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**INFLUENCE OF AGILE PROJECT MANAGEMENT PRACTICES ON  
PROJECT SUCCESS: A QUANTITATIVE STUDY ON CONSTRUCTION  
INDUSTRY IN DEVELOPING COUNTRIES IN THE POST-COVID-19 ERA**

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**Abstract**

The study analysed the impact of Agile Project Management (APM) practices on project success (PS), using team collaboration (TC) as a mediator and organizational flexibility (OF) as a moderator. The study was conducted in the construction industry of developing countries. Applying a quantitative method, data was gathered from 75 participants using non-probability convenience sampling. The results suggested that APM has a significant positive influence on project success, emphasising its efficiency in enhancing project results. Furthermore, APM positively increased the level of team collaboration (TC), which in turn led to the success of the project, indicating the mediating role of collaboration.

The study has also examined the moderating role of OF between APM and PS in the construction industry. The findings suggest that the proposed moderating role of OF between APM and PS was insignificant. The results indicate that there may be other organizational factors that may play a more crucial role in this context. These results provide critical theoretical contributions by expanding the understanding of APM procedures in the most neglected construction industry, especially in scenarios with limited resources.

From a practical perspective, the study provides valuable insights for project managers and industry professionals, emphasizing the need to adopt APM strategies to increase project efficiency and collaboration among team members. Despite its contributions, the study acknowledges limitations, such as the use of convenience sampling and a relatively small sample size, which may impact the generalizability of the results. Future research should explore these relationships in a broader context and analysis other factors affecting project success.

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Keywords: Agile Project Management, team collaboration, organizational flexibility, project success, construction industry, developing countries

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## ACRONYMS

APM	Agile Project Management
TC	Team Collaboration
OF	Organizational Flexibility
PS	Project Success
TPM	Traditional Project Management

# 1. Introduction

## 1.1 Background of the Study

The innovative and flexible nature of APM has earned it considerable praise in recent times. Emphasising incremental development, continuous stakeholder engagement, and responsiveness, compared to traditional, step-by-step project management style, APM, which originated from the software development industry, is quite different (Beck et al., 2001). By applying fundamental agile concepts, including sprints, daily stand-up meetings, and feedback sessions, project teams are better able to deal with changing requirements and other unplanned challenges. Consequently, it is best suited for fast-moving environments (Serrador & Pinto, 2015). Gradually, such concepts have also been used outside of IT, as some non-tech domains, like construction, have started to use Agile philosophies to enhance project performance, minimise risks, and address changing client expectations (Conforto et al., 2016).

According to Jamshidi (2023), typical project management techniques may not be able to handle the high level of uncertainty, risk, and change inherent in building projects, which are frequently vast, complicated, and time-sensitive. Construction managers may find that APM's emphasis on incremental deliveries and stakeholder involvement gives them more flexibility to handle challenges as they arise, such as unforeseen environmental conditions, design changes, or shifting legislation (Bergmann & Karwowski, 2019).

The outbreak of the pandemic has affected the construction industry very badly. There is uneven access to materials, delays in delivery timelines, and a lack of an adequate and specialised workforce (Omotayo et al., 2024). The entire world faced reoccurring delays within projects as a result of constrained movement of workers, forced isolation measures, and lack of accessible construction materials. The World Economic Forum (2021) states that traditional management principles that remained unscathed during the pandemic revealed their weaknesses. Such methodologies, which are often used in the construction sphere, include project planning along with overseeing active project sites, showing little to no development or flexibility to change as the situation demands.

Constant fluctuations in demand and supply gaps, an increase in budget constraints, ensuring the safety of the workforce, and adapting to new working conditions are some of the major challenges faced by the construction industry in developing countries (Harris et al., 2020).

Moreover, developing countries also faced issues in adapting the new techniques and strategies, such as remotely monitoring ongoing projects and digitally connecting with teams due to limited infrastructure to support the implementation of modern and innovative technologies. The available traditional project management approaches, due to their strict standards and already defined schedules, were the barriers to successfully adapting to the required changes in project management in the construction industry (Circic Lalic et al., 2022).

With regard to the problems mentioned, APM has a solution to these, and it comes in the form of a framework that allows step-by-step development, stakeholder engagement, and the ability to alter the project to meet emerging conditions (Copola Azenha et al., 2021). The flexibility embedded in APM practices enables construction managers to make adjustments more swiftly in the projects. This impacts the chances of delays and cost overruns (Suhartini et al., 2024). Also, most agile methods include feedback from specialists in other fields. Due to its ability to adapt, APM is considered a crucial implementation in the construction industry because it simultaneously allows engagement of multiple stakeholders, such as customers, project teams, designers, contractors, and project engineers (Dingsøy et al., 2012). In addition, the APM's capability to subdivide large building projects into more easily controllable portions serves to lower risks and ensure the efficient use of resources by firms. The focus on achieving incremental value through very frequent iterations and reviews in Agile ensures that projects are completed, even when they are disrupted by several unforeseen challenges, such as those that occur during a pandemic.

