

The Impact of Applying the Agile Methodology on the Quality of Health Project Implementation: An Applied Study in Private Sector Hospitals in Riyadh City

على جودة تنفيذ المشاريع الصحية دراسة تطبيقية في مستشفيات القطاع الخاص بمدينة الرياض Agile أثر تطبيق منهجية

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Abstract

This research investigates the impact of Agile methodology on the quality of healthcare project implementation within private hospitals in Riyadh, Saudi Arabia. With the growing emphasis on flexibility, digital transformation, and patient-centered care—particularly in alignment with Vision 2030—Agile frameworks such as Scrum, Kanban, and SAFe have emerged as promising approaches to enhance responsiveness, efficiency, and cross-functional collaboration. The study adopts a quantitative research design using a structured survey targeting 50 professionals in healthcare project management roles. Findings reveal a positive correlation between Agile practices and improvements in project delivery timelines, cost control, service quality, and stakeholder engagement. Additionally, organizational readiness—including leadership support and adaptive culture—was identified as a significant moderating factor influencing Agile's success. The study also explores challenges in Agile adoption, such as resistance to change and limited Agile literacy, while highlighting the potential of integrating Lean Six Sigma and change management theories. The results offer empirical evidence supporting Agile's effectiveness in Saudi healthcare settings and present practical recommendations for enhancing its implementation to meet strategic healthcare goals. This research fills a critical gap in empirical studies on Agile in the Saudi private healthcare sector and provides a model for future improvement initiatives.

Keywords:

Agile Methodology, Healthcare Project Management, Vision 2030 Saudi Arabia

الملخص

تهدف هذه الدراسة إلى استكشاف أثر تطبيق منهجية أجايل (Agile) على جودة تنفيذ المشاريع الصحية في مستشفيات القطاع الخاص بمدينة الرياض، في ظل التحول الرقمي المتسارع وتزايد التوجه نحو رعاية صحية محورها المريض، بما يتماشى مع مستهدفات رؤية السعودية 2030. اعتمدت الدراسة على منهج

كيمي باستخدام استبيان موجه لـ 50 متخصصًا في إدارة المشاريع الصحية. أظهرت النتائج وجود علاقة إيجابية بين تطبيق ممارسات أجايل وتحسن جودة التنفيذ، من حيث تقليص مدة الإنجاز، تحسين الكفاءة، وضبط التكاليف، إضافة إلى تعزيز التعاون بين الفرق ورضا أصحاب المصلحة. كما تبين أن جاهزية المنظمة، بما يشمل دعم القيادة ومرونة الثقافة المؤسسية، تعد عاملاً حاسماً في نجاح تطبيق أجايل. تناولت الدراسة أيضاً أبرز التحديات مثل مقاومة التغيير وضعف المعرفة بمنهجية أجايل، واقترحت دمجها مع نماذج تحسين الجودة مثل "الين ستة سيغما" ونموذج إدارة التغيير "كوتر". تسد هذه الدراسة فجوة معرفية مهمة في الأدبيات المتعلقة بتطبيق أجايل في القطاع الصحي الخاص بالسعودية، وتقدم نموذجاً عملياً يمكن أن يُستفاد منه في تحسين جودة المشاريع المستقبلية.

الكلمات المفتاحية:

أجايل، إدارة المشاريع الصحية، رؤية السعودية 2030

Introduction

Over the past few years, the healthcare systems across the whole world have experienced a phenomenal change due to digital innovation and increased patient expectations, as well as the necessity of greater efficiency. In this regard, flexibility, collaborative project management methodologies and iterative methodologies have become popular, especially Agile methodology. Agile was first developed as software development and is currently being extensively discussed in other industries, with the healthcare domain being one of them; the tenets of responsiveness, constant feedback, and cross-functional collaboration closely resonate with the rapid and unexpected nature of the healthcare environment (Alotaibi & Almudhi, 2023). In their attempts at enhancing service delivery and patient outcomes, the Agile principles present viable avenues that healthcare institutions should consider as some of the potential expedients to the realization of enhanced flexibility, decreased implementation time, and streamlined care delivery processes.

The agile methodology has increasingly been accepted as one of the important tools to use during health sector project management on the basis of its ability to react fast to any changes in patient requirements and needs in the clinical context. In contrast to linear prototypes, Agile enables iterative planning, frequent stakeholder involvement and assessment, which remain essential in a healthcare environment with a dynamic regulatory environment and clinical intricacies (Saleh et al., 2024). As an example, in hectic settings such as emergency rooms and home-based hospital systems, implementation of Agile would enable the facilitation of multidisciplinary team coordination, minimise redundancies and provide medical and administrative challenges with the ability to adapt quickly. According to recent research, Agile holds a promise to better the decision-making processes and achieve real-life results in terms of quality and patient happiness with the help of responsive and modular project cycles (Desai et al., 2024).

Agile approaches are especially applicable in the Kingdom of Saudi Arabia, where the healthcare industry is in the active process of transforming as per the objectives of Vision 2030. Healthcare has gone through privatization and has seen the increase of tools based on digital health, patient-centric care, cost effectiveness, which requires flexibility, scalability and outcome-based project management strategies. Al Owad et al. (2023) have reported a positive measurable outcome of Lean Six Sigma integrating with change management models in applying them to emergency care services, which indicates a favorable environment of Agile application to analogous medical communities. Moreover, the functioning of hospital pharmacy, which has always been associated

with the issue of inventory management, staffing, and workflows optimization, can also be improved with hybrid Agile models that allow optimizing efficiency and clinical quality, according to Sallam (2024).

Although there is an increasing interest in exploring the functions of Agile methodology in the healthcare field, little empirical study, dedicated to exploring the practice of Agile methodologies, can be found in the Saudi private hospital sector. The majority of the studies conducted so far remained theoretical or exploratory in nature, and a small number of them provided on-the-ground overview on how the Agile frameworks might impact healthcare projects, collaborations between the stakeholders, or the outcomes of the services. This paper will attempt to address that gap by discussing how the implementation of Agile methodology influences the quality of health project implementation in the context of Riyadh and its private hospitals. The study will produce meaningful evidence about the effectiveness of Agile in Saudi healthcare settings by giving prominence to offline implementations and results, which could prove beneficial in informing future policy-making and operating practices.

Research Problem

The rate of providing high-quality project implementation in healthcare establishments is becoming more demanding in the context of a constantly developing environment with a high level of complexity. Conventional project management techniques fail to fulfill the changing necessities of the healthcare sector in most instances (Saleh et al., 2024). To counter that, the Agile approach has appeared as a contemporary system that prioritizes the modification of constant change, the coordination, and stakeholder engagement, which is highly applicable to the pace of the healthcare service (Alotaibi & Almudhi, 2023). Yet, despite the increased interest in Agile in the global healthcare landscape, the absence of empirical research on the real contribution of the Agile method to project quality, particularly in the context of the Saudi Arabian privately owned healthcare sector deserves to be mentioned (Desai et al., 2024).

This shortage is worse in Riyadh, as it is a city experiencing a boom with regards to the proliferation of private hospitals in consonance with Vision 2030 change in the country. Irrespective of this growth, there is still little evidence to find out whether the use of Agile in these environments would really improve the quality of any project or not, because of impediments in organizations and cultural attributes that act as barriers to effectiveness (Al Owad et al., 2023). Recent research shows that successful implementation of Agile in the domain of healthcare presupposes congruence between the method and the culture and possibilities of the organization to comply with its leadership (Githara, 2024). Besides, the pairing of Agile and quality-improvement frameworks like Lean and Six Sigma could potentially provide better performance results in cases of proper settings (Sallam, 2024).

- Based on that, the research problem lies in the fact that there are no field-based studies directly evaluating the use of Agile methodology and its effect on the quality of healthcare project implementation at the private hospital of Riyadh. The lack of knowledge restricts fact-based decision making and can be applied to one of the most strategic healthcare industries in the Kingdom. This study therefore seeks to address the following research question:

To what extent does the application of the Agile methodology affect the quality of healthcare project implementation in private sector hospitals in Riyadh?

Importance of the Study

1. Scientific Importance:

- ❑ Contributes to the limited body of knowledge on Agile methodology application in healthcare project management.
- ❑ Provides empirical data specific to the private healthcare sector in Riyadh, an under-researched area.
- ❑ Enhances understanding of the relationship between modern project management approaches and service quality in clinical settings.
- ❑ Opens pathways for comparative studies across different healthcare systems and regions.
- ❑ Supports academic discussions on integrating flexible methodologies in complex organizational environments.

2. Practical Significance

- ❑ Offers insights for hospital administrators and project managers to improve project outcomes using Agile principles.
- ❑ Assists decision-makers in adopting more effective and adaptable project management strategies.
- ❑ Helps identify operational barriers and success factors in Agile implementation within healthcare institutions.
- ❑ Supports the development of training and capacity-building programs tailored to Agile healthcare projects.
- ❑ Contributes to improving patient care quality by optimizing project execution and responsiveness in healthcare settings.

