare sector through initiatives such as the Dubai Quality Award and compliance with international standards, with empirical data showing the positive impact of TQM on service quality. However, the implementation of TQM in Lithuanian hospitals is associated with particular challenges, including limited financial resources and knowledge. Successful implementation has been observed in larger hospitals where management awareness and employee training are key factors. Despite the reported successes, the lack of recent research in Lithuania shows that there is a need for up-to-date knowledge about the current dynamics and challenges of implementing TQM in healthcare.

Six Sigma is a quality management approach recognized in healthcare as a valuable strategy for improving quality, workflow efficiency and patient outcomes. With its focus on achieving zero defects in processes, it is particularly suited to the healthcare sector, where mistakes can have serious consequences. The integration of Six Sigma principles into healthcare processes aims to identify and reduce potential risks, improve workflow efficiency, enhance patient outcomes and optimize the use of resources. Two case studies demonstrate the success of Six Sigma in healthcare. The first case of Scottsdale Healthcare in Arizona shows how Six Sigma optimized an overcrowded ED by reducing patient transfer times and increasing overall capacity, resulting in higher profitability and shorter patient waiting times. A second case study of King Fahd University Hospital in Saudi Arabia shows how Six Sigma principles were successfully applied in the outpatient pharmacy to significantly reduce medication errors, improve patient satisfaction and increase safety measures. These case studies highlight Six Sigma`s transformative role in healthcare, aligning with the sector's commitment to continuous improvement and providing a roadmap for organizations seeking to improve their performance.

In addition to Six Sigma, Agile business management represents a paradigm shift in healthcare, providing a versatile and effective framework for the dynamic and complex healthcare environment. Agile principles such as iterative development, collaboration, and adaptation increase responsiveness to changing patient needs, improve team communication and use resources more efficiently. A case study of eHealth systems illustrates the positive impact of Agile management on innovation processes and highlights the relationship between organizational agility and innovation in healthcare. The study also emphasizes the importance of management support for the success of Agile methodologies. The application of Scrum, a widely used Agile model, is highlighted in the Lithuanian healthcare sector, specifically the IDC of Vilnius University Hospital Santara Clinics, which focuses on optimizing activities, maintaining and developing information systems, improving data management and increasing service quality. In addition, the application of Agile management during the COVID-19 pandemic in the Netherlands demonstrates its effectiveness in crisis management as it allows rapid decision-making, improved communication channels and adaptation to changing circumstances. While Agile management holds promise for innovation and operational efficiency, it is important to distinguish between agility and adaptability and recognize that both are necessary for

successful healthcare management in an ever-changing environment.

Lean management, TQM, Six Sigma and Agile business management models have proven to be effective in driving innovation processes in healthcare, but each approach has its disadvantages and limitations. Lean management, which emphases the elimination of non-value-added activities, has been beneficial in increasing the efficiency and quality of care. However, challenges arise in healthcare due to the uniqueness of patient cases and potential conflicts with patient-centred care. TQM, with its focus on continuous improvement and employee involvement, has proven successful in improving organizational performance and patient satisfaction. Yet, challenges in implementing TQM in Lithuanian hospitals include limited resources and knowledge, with larger hospitals showing more success. As the case studies show, Six Sigma's focus on achieving zero defects in processes has proven valuable in healthcare. However, a rigid focus on process improvement can lead to broader systemic issues, and successful implementation requires a commitment to data-driven decision making. Agile management, characterised by adaptability and principles of collaboration, provides a versatile framework for the dynamic healthcare environment. The success of the Agile model is highly dependent on consistent management support, as inconsistent support can lead to project cancellation, as seen in a case study. Furthermore, while Agile management is promising for crisis management, it is important to distinguish between agility and adaptability to achieve successful healthcare management in an ever-changing environment. The main aspects of the advantages and limitations of each business management model are presented in Table 3.

In conclusion, each model has unique strengths and limitations that require careful consideration of contextual factors and potential challenges when applied to healthcare innovation processes. Choosing the right model depends on the specific needs and challenges of each healthcare organization. Lean management is characterised by improving efficiency and quality of care, TQM by continuous improvement and employee engagement, Six Sigma by achieving zero defects in processes and Agile management by the principles of adaptability and collaboration. Organizations need to adopt a tailored approach to healthcare management to improve performance and drive innovation, ultimately leading to improved patient outcomes and higher quality care.