Objectives of the Study

Main Objective:

- ❑ To assess the impact of applying the Agile methodology on the quality of healthcare project implementation in private sector hospitals in Riyadh.

Sub-Objectives:

- ❑ To identify the key components of Agile practices being implemented in private hospitals.
- ❑ To evaluate the extent to which Agile improves project efficiency, adaptability, and team collaboration.
- ❑ To examine the challenges and barriers faced during the implementation of Agile in healthcare settings.
- ❑ To analyze the influence of Agile on project timelines, cost control, and patient-centered outcomes.

- To propose recommendations for enhancing Agile adoption in healthcare project management.

Theoretical Literature

Foundations of Project Management Theory

Traditional Project Management Approaches

The formal profession of project management has traditionally utilized plan-based, or so-called waterfall techniques. Such conventional models focus on sequential stages of development which include: initiation, planning, implementation, monitoring and closure. This linear path presupposes that all the requirements are known in advance; also, in this case, every stage should be accomplished before going to the next one. In healthcare, these methodologies were mostly applied to broader-scale physical infrastructure initiatives, implementation of electronic health records (EHRs), or implementation of systems in the clinical domain. Traditional project management (TPM) is based on control, predictability and documentation, hence is appealing to an environment where there is magnitude of regulation and accountability.

Nevertheless, such attributes may also impact the performance negatively in a dynamic environment, such as healthcare where processes may change, regulations may change, or the needs of the patients may change throughout the project lifecycle. Such fluid environments may not be easy to handle by TPM. Rigid nature of waterfall model tends to result in the high cost and time overrun, especially when those assumptions that were made the first time are proven wrong or incomplete (Alotaibi & Almudhi, 2023). Also, the use of stakeholders in the traditional models is normally restricted to the reviews of milestones thus there is lesser probability of the iterative feedback that could enhance service delivery. Such constraints have precipitated a move towards more adaptive frameworks that can incorporate uncertainty and rapid change establishing the conditions of the coming of Agile.

Evolution Toward Agile Methods

The inability of TPM to handle ambiguity and the late-arising needs prompted the appearance of Agile approaches in the software development industry in the beginning of the 2000s. Agile rose due to the necessity of the more quick, customer-oriented, and flexible solutions. Agile is more iterative, with stakeholders involved aggressively at every stage and with constant re-evaluation and reconsideration of goals and results. These principles are since extended outside of software into healthcare, construction, and education where the needs and multi-faceted stakeholder environment are also rapidly changing.

Agile methods have also made a breakthrough in healthcare in such spheres as hospital activities, digitalization, pharmaceutical activities, and telemedicine initiatives (Sallam, 2024). This is, in part, attributable to the fact that Agile can add value gradually and listen to end-user (patients, healthcare professionals and administrators) real-time feedback. Agile methods are characterized by the speed of prototyping, cross-functional teams, as well as the planning horizon (Saleh et al., 2024). Such skills are now considered to be critical in a climate that evolves with technological advancements, a shifting set of patient demands, as well as with a culture that requires accountability of performance.

The comparative Analysis: Predictive Models vs. Adaptive Models

The traditional (predictive) and Agile (adaptive) approaches have two divergent perspectives as to how projects are to be planned, performed, and analyzed. The main features of predictive models are a clear planning, scope and resource assignment that precede their execution. They fit in projects that are low on uncertainty and high on multiplication. Conversely, the adaptive models are based on the premise that any change is unavoidable and project teams should not be prescriptive.

There is a basic contrast in the stakeholder involvement. Predictive models include stakeholders mostly in the initiation and closing stages, but adaptive models take into account the comments of the stakeholders all over the project (Saleh et al., 2024). This is especially applicable in healthcare where its stakeholders such as patients or regulators may offer a valuable input that can change the course of the project. The recurring cycles of Agile feedback are appropriate in those situations where requirements and contextual expertise increase between iterations.

Risk management is yet another difference. The risks in predictive models are known beforehand and are resolved by performing contingency planning. Agile management approach to risk requires short iterations, fast prototyping and the think big, act small, but fail fast approach where early identification and correction is possible. This will improve flexibility and enables realization of benefits earlier.

Predictive models are ideal in projects where there are cost savings due to standardization, compliance and predictability but Agile is more appropriate in settings where innovation, responsiveness and collaboration are needed, and they are more valuable in modern healthcare settings where these qualities are most essential (Alotaibi & Almudhi, 2023). Accordingly, preference between the two methodologies or combining them to form hybrid models largely depends on the complexity of the healthcare project under consideration, uncertainty of a healthcare project, and dynamism of a healthcare project.

Agile Methodology: Theory Base

Origins and Evolution of Agile

The Agile Manifesto of 2001 which was the creation of a group of software developers in the search of an improved way to handle software projects was a start of the Agile methodology. Unsatisfied with more strict and documentation-related models, they suggested a list of values and principles that involved people, interactions, working software, collaboration with customers and change responsiveness. These concepts in the long term were mutated into a movement that affected the theory and practice of project management all over the world.

Agile is rooted in the concepts of lean thinking, iterative development and system theories. Agile thinking assimilated lean ideas of Japanese manufacturing which were abolishing waste and streamlining value streams. Agile was also shaped by the iterative development practises of the 1990s including Rapid Application Development (RAD) and Extreme Programming (XP). These core concepts allowed structuring more flexible and rigid frameworks such as Scrum, Kanban, and SAFe.

In the sector of healthcare, the trend of Agile started with digitalization of services (where software projects required faster cycles and increased user satisfaction). Nonetheless, it has recently been

applied in the scope of operations like patient admission, clinical trials, pharmacy management, and infrastructural development in the hospitals (Sallam, 2024). This flexibility in being more clinically or non-clinically oriented shows its theoretical flexibility and worth as an organization.

Core Principles of the Agile Manifesto

The Agile Manifesto outlines four key values:

1. **Individuals and interactions over processes and tools**
2. **Working software over comprehensive documentation**
3. **Customer collaboration over contract negotiation**
4. **Responding to change over following a plan**

These principles are backed by 12 guiding principles that focus on iterative delivery, stakeholder satisfaction, sustainable development, face to face communication and continuous improvements. The implications of these principles within healthcare cannot be understated as the communication within a team, iterative improvement, and patient involvement are essential to service quality and safety.

Take, for instance, Agile promotes constant re-consideration and the change of the process, which healthcare requires due to quality improvement demands (Saleh et al., 2024). On the same note, Agile privileging focus on working software is comparable to giving functional health interventions, though they may be incomplete or iterative, over full systems patent and finishing. At this, the underlying ideas of Agile approach fit well with the evidenced-based healthcare practice that can be changed rather than strict plans.

Agile Values and Practices in Organizational Context

In addition to principles, Agile consists of several helpful tools and practices in support of its theoretical orientation. Frameworks like Scrum add roles (e.g. Scrum Master, Product Owner), ceremonies (e.g. daily stand-ups, sprint reviews) and artifacts (e.g. product backlogs) to support transparency, accountability and constant feedback. Such structures can be applied to the healthcare setting. As an illustration, hospital unit morning briefings can be similar to daily stand-ups, synchronizing activities and priorities of the work teams.

Organizationally, Agile encourages decentralization, team independence, and cross-functionality-the characteristics that are becoming required to manage complex healthcare projects (Githara, 2024). Agile teams get the ability to make local decisions, which boosts the speed and proper context. This is especially so in the privately owned healthcare facilities in Saudi Arabia as organizational agility is essential to achieve performance targets, performance expectation, and patient satisfaction measures.

Moreover, the Agile stresses on minimal viable products (MVPs), which helps to embrace experimental methods of service design in healthcare. When small pilots are introduced and the impact can be measured, large-scale implementations can be introduced in successful interventions. This is less risky and helps foster innovation. It is also consistent with the tradition of action research of healthcare improvement science.

In perspective of culture, Agile also creates a learning-based condition. Agile emphasizes the idea of constant improvement by means of using retrospectives and process improvement. This principle is particularly topical in medical care where the quality and safety rely on the repetitive learning based on near misses and patient experiences as well as inter-professional teamwork.

Not that there are no thorns that can be associated with the implementation of Agile values into healthcare organizations. The opponent attitude towards change, decision-making highly centralized, as well as the complexity of the regulatory system may suppress the use of Agile (Alotaibi & Almudhi, 2023). As such, it is frequently necessary to implement Agile and introduce concurrent organizational change, necessitating training, executive sponsorship, and a culture that places an emphasis on experimentation and accountability.

Agile Frameworks Relevant to Healthcare

One of the most popular Agile frameworks that have been implemented in a hospital environment is the Scrum framework, dealing with IT systems and digital health the most. It works in short development iterations, called sprints, 1 sprint is usually 2-4 weeks during which cross-functional teams work together to provide incremental value. The fact that Scrum is highly structured (with specific roles (Product Owner, Scrum Master, and Development Team), ceremonies (daily stand-ups, sprint reviews, and retrospectives) and artifacts (product backlog, sprint backlog, and increment)) allows it to be highly effective in supporting transparency, accountability, and continuous improvement (Kakumanu, 2024).

Scrum

Complexity, uncertainty, and the constantly changing nature of needs in the field of healthcare need dynamic project management processes. Agile frameworks are provided as a contrast to traditional models with their focus on flexibility, collaboration, and on iterative progress. Some of the most used frameworks in healthcare are Scrum, Kanban, Lean-Agile/SAFe and DSDM. Each framework also introduces a different perspective and tools to improve the final results of the project, especially the health information system, digital change, and clinical process improvement.

Hospitals in Saudi Arabia transforming their digital health environment have used Scrum to create patient portals, electronic health record (EHR) applications, and clinical decision support applications. Iterative model implies the use of repetitive testing and adaptation which can be especially helpful when adjusting the software functions towards clinical workflow (Al Owad et al., 2023). Furthermore, Scrum builds on team participation, shortens time development, and encourages constant feedback, an aspect of high-value to settings characterized by fast development of health technologies and continuous changes in the needs and expectations of stakeholders.

Kanban

Kanban does not work like the Scrum system of sprints, but aims towards visualizing workflow and limiting in-progress work in order to increase efficiency and eliminate bottlenecks. It is especially applicable when healthcare operations should follow regular continuous work as opposed to sprints. In the meantime, Kanban boards (physical and digital) pose different steps or categories of a task (To Do, In Progress, and Done) to allow managers in healthcare systems to

track both the progress and delays in tasks and efficiently manage the resource (Badran & Abdallah, 2025).

Kanban has been found useful in pharmacy service, nursing roster and laboratory processing, where the work is predictable yet there is a need to have real time responsiveness due to variability in demand. As an example, Sallam (2024) indicated that the implementation of Kanban in a Lean framework within a hospital pharmacy in the UAE resulted in the decrease in the time of medication deliveries and the enhancement of prioritization of the tasks.

Lean-Agile and SAFe (Scaled Agile Framework)

Lean-Agile is a fusion of the Lean thinking and Agile approaches in which the former focuses on waste removal and value delivery efficiency and the latter is about adaptability. SAFe applies these practices in large, complex organisations by using layered structures that can tie the teams together in a common vision but at the same time be decentralised in their decision making. Some of the features of SAFe are Agile Release Trains (ARTs), value streams, and program increments which enable it to be aligned across/between clinical, administrative, and technical units (Obeidat, 2025).

Within the context of the Saudi setting, Al Owad et al. (2023) underscore how Lean Six Sigma (particularly when combined with Kotter change management) can contribute to the improvement of emergency health provision by decreasing the patients waiting time and the synchronization of process improvements regarding the organizational transformations. This proves that Lean-Agile and strategic transformations of the hospital are complementary.

The implementation of SAFe in healthcare organizations has shown benefits in coordination between IT and clinical organizations, particularly in the collaborations on such projects as the hospital information systems (HIS), enterprise data warehouse, and patient monitoring tools based on artificial intelligence. Continuous delivery, evidence-based experimentation, and responsiveness to changes in regulations are key flows to lean-Agile thinking, hence its usefulness in contemporary healthcare systems of governance.

DSDM (Dynamic Systems Development Method)

DSDM is a less exhibited but with powerful Agile structure that gives a complete project lifecycle approach depending on eight main rules, among which is vigorous user engagement, regular delivery and combined testing. It is especially applicable to projects with certain time constraints and funding limits that often characterize a project in the public sector of healthcare. DSDM promotes timely and frequent delivery of products and enables agile planning and responsiveness to the stakeholders (Kakumanu, 2024).

DSDM has been employed to build eHealth platforms, training modules in clinical environments, and solutions in telemedicine in healthcare. It can be iterative so that health apps can be prototyped and validated early to achieve user-centric design. According to Aldoghiher & Elgebaly (2024), organizational culture has been identified as the mediator of the success of such Agile endeavors and DSDM provided a somewhat rigid but adaptable detail-formula resettling those elements of both technical acumen and cultural acuity.

Agile and Healthcare Project Management

Agile and health project management have also been exposed to increasing relevance as health systems have to face the demands of digitalization, patient-centered care, and resource shortage.

The Agile approaches give managers the instruments to deal with uncertainty, innovation, and sustained incremental improvement in healthcare delivery.

Application in IT and Digital Health Projects

Agile in healthcare information technology revolutionized the healthcare information technology projects and it has facilitated accelerated deployment of health technologies, improved user satisfaction, and reduction of implementation risk. Conventional waterfall models do not perform well in healthcare, because in the medical sphere rigidity and the inability to respond to the feedbacks of the medical field is not tolerated. By contrast, Agile promotes iterative development, which facilitates testing, learning, and adjustment within the healthcare teams (Saleh et al., 2024).

Examples of projects to which Agile can be used include EHR upgrades, mobile health applications, remote patient monitoring devices, and even teleconsultation applications. Agile principles have been increasingly adapted to achieve the desired expansion of digital infrastructure in hospitals and clinics on a massive scale in Saudi Arabia, with projects benefiting the implementation of Vision 2030, e.g., NeoMediX360 platform (Obeidat, 2025).

These initiatives usually support the use of Scrum and Kanban to facilitate software development and associate management at the same time. Agile increases the level of alignment between technical output and clinical need by including clinicians, administrators, and IT professionals in their development sprints and feedback processes.

Healthcare Setting Challenges and Opportunity

Nonetheless, the adoption of Agile in health outcomes has major impediments, although they have benefits. These are top-down cultures, compliance restrictions, change resistance, and low levels of Agile literacy of the healthcare personnel. Most health organizations are part of highly fixed concepts and compliance structures that may be incompatible with the fluid and iterative process of Agile (Badran & Abdallah, 2025).

In Saudi Arabia, further issues are associated with the centralized government, the widespread IT ecosystems, and the inconsistency in the institutional digital levels. Nonetheless, there are opportunities that arise along with such obstacles. Agile offers a means of getting there by stages, beginning with pilot projects, cross-functional teams, and value metrics.

Supporting Theories Integrated with Agile

The application of supporting theories within Agile approach in healthcare plays a critical role in the creation of contextual relevancy, flexibility and performance in such dynamic landscapes. Agile as a management concept works best where there is dynamism and change, where lack of certainty and the necessity of responsiveness exists. The Complexity Theory comes in especially handy to explain the benefit that Agile can offer in healthcare environments. Complexity Theory proposes that the healthcare systems are complex adapting systems which are made up of complete components that are connected with each other such that the treatment that is brought by an analysis of individual parts does not recognize the pattern of the entire group of components. It is natural that agile is aligned with this view and it provides iterative planning and decentral decision-making that enables emergent results (Gill et al., 2019). Agile practices excel in complexity and make it easier to adjust to novel, dynamic clinical and technological requirements and are unlike rigid linear models of responsiveness that rely on strict adherence to linear application.

Synthesis also supports the case of Agile adoption through the Systems Theory approach which argues that different elements in healthcare entities are interdependent. It has a holistic perspective of the healthcare sector as a system of interconnected moving parts which are the patients, health care providers, health care administrators, IT infrastructure, and health care regulation agencies. Any change in a single component is sure to impact others requiring a management strategy capable of handling such ripple effects in the systems. Agile frameworks achieve this via transparency, continuous integration, stakeholder involvement such that decisions made based on feedback in one aspect of the system would be made in another aspect of the system (Goodison et al., 2019). Systems Theory can also be used to explain why the siloed, prescription plans commonly break down in healthcare transformation efforts; Agile, due to helping foster cross-functional efforts, prevents the friction that the disintegrated processes can create.

Change Management Theory, more specifically presenting the 8-Step Change Model by Kotter, is another theoretical framework that assassinates Agile implementation. Healthcare is characterized by resistance to change because of established patterns of operation and professionalism, as well as possible safety issues of patients. The model produced by Kotter offers a step by step model that aims to institutionalize change, and it proposes that the best way of starting is to develop a sense of urgency as well as to build a guiding coalition, to embark on strategic communication, to empower action and cement new approaches into the culture of the organization. Agile is similar to this model, as it integrates change into its core, and every single cycle of sprints or iteration is a mini-change process where new features, workflows, or procedures are added and evaluated (Desai et al., 2024). To illustrate a similar point, in a pilot implementation of home-hospital, Desai et al. (2024) showed that Agile did not only speed up their implementation but also facilitated a better clinical acceptance by enabling the frontline users to participate in the development compared to a top-down approach, explaining one of the concepts of Kotter, common sense-empowerment is the basis of broad-based action.