Table 3

Business management models: advantages and limitations

Business Management Model	Advantages	Limitations
Lean	• Improved productivity and cost-effectiveness; • Financial gains; • Patient-centred care through streamlined processes; • Increased patient satisfaction.	• Resistance to change; • Resource intensity; • Overemphasis on cost cutting.
TQM	• Increased employee engagement and satisfaction; • Cost reduction and efficiency; • Continuous improvement and patient-centred care; • Increased patient satisfaction.	• Resistance to change; • Resource intensity; • Overemphasis on metrics.
Six Sigma	• Evidence-based decision-making approach; • Cost savings; • Workflow efficiency; • Increased patient satisfaction.	• Resistance to change; • Resource intensity; • Overemphasis on cost cutting.
Agile	• Increased responsiveness to changing patient needs; • Enhanced team communication and collaboration; • Early and predictable delivery; • Increased customer satisfaction.	• Resistance to change; • Scaling complexities; • Overemphasis on short-term goals.

Source: created by the author.

3.3. The Integrated Healthcare Innovation Model (IHIM) Conceptual Framework

The healthcare industry is constantly evolving, and innovative solutions that improve patient outcomes are crucial (Flessa and Huebner, 2021; Kraus *et al.*, 2021; Lee and Yoon, 2021; Kulkov *et al.*, 2023). In addition, the complex and dynamic nature of the healthcare sector, combined with the various strengths and weaknesses of business management models, required a comprehensive and integrated approach. To address this need, a comprehensive conceptual framework called the Integrated Healthcare Innovation Model (IHIM) was developed. This model emerged as a practical response to the complex challenges and opportunities of the healthcare sector and provides a flexible,

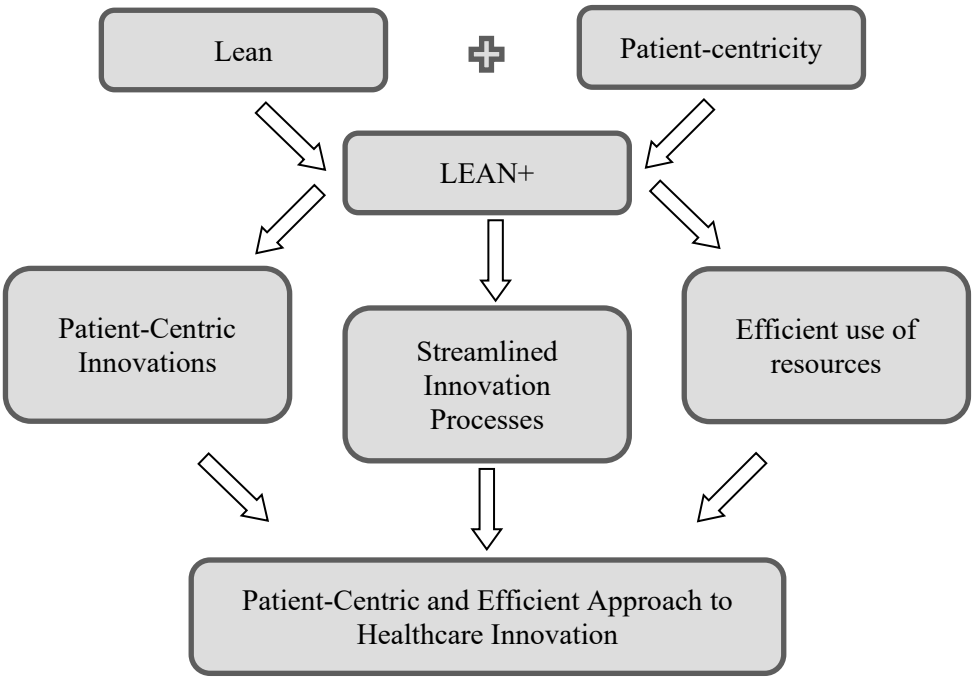
patient-centred and holistic framework to drive innovation in the industry. It offers a new way of thinking about healthcare innovation and provides a roadmap for healthcare organizations that want to excel in this area. The IHIM framework consists of key components that complement each other to drive innovation in healthcare: Lean+, Total Innovation Quality Management (TIQM), Innovative Sigma and Agile Healthcare Framework (AHF).

LEAN+: Patient-Centred Efficiency

LEAN+, which incorporates Lean principles, aims to increase efficiency by eliminating non-value-added activities. However, it goes beyond traditional Lean practices by integrating a patient-centred approach. LEAN+ aims to deliver innovations that directly improve the quality of care and patient outcomes. It also ensures that healthcare organizations meet the needs and preferences of patients and that processes are not only streamlined but also tailored for operational efficiency. Continuous patient feedback is emphasized to ensure that the care provided meets patient expectations, contributing to continuous improvement and bringing innovations in the healthcare sector more efficiently.