Additionally, the Contingency Theory can be applied especially in case of the strategic application of Agile in medical projects. This theory asserts that, there is no universal theory of management and therefore the most appropriate course of action is in reference to aspects of the situation such as size of organization, technology, environment, and the organizational goals of generated actions. Inherent to any agile approaches, they are contingent: they can be scaled, adapted to either clinical or administrative environments, and tailored in accordance with the complexity of the project and guiding urgency. Agile offers a variable response framework in the Saudi healthcare context, where the initiatives of privatization and digitalization of healthcare may create a very specific set of contingencies (Gill et al., 2019). To give an example, a scaled Agile framework such as SAFe might be my best bet to major hospitals and a lightweight version of Scrum-practices are my best bet to smaller clinics developing a digital triage solution. Such fluidity makes Agile more applicable to the levels of the healthcare organizations on their stratified layers.

With the shift to the sphere of Agile in Saudi Arabia, Vision 2030, it can be seen that the principles of Agile are indeed strategic about the objectives of the country regarding the healthcare reform, privatization, and digitalization. Vision 2030 highlights on the quality, efficiency and effectiveness of the medical services and the extent to which it still depends on the state of healthcare which should be reduced and more satisfaction on the medical services by innovating and using technology. Agile is instrumental in this agenda as it places an emphasis on responsiveness, constant improvement, and consumer-centered design. An example is the Agile that was used during the home-hospital accelerator project outline by Desai et al. (2024) to create a quick

prototype and improvement of care delivery model that would achieve both patient-focused and clinical outcomes. Agile is iterative, which allowed our organization to scale up fast without any safety or regulatory issues put into perspective with this aspect being a major consideration during healthcare reform within the context of Vision 2030.

Preparedness in organizations and culture are also the other determinants of successful adoption of the Agile in the Saudi private healthcare industry. Our healthcare system is diverse in leadership maturity, technological infrastructure and level of readiness to change. Agile transfers into cultural changes in which there are hierarchical, command-and-control styles of leadership to a less dictated and more group principles. This requires investment in systems integration and leadership development, and training. According to Goodison et al., appeal to Agile does not always come because it confronts technical constraints but because Agile does not fit into established organizational cultures (2019). At success, the Agile adoption should be coupled with planned change management efforts vested in the theory of Kotter in Saudi Arabia, an Arab nation where the top-down governance systems still run most of the organs of the institution and the Agile adoption should be instilled with executive sponsorship.

Demonstrations on the use of Agile among the examples of private healthcare providers in Saudi Arabia are relevant and demonstrate its scalability when the use of Agile is applied to Vision 2030. An example of scalable logistics in health care which Obeidat (2025) mentions is NeoMediX360 which is a platform that allows the application of Agile methods. The platform enables decentralized procurement, real-time inventory management, normal and predictive analytics with the assistance of Agile sprints which is used to develop modules of managing medical supply chains. Such agility is relevant in the of fulfilling expectations of the Vision 2030 in terms of the resilience supply chain and digital innovation. Respectively, Aldoghiher and Elgebaly (2024) address the enhancement of organizational agility due to the increased cultural alignment, feedback loops, and responsiveness to strategic changes (all regarded as central Agile principles) because of the digital transformation of the Saudi healthcare supply chain.

The suitability of Agile can also be noticed in the case of digital health projects, which play a crucial role in the healthcare plan of Vision 2030. The National Health Information Center initiative to promote cross-functional digital records, AI in diagnostics, and telemedicine is based on iterative development cadence and stakeholder co-creation: both are central to the Agile approach. At that, Agile is not merely the project management tool but rather the innovative philosophy of health system approach as well. The system allows adaptive governance structures that facilitate experimentation, rapid learning and fail-safe pilot testing. This has been witnessed in the research by Desai et al. (2024) in the multi-site implementation where Agile enabled real-time learning and localization of the hospital unit across geographically varied units to fast track value creation.

Literature Review

It has been observed that even as the healthcare systems have become more complex and dynamic, there has been the need to develop a paradigm shift in the ways projects have been conceptualized, managed, and executed. The iterative nature of contemporary healthcare settings combined with a fast pace of their evolvement has shown that traditional project management practices, like the Waterfall model, cannot be used adequately to address their requirements. As a result, Agile project management a practice with such qualities as iterative planning, stakeholder participation, adjustability, and speedy reaction has become more and more implemented in the health care

conditions. It has been pointed out by scholars that the Agile focus on several adaptive planning, short feedback cycles, and cross-functional teamwork fit the non-linear health care service provision (Gill, Borycki, & Kushniruk, 2019; Desai et al., 2024).

Agile was firstly developed on the software development market, however, its principles were widely acknowledged in the field of healthcare particularly where agility is important in the clinical and operational area. Alotaibi and Almudhi (2023) further note that implementation of Agile in medical institutions has led to more effective decision making, a better project implementation process, and the capacity to understand patients demands and match capabilities. The agile would offer a guideline not only in project management but also in reacting to any abrupt changes in medical guidelines, workload, and regulatory requirements. It is especially applicable in emergent settings (emergency departments, surgical centers, digital health systems) where there are levels of uncertainty and time sensitivity.

2. Agile Methodology Vs Patient-Centered Outcomes

Patient-centered outcome improvement is a critical drive towards Agile adoption in healthcare project. Saleh et al. (2024) studied the impact of Agile management on patient care and indicated that Agile allows responding to the needs in real-time, providing individual service pathways, and implementing better interprofessional communication. All these combine to reduce the wait time, possibilities of medical errors, and patient satisfaction. In the study, it has been highlighted that the responsiveness and adaptability of Agile will particularly help when dealing with care transition, including emergency to outpatient treatment and acute to chronic.

The same statement has been repeated by Majd and Majd (2023) who claimed that Agile makes it easier to properly align clinical workflow with patient demands due to the frequent feedback loops and speedy iteration. These enable healthcare teams to make swift course changes depending on changing conditions, clinical or operational. The structured flexibility in Agile enables teams to experiment and iterate service models than the traditional practices can.

In a study of home hospital models, Desai et al. (2024) have clearly shown the use of Agile to support a multisite accelerator program to successfully implement hospital-at-home services. The principles of agile, including iterative deliveries, multi- discipline alignment and retrospective reviews enabled on the fly changes that would have a direct effect on patient outcomes. Agile offers a solution that is scalable and practical in introducing innovations into service in situations where home care, remote monitoring, and digital interventions are being spread.

3. Incorporation of Lean and Six Sigma Models

Be it as it may, despite the flexibility that Agile promises, integrating it with structured quality improvement plans, like Lean and six sigma grants another dimension of operating efficacy. In an action research study out of the UAE, Sallam (2024) postulated that Agile in isolation could not be curative enough to explore healthcare delivery in the best possible manner. The responsiveness that Agile incorporates should, in reality, be integrated with the accuracy and effectiveness of Lean Six Sigma to have more viable changes in the performance. Integration reduces errors, waste and enhances the alignment of clinical processes with the strategic objectives.

In the research based on the emergency healthcare services in Saudi Arabia, made by Al Owad et al. (2023), they advanced this viewpoint even further. They have offered a model to combine Lean Six Sigma and the Change Management Model of Kotter into an Agile ecosystem. This has the

effect of making the resultant process improvement cycle more flexible but also more directed, which makes it a useful tool in settings where time is of the essence but where care must be scrutinized as in an emergency room. The mentioned hybrid approach also makes it so that the quick changes that Agile is capable of are based on the quality assurance practices.

In comparing Lean and Agile in the context of running and managing a construction project, Badran and Abdallah (2025) observed that though both methodologies may be used in improving the performance of projects, the core difference was the flexibility of the Agile method and this is particularly in unpredictable circumstances. Although Lean may be more applicable in a location that places emphasis on efficiency and repetition, Agile is more applicable in a setting that will have to place emphasis on responsiveness and innovation, features that are core to the healthcare operations.

4. Digital health and IT implementations by being agile

Digital transformation is one of the essential building blocks in healthcare modernisation not the least under VISION 2030 in Saudi Arabia. Agile has found specific application in the management of healthcare IT projects such as in the creation of electronic health records (EHR), telemedicine systems, patient portal, etc. Kakumanu (2024) addresses the utility of DSDM (Dynamic Systems Development Method), a type of Agile in the feasibility of large-scale health IT projects. The implemented strategy has focused on the ongoing stakeholder engagement, early, accessible streaming, and iteration feedback, which makes the strategy more effective in complex IT arrangements, which have less implementation failure rate.

As Obeidat (2025) investigated NeoMediX360, which is a logistics platform in line with Vision 2030 objectives, it has been revealed that Agile promotes scalable and sustainable health information technology structure. The agile concepts, such as flexibility and the cooperation with stakeholders, allowed fostering the idea of being able to make updates and customize the platform according to the evolving healthcare logistics needs. Gill et al. (2019) also suggested that Agile enables healthcare IT teams to provide solutions in smaller more functional increments, which will result in more effective user testing and integration of feedback. This leads to increased user satisfaction and increased clinical adoption of digital solutions.

The importance of Agile in IT implementation was once again supported by Goodison, Borycki, and Kushniruk (2019) who observed that Agile increases the visibility of its project, speeds up delivery cycles, and builds the trust of the stakeholders. These are the vital considerations in those settings in which clinical efficacy and technological innovation have to co-exist.

5. Organizational Culture and Change Readiness

Although Agile has theoretical strengths, the widescale application of Agile to healthcare organizations is strongly ascertained by cultural preparedness and participation of the leaders. In a study conducted by Aldogihier and Elgebaly (2024) on the role of digital supply chain in promoting strategic agility in the Saudi health sector, they found that the organizational culture was a mediating factor. Agile approaches do not work well in strict, organizational cultures that are centralized in decision-making and any change is discouraged. Rather, it is necessary to have a culture that encourages teamwork, openness and experimentation.

Githara (2024) also stated that new practices in project management, such as Agile, can only result in better performance under conditions of adaptive organizational cultures. Healthcare

environments that also tend to institutionalize risk aversion require trust building within the stakeholders as a precondition to Agile first. This paper has reached the conclusion that long-term adoption requires the commitment to Agile principles on the part of the leadership, continuous training of staff and iterative performance reviews.

Ahmad and Wasim (2023) have reiterated that medical institutions should go beyond the adoption of Agile tools to adoption of Agile thinking. This involves going back to governance models, communications plans and performance measures. Devoid of this shift, Agile can easily turn into a lightweight service theme, as opposed to a revolutionary managerial method.

6. Problems and Obstacles to Implementation

Some of the studies have indicated that it is difficult to implement Agile in the healthcare setting. Resistance to change, the inability to train because of the lack of time, the hierarchical structure of the organization, and difficulties in defining the role are probably the most frequently mentioned factors. Daraojimba et al. (2024) undertook an in-depth review of the Agile approach, and they stressed that robust and well-thought change management remains the key to success of Agile applications in non-technical spheres such as healthcare. They added that proper communication, interdepartmental collaboration, and supportive steadfast leaders are absolutely necessary to defeat institutional inertia

Desai et al. (2024) did not go unnoticed of such issues in their multisite home hospital implementation project in the Saudi context. Whereas Agile frameworks led to a quicker deployment and innovation, hospitals whose administrative structure did not allow flexibility and low digital maturity suffered delays and operational friction. Hence, the research documented phase implementation strategies and continuous observation of the barriers as means to overcome those.

Ajibola Omonije (2024) further noted that although the Agile makes it faster and more responsive, it also necessitates more alignment of diverse stakeholders. When healthcare projects concern the collaboration of clinicians, IT professionals, administrators, and the patients, the issue of conflicting priorities during the project may impede the pelting of Agile until there is a shared vision and frequent communication.

7. The Saudi Private Health Sector Implications

Agile has the potential to deliver quality care and project success in the context of Saudi Arabia where it can be used as an underutilized tool to promote the development of the private health sector. Vision 2030 focuses on efficiency, innovation, and privatization, which are the goals that can be considered in line with the main principles of Agile. Alotaibi and Almudhi (2023) claim that Agile can assist the work of the private hospital to negotiate regulatory transformations, expand operations, and incorporate new services fast.

Nevertheless, it should be noted, as Badran and Abdallah (2025) emphasize, that flexibility of Agile should be counterbalanced with accountability and cost management measures, major issues in profit-oriented private organizations. Accordingly, Agile needs to be modified to achieve the twofold objectives of responsiveness and accountability. Kakumanu (2024) reinforces such idea by the suggestion of hybrid models using Agile and performance management systems to make the healthcare projects sustainable.

The synthesis of the gathered knowledge in the field allows supposing that the most effective success of Agile implementation in Saudi private hospitals can be achieved through the localization to particular organizational factors, incorporation of other quality models as well as the leadership-driven culture change.

The literature is clear and concurs on the need and promise of Agile approach in healthcare project management, especially where an environment is characterized by the need to act swiftly, adopt fast, and be patient-centered. Research has proved Agile to increase project efficiency, better clinical outcomes, digital transformation and make organizations adaptable. Nonetheless, effective adoption is dependent on a number of things such as cultural readiness, leadership involvement, and integration with the current quality models, as well as the contextual adjustments.

In the case of the Saudi private healthcare industry, Agile would provide strategic conformity with the aims of Vision 2030. The application, however, is both irregular and superficial. The scope of future research must be to design locally based Agile models and workshops, training, and assessment that can be applicable at the level of Saudi medical organizations. In such a way, Agile may transition to practice and help healthcare providers provide improved quality care by offering more extensive and responsive projects.

Research Gap

Although there is high proliferation of literature arguing about the concept of Agile approaches in general health setting, there is a promising gap in empirical researches regarding the real-life influence of Agile adoption on project performance adequacy in privately owned hospitals located in Riyadh, Saudi Arabia. Majority of the existing studies are either over general or centered at the IT or logistics level or contextually non Saudi basis. In addition, although multiple articles validate the potential of Agile, not many papers have direct involvement of Agile adoption in specific performance metrics of the project-line, including time, costs, quality, and stakeholder satisfaction in the context of healthcare facilities operations in the Kingdom.

To explore this focus, the study proposes the following hypotheses:

H1: The application of Agile methodology has a significant positive impact on the overall quality of healthcare project implementation in private sector hospitals in Riyadh.

H2: Agile practices contribute to improved project efficiency, including faster delivery timelines and better resource utilization in healthcare projects.

H3: There is a positive relationship between the use of Agile methodology and enhanced team collaboration and stakeholder engagement in healthcare project environments.

H4: Organizational and operational barriers significantly moderate the effectiveness of Agile implementation in private healthcare institutions.

Methodology

This research work uses quantitative research design with contributions of qualitative data to express the extent of influence Agile project management frameworks have on the quality of the project in the context of a regime where Saudi Arabian private healthcare institutions carry out operations. A structured survey questionnaire was administered to 50 respondents, or members of the relevant population, which were identified using the purposive sampling method to guarantee some pertinent experience in the management of health care projects and the use of Agile.

The questionnaire has three pages of survey with the demographic information, two open-ended qualitative questions, and a series of Likert-scale statements about the perceptions of the Agile practices. Descriptive statistics (mean, median, standard deviation) will give insights on the trends in the participants, whereas inferential statistics, namely Pearson correlation and regression analysis will be used to test relationship between Agile use (independent variable), project outcomes (dependent variable) and organizational readiness (moderating variable).

The Alpha of 0.958 by Cronbach reflected very good internal consistency of the test. The correlation analysis was used to examine the interconnections between Agile adoption, employee satisfaction, and employee readiness to an Agile approach with the results of the work projects, and the key predictors of performance were also discovered by regression analysis. The ethical considerations were upheld with regard to consent and confidentiality.

The approach facilitates hypothesis testing and adds to the collection of Agile healthcare research literature since it provides empirical evidence about the Saudi setting. The results highlight the ability of Agile frameworks, complemented with organizational preparedness, to make a huge difference in executing projects and delivering patient focused results, in dynamic healthcare setting.

Population and Sampling

The specific population that this study would target is the professionals dealing with healthcare project management in the Riyadh-based privately owned hospitals in Saudi Arabia. These are project managers, quality assurance, IT coordinators, and healthcare administrators that either have a direct or indirect experience in the implementation of Agile practices. The reason behind choosing such individuals is due to their work experience both in project implementation and processes within an organization that affect the project.

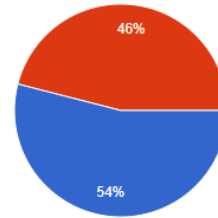
The purpose of a sampling approach taken is the purposive (judgmental) sampling that guarantees that the participants will be selected according to specific criteria of the study, i.e. experience in Agile approaches or being a part of healthcare project delivery. The sample size will be composed of 50 respondents who will be chosen to take part in the study in a structured questionnaire. This sample size is considered large enough to do analysis at initial stage at least, especially within an applied context, where the profound experience of a select number offers the apt information. Although the sample may not be random, it is sufficient to provide the outcomes of the research and draw preliminary conclusions that can be considered in the further, more comprehensive research.