Figure 4

LEAN+ framework



Source: created by the author.

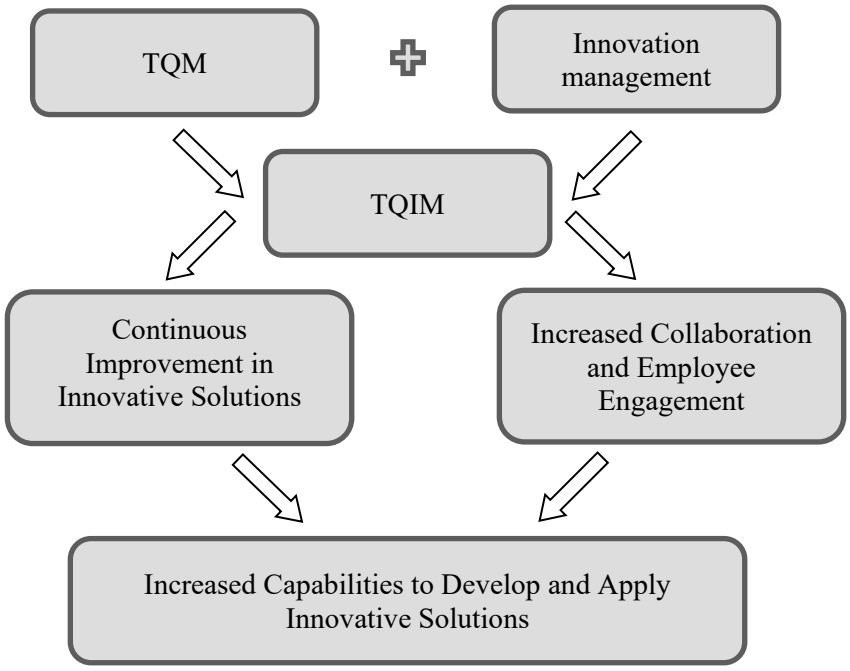
TIQM: Continuous Improvement in Innovation

TIQM combines the principles of TQM with innovation management practices. In addition to continuous operational improvement, TIQM also expands the possibilities for developing and applying innovative solutions. As a result, there is a systematic and disciplined approach to managing

the entire innovation process, from idea generation to implementation. This leads to more efficient, transparent and better organized innovation processes. TIQM also promotes a culture of collaboration and employee involvement in the innovation process. Through mechanisms such as cross-functional teams and continuous improvement initiatives, employees are empowered to contribute their insights, creativity and expertise to innovation efforts, fostering a more inclusive and dynamic innovation environment.

Figure 5

TQIM framework



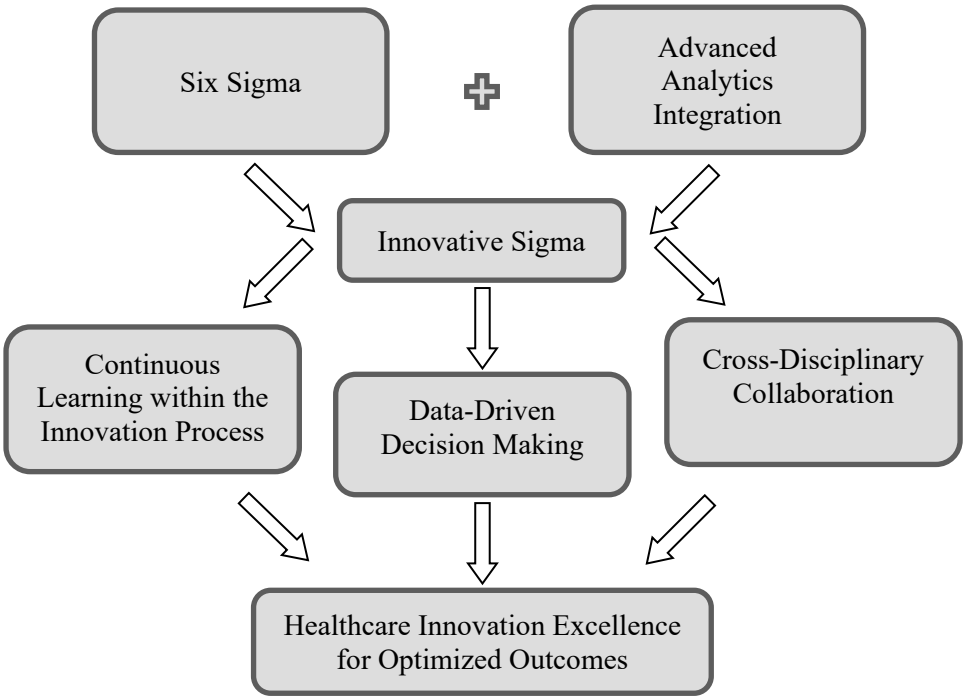
Source: created by the author.