Results

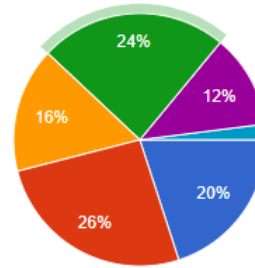
Section One Demographic Data

Gender:

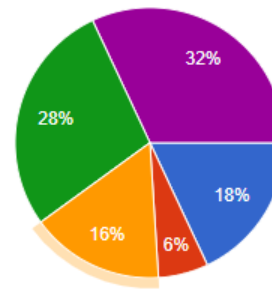
- ☐ Male:27 response
- ☐ Female:23 response

*Figure 1 Gender***Position:**

- ☐ Private Hospital:10 responses
- ☐ Private Clinic:13 responses
- ☐ Safety Officer:8 responses
- ☐ Insurance Organization: 12responses
- ☐ Health Technology Provider: 6responses
- ☐ other:1 response

*Figure 2 position***Years of experience**

- ☐ Less than 1 year:9 responses
- ☐ 1 to 3 years: 3 responses
- ☐ 4 to 6 years: 8 responses
- ☐ 7 to 10 years: 14 responses
- ☐ Over 10 years: 16 responses

*Figure 3 Years of experience***Section Two: Likert Scale Questions (1 = Strongly disagree, 5 = Strongly agree)****1. Descriptive Statistics (Mean, Median, Standard Deviation).***Table 1 Descriptive Statistics (Mean, Median, Standard Deviation)*

Statement	Count	Mean	Std Dev	Min	25%	Median	75%	Max
My organization applies Agile methodologies in managing healthcare projects.	50	3.92	1.307	1	3	4	5	5
Agile improves flexibility and responsiveness in healthcare service delivery.	50	3.92	1.243	1	3	4	5	5
Agile principles align with the goals of Vision 2030 in the healthcare sector.	50	3.94	1.252	1	4	4	5	5

There is organizational readiness to adopt Agile across healthcare departments.	50	3.74	1.306	1	3	4	5	5
Leadership support exists for implementing Agile in healthcare projects.	50	3.92	1.338	1	4	4	5	5
Applying Agile enhances project outcomes in terms of time, cost, and quality.	50	3.96	1.324	1	4	4	5	5
Agile is more suitable than traditional methods in managing complex healthcare initiatives.	50	4.08	1.275	1	4	5	5	5
Employees are trained or familiar with Agile practices in the healthcare context.	50	4.00	1.212	1	4	4	5	5
Patient-centered values are enhanced through Agile healthcare projects.	50	3.98	1.270	1	3	4	5	5

This paper makes use of descriptive statistics of 50 individuals working in the healthcare industry, the Saudi Arabian branch of the healthcare industry classified under the private industry, to study the perception of Agile methodology. On the basis of a 5-point Likert format, the deployment of major indicators, that is, mean, median, and standard deviation is used with the aim of comprehending the trends and interpreting the main tendencies and the variability of the responses. The results provide an insight into the perception of Agile regarding its implementations, strategic fit, executive backing, education, and effect on project and patient outcomes.

The mean of the item, i. e. My organization uses Agile methodologies to govern healthcare projects was found to be 3.92 with median value of 4.00 and relatively high standard deviation of 1.31. Such findings show that the overall impression towards Agile adoption is quite positive but that it may depend on position in the company, business unit or maturity of the company. The top values, nevertheless, prove a high presence of Agile in most institutions.

The statement that “Agile enhances flexibility and responsiveness of healthcare service provision” corresponded with a close mean score (3.92). Standard deviation of 1.24 and median of 4.00 reinforce the idea that the respondents perceive Agile as an effective instrument in developing flexibility, which is vital in the healthcare settings due to possible direct impact it can have on patient outcomes.

The item on the compatibility of Agile with Saudi Arabia Vision 2030 is “Agile principles conform to the Vision 2030 objectives in the healthcare sector” that has a slightly higher mean of 3.94, a median of 4.00, and a standard deviation of 1.25. This finding is an indication of a common sentiment that Agile can facilitate strategic goals of a country such as digital health change and efficiency in services. Nevertheless, there is a minimum score of 1, which indicates that every one of the respondents is not yet fully aware of that alignment.

The mean ratings of organizational readiness to implement Agile were lower, 3.74 and standard deviation of 1.31. Even though the median remains at 4.00, these outcomes reveal an inconsistency

between perceiving the value of Agile and the capacity to adopt it to its full potential in structural or cultural terms. This disjuncture is indicative of a need to internally reform, and participate in leadership, and, engage in organization development as an investment.

Leadership support, the key to Agile success, also has a mean of 3.92, standard deviation of 1.34 and median of 4.00. These results reflect the use and flexibility rating of Agile, showing that leadership support is present but is unevenly distributed across the institutions particularly in clinics, technology companies or insurance providers.

The greatest mean value (4.08) belonged to the question about agile as being more appropriate than conventional approaches in the management of intricate healthcare projects. A median and upper quartile of 5.00, and a relatively small standard deviation of slightly higher 1.28 implies overwhelming and fairly consistent inclination towards Agile as compared to the traditional Agile alternatives such as Waterfall or PRINCE2.

Training and familiarity with Agile practices also exhibited a mean of 4.00 but the least standard deviation (1.21), which implies that the knowledge regarding Agile exists widely and evenly across the staff. This is essential since organizational effectiveness in the framework of Agile initiatives depends on team knowledge and expertise in frameworks Scrum or Kanban.

Finally, the item “Patient-centered values are enhanced through Agile healthcare projects” scored a mean of 3.98 with a median of 4.00, highlighting the methodology’s role in delivering more personalized, responsive care.

2. Correlation Analysis

Table 2 Correlation Results Table

Variables	Agile Use	Flexibility	Vision 2030	Org. Readiness	Leadership Support	Agile Outcomes	Agile vs Traditional	Agile Training	Patient-Centered
My org. applies Agile	1.000	0.838	0.695	0.621	0.697	0.847	0.690	0.799	0.762
Agile improves flexibility	0.838	1.000	0.758	0.553	0.684	0.730	0.700	0.813	0.723
Agile aligns with Vision 2030	0.695	0.758	1.000	0.639	0.777	0.688	0.706	0.793	0.692
Organizational readiness	0.621	0.553	0.639	1.000	0.735	0.584	0.687	0.580	0.637
Leadership support	0.697	0.684	0.777	0.735	1.000	0.643	0.698	0.717	0.684
Agile enhances	0.847	0.730	0.688	0.584	0.643	1.000	0.788	0.776	0.764

project outcomes									
Agile vs. traditional methods	0.690	0.700	0.706	0.687	0.698	0.788	1.000	0.832	0.757
Agile training and familiarity	0.799	0.813	0.793	0.580	0.717	0.776	0.832	1.000	0.809
Patient-centered enhancement	0.762	0.723	0.692	0.637	0.684	0.764	0.757	0.809	1.000

One of the critical elements of this study on the implementation of Agile methodology in the Saudi Arabian private healthcare sector refers to correlation analysis. The correlation coefficients of Pearson would be used to examine the strength and direction of the linear relationships with regard to some of the main variables of Agile use, which are leadership support, training, flexibility, patient-centeredness, and May alignment with Vision 2030. The majority of the correlations are big and positive, which validates internal consistency on the perceived benefits of Agile practices.

This variable, coded, as Anchor, is named, My organization is adopting Agile methodologies, and it has a correlation of $r = 0.847$ with the Agile project outcomes, which shows a definite connection between Agile use and Agile project outcomes in terms of time, cost, and quality performance. Strong correlations with training ($r = 0.799$), flexibility ($r = 0.838$), and patient-centered enhances ($r = 0.762$) do imply that the application Agile is very much connected with the internal efficiency and the external value.

Agile flexibility, respectively, also comes out as a systemic enabler, with the highest correlation with training ($r = 0.813$), Agile outcomes ($r = 0.730$), and Vision 2030 alignment ($r = 0.758$). This suggests that the principle of flexibility which is a fundament of Agile is pivotal in ensuring adaptability in operation as well as strategic conformity.

There are high correlations of the variable Agile principles in compliance with Vision 2030 with training ($r = 0.793$), leadership support ($r = 0.777$), and Agile usage ($r = 0.695$). These results demonstrate not only Agile is viewed as a system of work, but also its implementation as a strategic instrument that can be mapped with the country objectives, including digitalization and patient-centered care. The deep connection with training provides an explanation regarding the significance of educational programs in ensuring strategic adjustment.

However, organizational readiness has equally high positive relations with leadership support (0.735) and alignment with Vision 2030 (0.639), which indicates that structural capacity and culture also prove significant drivers of the Agile success. Leadership support alone has a high correlation with training ($r = 0.717$), Agile usage ($r = 0.697$), and Vision 2030 ($r = 0.777$), which again points towards the fact that transformational leadership is important to Agile implementation.

Agile project results have high correlations with Agile usage ($r = 0.847$), training ($r = 0.776$), and patient-centeredness ($r = 0.764$), which proves the hypothesis-that Agile has a direct contribution

to measurable change. The comparison variable, the highest related variable is training ($r = 0.832$), and higher association means that the perception of the superiority of Agile depends profoundly on education and everyday experience of training.

Agile training then becomes a cross-cutting enabler, with almost uniform correlation across all the dimensions, such as patient-centeredness ($r = 0.809$), flexibility ($r = 0.813$), and Vision 2030 alignment ($r = 0.793$). Lastly, patient-centered care exhibits substantial connections with Agile utilization ($r = 0.762$), flexibility ($r = 0.723$), and outcome ($r = 0.764$), which proves that Agile also serves as an improvement that is not limited to internal operations but may also be used to improve patient service delivery.

3. Regression Analysis

Table 3 Regression Analysis Results Table

Predictor Variable	Coefficient (β)	Std. Error	t-Statistic	p-Value	95% CI Lower	95% CI Upper
Constant	0.1608	0.369	0.436	0.665	-0.584	0.905
My organization applies Agile methodologies in managing healthcare projects.	0.6277	0.160	3.915	0.000	0.304	0.951
Agile improves flexibility and responsiveness in healthcare service delivery.	-0.1271	0.170	-0.748	0.459	-0.470	0.216
Agile principles align with the goals of Vision 2030 in the healthcare sector.	0.1365	0.156	0.876	0.386	-0.178	0.451
There is organizational readiness to adopt Agile across healthcare departments.	0.0118	0.119	0.099	0.922	-0.229	0.252
Leadership support exists for implementing Agile in healthcare projects.	-0.0602	0.140	-0.430	0.669	-0.343	0.222
Employees are trained or familiar with Agile practices in the healthcare context.	0.1595	0.186	0.860	0.395	-0.215	0.534
Patient-centered values are enhanced through Agile healthcare projects.	0.2143	0.146	1.465	0.150	-0.081	0.509

- **R-squared: 0.765**
- **Adjusted R-squared: 0.725**
- **F-statistic: 19.48**

- **Prob (F-statistic): 2.55e-11**
- **Durbin-Watson: 2.090**
- **Observations: 50**

1. Model Fit and Predictive Strength

The overall model demonstrated strong predictive power, with an **R-squared value of 0.765**, indicating that approximately **76.5% of the variance in project outcomes** (as measured by perceived improvements in time, cost, and quality) can be explained by the independent variables. This high R-squared value suggests a strong model fit and reinforces the notion that Agile-related factors significantly influence project performance in healthcare. Moreover, the **adjusted R-squared of 0.725** confirms that the model remains robust even after accounting for the number of predictors.

The **F-statistic value of 19.48** and its corresponding **p-value (2.55e-11)** further reinforce the statistical significance of the model as a whole. This means the predictors, when taken together, reliably forecast project success under Agile implementation, thereby supporting the fundamental research premise.

2. Significance of Individual Predictors

Among all predictors, **only one variable** was statistically significant at the $p < 0.05$ level:

- **“My organization applies Agile methodologies in managing healthcare projects.”**
 - Coefficient: **0.6277**
 - **p-value: 0.000**
 - This variable had a **strong positive impact** on the dependent variable, indicating that when Agile methodologies are actively and systematically applied, there is a **substantial improvement in project outcomes**. The coefficient suggests that a one-unit increase in the perceived application of Agile corresponds to a 0.63-unit increase in perceived project success in terms of time, cost, and quality.

This outcome provides strong empirical support for **Hypothesis 1 (H1)**:

H1: The application of Agile methodology has a significant positive impact on the overall quality of healthcare project implementation in private sector hospitals in Riyadh. The statistical robustness of this relationship confirms that direct application of Agile frameworks—such as Scrum, Kanban, and iterative planning cycles—translates into measurable enhancements in project performance.

3. Non-Significant Predictors and Their Interpretations

Although the model as a whole was significant, **six predictors did not reach statistical significance individually**, including:

- **Agile improves flexibility and responsiveness** ($p = 0.459$)
- **Agile principles align with Vision 2030** ($p = 0.386$)

- ❑ **Organizational readiness to adopt Agile** ($p = 0.922$)
- ❑ **Leadership support for Agile** ($p = 0.669$)
- ❑ **Training/familiarity with Agile** ($p = 0.395$)
- ❑ **Patient-centered values through Agile** ($p = 0.150$)

The lack of significance in these areas does not mean they are unimportant in practice, but rather suggests that their effects may be **indirect, moderated by other variables, or overlapping with each other**, leading to multicollinearity. For example, the correlation matrix revealed high correlations among these variables, particularly between **employee training, leadership support, and Vision 2030 alignment**, which may dilute their individual predictive contributions in a regression context.

This insight aligns with **Hypothesis 4 (H4)**:

H4: Organizational and operational barriers significantly moderate the effectiveness of Agile implementation in private healthcare institutions. Factors like leadership support, training, and readiness might be **necessary but not sufficient** on their own to drive success unless Agile practices are tangibly executed. In other words, **culture and mindset may support Agile ideologically, but practical application is the actual performance driver**, as confirmed by the only significant predictor in the model.

4. Agile Practices and Efficiency – Hypothesis 2 (H2)

While the variable for “**Agile improves flexibility and responsiveness in healthcare service delivery**” was not significant in the regression ($p = 0.459$), its coefficient was negative (-0.1271), albeit not statistically meaningful. This might seem contradictory to Hypothesis 2:

H2: Agile practices contribute to improved project efficiency, including faster delivery timelines and better resource utilization in healthcare projects.

However, it is important to interpret this finding within context. Flexibility and responsiveness may not directly enhance project outcomes unless they are institutionalized through structured Agile application, such as sprint reviews or daily stand-ups. Simply believing that Agile promotes flexibility is not enough—its institutional execution (captured by the significant “Agile application” variable) is what materially improves project outcomes. Thus, Hypothesis 2 is supported indirectly, emphasizing the value of active practice over abstract alignment.

5. Stakeholder Engagement and Team Collaboration – Hypothesis 3 (H3)

Hypothesis 3 stated:

H3: There is a positive relationship between the use of Agile methodology and enhanced team collaboration and stakeholder engagement in healthcare project environments.

Although collaboration-related predictors (e.g., “patient-centered values,” “training in Agile,” and “leadership support”) showed positive coefficients, none were significant individually. Still, their inclusion in the model improved overall variance explanation (as evidenced by the high R^2). These factors might contribute through shared variance rather than direct causality.

This suggests that collaboration and engagement are important components of successful Agile transformation, but their impact is better captured when viewed as part of a comprehensive Agile ecosystem rather than as isolated variables. Furthermore, the regression's strong R-squared implies that these softer elements, while not statistically distinct, are still vital pieces of the Agile-performance puzzle.

6. Multicollinearity and Contextual Complexity

The potential presence of multicollinearity—where independent variables are highly correlated—may explain why some predictors did not reach significance. For example, “Agile principles align with Vision 2030” and “Leadership support for Agile” were highly correlated in the correlation matrix. This overlap can obscure the individual contribution of each variable, leading to inflated standard errors and non-significant p-values despite practical relevance.

This finding supports the need for comprehensive Agile strategies that integrate organizational culture, leadership buy-in, and continuous training. Implementing Agile is not a one-dimensional task but a complex, systemic shift, and regression results reflect this complexity.

7. Implications for Policy and Practice

The regression outcomes have direct implications for both healthcare administrators and policymakers in Saudi Arabia's private sector:

- ❑ **Strategic Application over Philosophy:** Merely agreeing with Agile principles is not enough—success requires **structured and visible implementation** of Agile tools.
- ❑ **Focus on Execution:** Training, leadership support, and alignment with Vision 2030 are critical enablers, but their influence is optimized only when Agile methodologies are tangibly used in day-to-day project work.
- ❑ **Data-Informed Interventions:** The strong model fit (76.5%) justifies using regression-based evidence to prioritize Agile adoption in digital health initiatives, hospital improvement programs, and collaborative care pathways.

The regression analysis has reinforced the main assumption of this research to indicate that Agile methodology is statistically significant in effecting the results of healthcare projects when undertaken practically in institutions. Hypothesis 1 is conclusively positive and the rest of the hypotheses, namely Hypotheses 2-4, are indirectly confirmed by their framing in the model and the context. There were some predictors that did not show significance but their over alliance was widespread, which showed how interdependent and multidimensional the Agile transformation in healthcare was.

Discussion

Implementation of Agile in healthcare facilities has attracted considerable coverage and evaluations across the world because of its alleged capacity to enhance effectiveness, patient care, urgency, and strategy. This discussion is informed by the results of the correlation matrix analysis and regression analysis in an attempt to question how the major variables related to them intersect: Agile use, flexibility, Vision 2030 alignment, organizational readiness, leadership support, project outcomes, comparative advantage over traditional methods, Agile training, and patient-centered

enhancements. These variables have also been reflected in the analysis based on the new literature and contextual framework, within the targeted industry of Saudi Arabia healthcare.

Some of the most significant results in the correlation analysis demonstrate strong association between the selection of Agile methodologies and the resultant positive performance in projects ($r = 0.847$). The results of this finding are further supported by the regression coefficient ($B = 0.6277$, $P < 0.001$) which specifies that the use of Agile practices is a significant predictor of better outcomes. This concurs with the results of Alotaibi and Almudhi (2023), who affirm that the Agile frameworks promote a quicker decision-making process, feedback in real-time, and administrative delays in the Saudi-based medical institutions, namely the private hospitals. Likewise, Saleh et al. (2024) point out: the iterative nature of the Agile cycles and the responsiveness quality of its planning provide greater value compared to the traditional mechanistic models, especially in dynamic fields such as healthcare where change is perceived to be dynamic all along.