Innovative Sigma: Data-Driven Innovation Excellence

The Innovative Sigma approach, based on the principles of Six Sigma, emphasizes the importance of data-driven decision making and uses statistical methods and analysis to optimize the development and implementation of innovative healthcare solutions. By fostering a culture of precision and excellence using performance metrics, historical data and regular feedback, Innovative Sigma guides strategic decisions that lead to successful implementation and improvement of innovative solutions. This component contributes to a culture of precision and excellence by maintaining a commitment to achieving zero defects in both processes and innovation.

Figure 6

Innovative Sigma framework



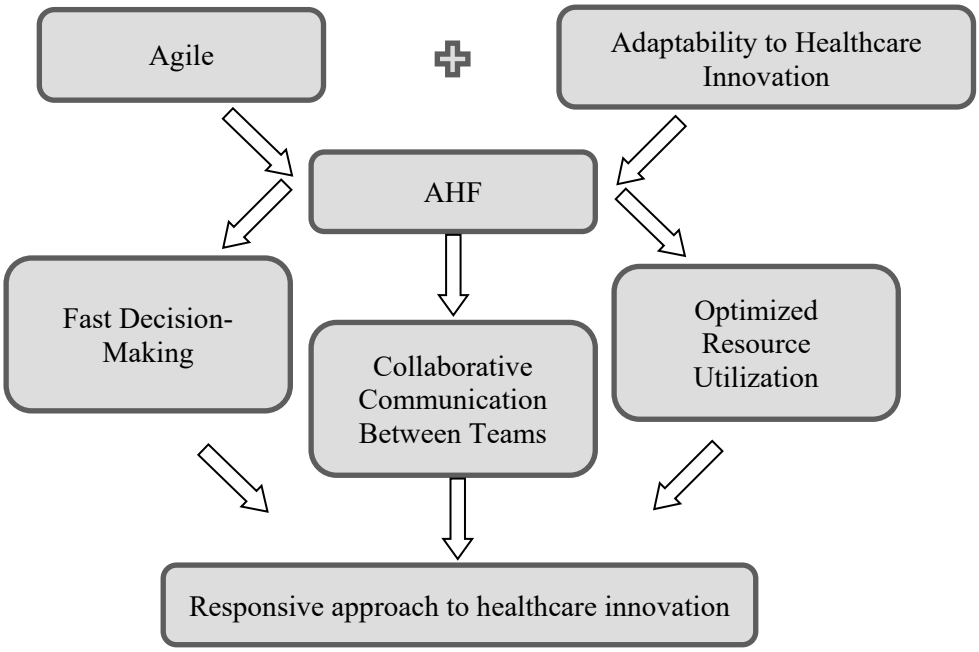
Source: created by the author.

AHF: Dynamic Adaptability and Collaboration

AHF is based on the principles of agile methodology and emphasizes iterative development, collaboration and adaptability. It ensures that healthcare organizations can respond quickly to changes in patient needs and dynamic circumstances within IHIM. This component aims to improve communication and collaboration between healthcare teams to enable more effective patient care, optimize the use of resources, including time, personnel, and technology in healthcare settings, and enhance data management to support a rapid and responsive approach to healthcare innovation. The AHF framework leads to a healthcare management approach characterised by increased responsiveness to changing patient needs, improved team communication, efficient use of resources, and iterative development methods, ultimately leading to improved operational flexibility, adaptability and innovation within healthcare organizations.

Figure 7

AHF framework



Source: created by the author.

A synergistic combination of models is part of IHIM's integrated methodology. To develop a solid framework for managing innovation in healthcare, it combines efficient continuous improvement, data-driven decision making and adaptability. By integrating these methodologies, the IHIM aims to overcome the limitations of each approach and to develop a comprehensive strategy that reflects with the specific challenges and opportunities in healthcare.

Characteristics and Key Components

The IHIM framework is built on fundamental principles that prioritize patient-centred innovation and a culture of continuous learning. First of all, IHIM places patients at the centre of the innovation process. By putting patients' needs first and ensuring that solutions are tailored to the uniqueness of each case, the model upholds the principles of *patient-centred care*. Also, IHIM encourages healthcare organizations to seek and prioritize patient input at all stages of the innovation lifecycle to ensure that solutions are tailored to the unique needs, preferences and challenges of individual patients. It is recommended to systematically collect and integrate patient feedback into the development and improvement of healthcare services and solutions. By placing the patient at the centre of innovation, IHIM ensures that healthcare interventions are tailored to the diversity of patient cases and promote personalized and effective care.

In addition, a *culture of continuous learning* emphasizes the importance of ongoing education, training and skills development for healthcare professionals. Based on this framework, healthcare professionals should be empowered to actively contribute to the innovation process by providing

them with the necessary training and education opportunities. However, learning does not have to be limited to traditional healthcare practices, but should include knowledge of new technologies, methodologies and best practices in innovation as well. Thus, a culture of continuous learning ensures that healthcare professionals remain agile and adaptable, and fosters an environment where innovation is seen as a dynamic and evolving process.

In addition, IHIM promotes effective knowledge management, capturing and sharing both tacit and explicit knowledge within the organization to create a culture of knowledge sharing that facilitates innovation. Employees should be encouraged to collaborate across different departments and specialities, as IHIM promotes a *multidisciplinary approach* and recognizes that different perspectives contribute to broader and more effective innovation.

The IHIM approach also recognizes the need to ensure consistent and committed *leadership engagement* for innovation initiatives. This model supports the idea that leaders should actively participate in and encourage innovation efforts by providing the necessary resources and fostering a culture that values and rewards innovative thinking. Leadership should also ensure that innovation efforts are aligned with the strategic goals of the healthcare organization. This includes integrating innovation into the organizational strategy, making it a core element of decision-making and resource allocation.

Finally, IHIM involves strategic resource planning that includes the *optimization of financial and intellectual resources*. Data-driven decision-making processes should be used to allocate resources effectively and ensure that innovation initiatives receive the necessary support without jeopardizing the financial stability of the organization.

These key components and characteristics serve as the foundation upon which the entire IHIM framework is built. They emphasize the importance of aligning innovation with patient needs, fostering a culture of continuous improvement, creating an environment where healthcare professionals are encouraged to actively contribute to the innovation process and optimizing resources. The IHIM model recognises that successful innovation in healthcare depends on a strong commitment to patient-centricity and a mindset that values continuous learning and adaptation.

Advantages and Considerations

The IHIM framework envisions a *cultural transformation* in healthcare organizations where innovation becomes part of the organizational DNA. This cultural shift ensures that innovation is not seen as a separate initiative but as an integral part of delivering high quality patient care. By empowering its employees and recognizing their contributions to innovation, IHIM also contributes to *higher employee satisfaction and increased retention* of talented healthcare professionals. A positive and innovative work environment attracts and retains the best talents in the healthcare industry. In addition, strong organizational support and development enable healthcare organizations to ensure an *agile response to challenges*. Managers and employees are equipped with the skills and

mindset required to adapt to changing circumstances and find innovative solutions, especially in times of crises. Essentially, this component of IHIM aims to create an environment that fosters innovation by aligning leaders` visions, empowering employees, strategically optimizing resources and fostering a culture that values and supports continuous learning and improvement. Finally, the IHIM is a framework that combines *adaptability and crisis management*. This framework has great potential to help organizations respond to changing circumstances and maintain a balance between agility and adaptability. In addition, IHIM creates a structured crisis response plan based on Agile principles, maintains communication channels, makes rapid decisions during crises, and uses innovation to address emerging challenges.

However, IHIM recognizes the importance for healthcare organizations to align their short-term operational goals with their long-term innovation goals. It is critical that leadership strikes this balance and ensures that innovation is not sacrificed for immediate operational gains. Also, the IHIM recommends the introduction of reward and recognition systems that recognize and reward innovative efforts. This could include recognizing successful innovation, fostering a culture of appreciation for creative problem-solving, and incentivizing employees to actively contribute to the innovation agenda. Finally, IHIM expects leaders to be adaptable by dealing with uncertainty, facilitating change, and maintaining a supportive environment for innovation, especially in times of change or crisis.