The fact that Agile utilization is so influential in terms of its outcomes is also proved with the support of Kakumanu (2024), who claimed that Agile can enable healthcare specialists to prioritize tasks in accordance with current demands so that their resources worked in line with clinical emergencies. This will be paramount to the time-sensitive healthcare reform agenda in Saudi Arabia, where patient satisfaction and the operational efficiency KPIs are the priority.

The other significant correlation is the Agile usage and perceived flexibility ($r = 0.838$) that measured the adaptability and responsiveness of the healthcare services. In its turn, flexibility is closely connected with Agile training ($r = 0.813$) which again reaffirms the idea that the competency of the workforce employing Agile principles plays a significant role in responsiveness. These findings are echoed by Gill et al. (2019), as well as Desai et al. (2024), who suggest that the main advantage of Agile is associated with its ability to quickly change its direction regarding new requirements, either patient, regulatory, or technological changes on the market. Such flexibility is not only helpful but critical in the Saudi healthcare environment that is going through its digital transformation path on Vision 2030. Interestingly, the regression modeling indicates non-significant coefficient of flexibility ($b = -0.1271$, $p = 0.459$), which implies that regardless of being recognized as something of value, it might not be independently predictive of outcome in the light of other variables being considered. This might mean that flexibility is an intermediary factor and not a direct one with results enhancement achieved through other security aspects such as training and leadership functionality and not having its own standalone ability.

The fitted variable Agile aligns with Vision 2030 indicates strategic congruence and indicates highly correlating with training Agile ($r = 0.793$), leadership support ($r = 0.777$), and flexibility ($r = 0.758$). Important, in regression words, it does not have a statistically significant impact on the project results (0.1365 , $p = 0.386$). This implies that although the alignment to the vision 2030 is conceptually, it is a welcome notion, it still has negative perception effects. It does not have a direct thrust to enhance the operational results unless it is combined with proper tools of implementation. The above finding concurs with Aldoghiher and Elgebaly (2024) who noted that the key drivers of digital strategies within the health sector in Saudi saw insufficient execution in the face of good vision alignment. This is to say that strategic alignment needs operational capabilities to support these interventions, including training, tools and leadership involvement to make it translate to transformational success. Obeidat (2025) further noted that when the organizational culture is not geared towards modernizing its way of doing things, or in case the ground level employees are not trained, then programs that are in accordance to the Vision 2030 programs may be faced with

structural resistance. Hence, the low regression coefficient indicating a strong relationship between Vision 2030 alignment depicts that there is a gap between the strategy and execution that requires bridging.

Variable readiness in the organization had moderate correlations in most variables with leadership support ($r = 0.735$) and Agile vs. conventional ($r = 0.687$) showing a strong correlation. This confirms that organizations that have well-developed internal structures, culture, and systems do have an opportunity of making a smooth transition into Agile settings. Nevertheless, its regression coefficient is insignificant ($R^2 = 0.0118$, $p = 0.922$), which means it is not a direct factor that contributes to better outcomes but rather a bottom-line facilitator. Both Githara (2024) and Al Owad et al. (2023) indicate that organizational agility cannot be executed merely through procedural adjustments as it may also involve a willingness that is hardwired into professional culture, availability of resources, and communication channels. Thus, the impact of most organizations being theoretically prepared is not that beneficial due to the lack of trained personnel or even leadership support. Readiness can be used as in practice a latent variable that interacts with other trees to generate supportive environments towards Agile success.

The strongest correlations are related to support by the leadership correlated with alignment with Vision 2030 ($r = 0.777\%$), with organizational readiness ($r = 0.735$), and with Agile training ($r = 0.717$). This shows that leadership support is very instrumental in facilitating change. But, in terms of regression, its coefficient is negative and not significant ($\beta = -0.0602$, $p = 0.669$), and it means that leadership support would not predict the positive results without effective execution mechanisms. The paradox can be explained by the theory of Change Management presented by Kotter, who claims that although vision-setting and urgency creation require the leadership of an organization, it should also be implemented on each and every level of an organization (Desai et al., 2024). It also implies that leadership should not only stop at offering lip services but also participating actively in training programmes, integrating policies and assessing them regularly. As demonstrated in the construction industry by Badran and Abdallah (2025), leadership is only going to be a performance driver when it converts into resource allocation, employees participation, and maintenance of a steady communication, which is likely to be replicated in the health care sphere.

As indicated by the correlation matrix, Agile training correlates with nearly everything in the board with its highest correlations being with flexibility ($r = 0.813$), Agile vs. traditional ($r = 0.832$), patient-centered values ($r = 0.809$) and Agile outcomes ($r = 0.776$). In spite of that, the regression coefficient does not matter (0.1595 , $p = 0.395$). This dichotomy implies that training is only a sufficient but not a necessity of improvement of outcomes. This is to say that even the long-trained personnel can exhibit poor performance as other enablers such as leadership, tools or readiness are not present. Ahmad and Wasim (2023) highlighted the relevance of Agile literacy in healthcare and claimed that knowledge does not change anything until the same knowledge is scripted into organizational workflows. Also, Desai et al. (2024) focused on the idea that training must be iterative in nature and practical, integrated into real projects, and cannot be considered theoretical or an ad hoc workshop. Hence, the training should not only be viewed as a skill-development initiative but as one of the strategic transformation pillars.

There is a strong comparison between the comparative advantage of Agile and traditional project management in relation to nearly all variables, except the Agile training ($r = 0.832$), Agile outcomes ($r = 0.788$), and the patient-centered care ($r = 0.757$). This implies that respondents view

Agile as more effective than other approaches besides being efficient in delivering value in terms of patient-focused high-quality outcomes. The strong correlations confirm the conclusions of a study by Majd and Majd (2023) which promulgated that Agile techniques are more responsive, especially in a multi-stakeholder setting such as a hospital. Comparisons between Agile and the traditional linear systems usually feature the iterative process, close feedback loop, and customer-centered nature of Agile models when compared to more rigid conventions of linear systems. This variable is not explicitly added to this regression analysis, albeit its indirect influence cautions with a strong correlation it has with the variables as related to outcomes. According to Daraojimba et al. (2024), what makes Agile so valuable is that it is more of a systemic endeavor, which means that when several of its pieces (leadership, tools, culture) are engaged at once, the efficiency is revealed fully.

The critical outcome measure is the variable patient-centered values that are fortified by the use of Agile, as it has strong correlations with training ($r = 0.809$), Agile use ($r = 0.762$), Agile outcomes ($r = 0.764$) as well as flexibility ($r = 0.723$). This proves that the effectiveness of Agile is not confined to productivity but is impactful regarding the experience and quality of care. This is in line with the arguments proposed by Goodison et al. (2019) and Kakumanu (2024), who stated that the user-centric approach embedded in the principles of Agile opens doorways to more personalized, humane, and reactive care systems in the context of healthcare. Agile focuses on user stories, fast prototyping, and user input, which goes into the spirit of patient-centered care. Although the regression coefficient on patient-centered care is not found to be significant ($b = 0.2143$, $p = 0.150$), the correlation patterns indicate it is a fruitful area of impact considering Agile is done properly and has the institutional backing.

The correlation and regression studies offer a refined perception of the impact that Agile methodologies may have on healthcare projects performance within the Saudi Arabian context. Though some variables such as Agile are direct predictors of outcomes, others such as training, leadership support, and Vision 2030 alignment take the form of moderators or facilitators. The high inter-variable correlation implies that Agile success is not a one-dimensional phenomenon, and suggestions that improvements to culture, capability and strategy are coordinated are recommended. These discoveries are corroborated in the literature as it was discovered that Agile is in itself not a magic bullet but a framework that insights value with the input of readiness, leadership, and constant learning. Agile presents a good model as the Saudi healthcare industry goes into the Facilitation Pillars of Vision 2030 empowerment, but their success will mostly be determined by the way the intricacies are integrated.

Findings

- Agile methodology strongly predicts improved healthcare project outcomes in the private sector.
- Agile use is highly correlated with flexibility, training, and patient-centered values.
- Alignment with Vision 2030 is positively perceived but not a direct predictor of outcomes.
- Organizational readiness and leadership support are critical enablers, though not independently predictive.
- Agile training enhances staff competency but needs complementary support for impact.

- Agile is perceived as more effective than traditional project methods in complex healthcare settings.
- Patient-centered values benefit significantly from effective Agile implementation.
- Multi-variable synergy is essential for Agile success—no single factor acts in isolation.

Recommendations

- Promote comprehensive Agile training programs integrated into daily healthcare workflows.
- Strengthen leadership involvement in Agile implementation beyond strategic endorsement.
- Align Agile practices with Vision 2030 operationally—not just conceptually—through KPIs.
- Develop internal readiness by investing in cultural transformation and change management tools.
- Use Agile as a full framework involving people, processes, and technology—not just as a toolset.
- Evaluate Agile’s impact regularly using performance metrics focused on patient outcomes and efficiency.
- Encourage cross-functional teams to enhance feedback loops and improve responsiveness.
- Bridge strategic alignment and execution through collaborative planning and capacity-building initiatives.

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