To summarize, the IHIM is a comprehensive and flexible approach that surpasses traditional business management models such as Lean, TQM, Six Sigma, and Agile in promoting innovation processes in healthcare. Tailored specifically for healthcare organizations, it ensures operational excellence and drives meaningful innovation in patient care. The IHIM optimizes innovation processes in hospitals, research departments and other areas such as leadership training, healthcare technology implementation, public health initiatives and global health organizations. Consulting firms, medical education programs, start-ups and quality improvement initiatives can also leverage IHIM to develop structured and patient-centred innovation. Overall, the IHIM is a versatile and holistic guide that can be applied across diverse aspects of healthcare. The main components and key elements of the IHIM framework are presented in Table 4.

Table 4

Components and Key Elements of IHIM

Components	Key Elements
Integrated Methodology	LEAN+: Patient-Centred Lean Management
	TIQM: Total Innovation Quality Management
	Innovative Sigma: Six Sigma for Innovation
	AHF: Agile Healthcare Framework
Key Components and Characteristics	Patient-centred care
	Culture of continuous learning
	Leadership engagement
	Financial and intellectual resources optimization
Advantages	Cultural transformation
	Higher employee satisfaction and increased retention
	Agile response to challenges
	Adaptability and crisis management
Considerations	Balancing short-term and long-term goals
	Reward and recognition systems
	Adaptive leadership skills

Source: created by the author.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. Each business management model has its own advantages and limitations that require careful consideration of contextual factors. Lean management is characterised by efficiency and quality, TQM is known for its continuous improvement, Six Sigma excels at achieving zero defects, and Agile management at rapid adaptability. To drive innovation and improve patient outcomes, healthcare organizations should adopt a tailored approach to healthcare management.

2. The choice of the right business management model depends on the specific needs and challenges of each healthcare organization. This tailored approach can improve operational excellence and drive innovation, leading to better patient outcomes and higher quality of care.

3. The IHIM framework provides a roadmap for healthcare organizations to drive healthcare innovation processes by integrating innovation into high-quality patient care. It empowers employees, which increases job satisfaction and retains talented professionals, emphasizes the need to align short-term performance goals with long-term innovation goals, recommends implementing reward systems to recognize innovative organizational efforts, and highlights the importance of fostering agile leadership, especially in times of change or during the crisis.

Recommendations for healthcare organizations

1. Adopt a Comprehensive Approach: Consider adopting an integrated methodology, such as the IHIM. This model combines the strengths of Lean+, TIQM, Innovative Sigma and AHF into a synergistic and comprehensive healthcare innovation management strategy.

2. Patient-Centred Innovation: Prioritize patient-centred care and involve patients in every phase of the innovation lifecycle. Systematically collect and integrate patient feedback to ensure that solutions are tailored to each patient`s individual needs, preferences and challenges.

3. Continuous Learning Culture: Promote a culture of continuous learning among healthcare professionals. Encourage ongoing education, training and skills development, not only in traditional healthcare practices but also in new technologies, methodologies and best practices in innovation.

4. Leadership Engagement: Ensure consistent and dedicated leadership commitment to innovation initiatives. Leaders should actively participate in and encourage innovation efforts by providing the necessary resources, fostering a culture that values and rewards innovative thinking, and aligning innovation efforts with the organization`s strategic goals.

5. Empower Healthcare Professionals: Empower healthcare professionals to actively participate in the innovation process. Provide training and education opportunities to improve their skills in both traditional healthcare practices and innovative approaches. Encourage collaboration between different departments and specialities.

6. Optimize Resources: Introduce strategic resource planning that includes the optimization of financial and intellectual resources. Use data-driven decision-making processes to allocate resources effectively and ensure that innovation initiatives receive the necessary support without jeopardizing the financial stability of the organization.

7. Reward and Recognition Systems: Implement reward and recognition systems that recognize and reward innovative efforts. Acknowledge successful innovation, foster a culture of appreciation for creative problem solving and incentivize employees to actively contribute to the innovation agenda.

8. Balancing Short-Term and Long-Term Goals: Ensure alignment between short-term operational goals and long-term innovation goals. Leadership should find a balance and avoid sacrificing innovation for immediate operational gains.

9. Adaptive Leadership: Rely on adaptive leadership, especially in times of change or crisis. Deal with uncertainty, facilitate change and maintain an environment conducive to innovation, even when faced with challenges.

10. Crisis Management with Agility: Utilize Agile principles for crisis management. Create a structured crisis response plan, maintain communication channels, make rapid decisions in times of crises, and use innovation to address emerging challenges.

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