The currently conducted research examines how the implementation of Agile methodologies in the construction industry in developing countries enhances project outcomes. It also attempts to assess the boundary condition of organizational flexibility and the mediating effect of teamwork on the relationship between APM practices and project success. This explains how these factors affect the application of Agile techniques in construction projects that lead to completing projects successfully within budgetary constraints. The author's interest in this topic was triggered by the increasing expenditure towards construction projects in these developing nations. It has been noted that, over the last decade, the construction industry in these countries has experienced significant growth. Hence, the author hopes to provide guidance on how construction firms can improve project delivery and minimise expenditure through the adoption of APM strategies.

## 1.2 Research Gap

As reported by Rigby et al. (2018), APM is very popular in technology and IT fields because of its accuracy and speed. However, the use of technology in the building sector is lagging, even though the sector is becoming more complex and needs greater flexibility. While construction projects are subject to dynamic factors like changing client expectations and limited availability of resources, the industry is still stuck with traditional project management practices (Arefazar et al., 2022). This gap between what the construction sector needs and what is available with the standard methods is accountable for project execution inefficiencies in terms of overspending and delays, which demand a more agile approach to be adopted.

Although the construction sector is growing significantly, particularly in emerging regions, APM adoption is still challenging in those markets. According to Turner (2021), key obstruction factors are changing aversion, absence of Agile frameworks customised for construction, and the industry's overreliance on centralised decision-making. The complexity of construction, where various parties with competing interests are involved, also makes it difficult to apply Agile's core tenets of multi-function team collaboration (Moreno et al., 2024). Such limitations slow down the industry's capacity to cope with unexpected shocks like shortages of materials, changing labour supply, or new legislation.

Amid escalating competition, the construction sector is changing towards sustainability, cost-efficiency, and innovation (Albuquerque et al., 2020). The adoption of APM practices in construction sectors is a potential solution that is relatively new due to APM's focus on iterative development, stakeholder participation, and continuous refinement. However, the practical implementation in the construction industry has not yet been fully explored. Most pre-existing literature concentrates on Agile techniques for software and IT industries, with very few attempts to investigate how APM can be modified to fit the peculiarities of construction projects (Owusu-Manu et al., 2019).

There is a major gap concerning the approaches that can help Agile be adopted or adopted improperly in construction, especially in developing nations where infrastructure projects are critical for economic development. In addition, there is little literature on how organisational APM flexibility, stakeholder participation, and resistance to Agile transformation affect APM implementation success in construction (Lines et al., 2015; Sadeek, 2022). If the construction

industry fails to understand these challenges, the industry is unlikely to be able to leverage Agile adoption in projects to improve efficiency and resiliency.

The purpose of this study is to analyse the impediments to APM adoption in construction in developing countries and suggest measures to overcome these barriers in order to shed light on this issue. It seeks to enhance the existing literature on APM beyond its primary focus on IT and offer useful insights on how APM can optimise project management processes and sector development in the long run.

### **Research Objectives**

- To identify the impact of Agile management practices on project success (e.g. Project quality, time management and cost efficiency) in construction industry.
- To identify the influence of team collaboration (e.g., team effectiveness, trust and cooperation, and shared decision making) on project success in construction industry
- To examine the mediating role of team collaboration between Agile management practices and project success.
- To examine the moderating role of organizational flexibility (structural flexibility, decision making flexibility and resource allocation flexibility) between Agile practices and project success.

### **Research Questions**

- To what extent do the Agile management practices influence team collaboration and project success in construction industry?
- Does team collaboration mediate and organizational flexibility moderate the relationship between agile management practices and project success?

## **1.3 Definitions and Scope of the Study**

This research looks into the application of APM practices in developing countries' construction markets, where project management was mainly characterised by severe project controls and top-down decision-making. In addition, Agile in Information Technology is accepted because of its flexibility, integration, and progressive accumulation of value (Rigby et al., 2018). However, its adoption in construction is still limited (Turner, 2021). This study intends to resolve this gap by carefully analyzing the Agile adoption in construction projects along with its feasibility, barriers, and facilitators.

This research centres on the application of Agile frameworks in construction project management, particularly Lean, Scrum, and Kanban. It evaluates the impacts of basic Agile's adaptive planning, stakeholder engagement, and incremental development on project execution and productivity (Forcael et al., 2024). As per Al-Zubaidi (2024), the key question of this research is how far the implementation of Agile methods will allow for the improvement of economies and efficiency of time, quality control, and risk in construction projects.

Furthermore, the study also predicts that team collaboration could assist companies in adapting agile methodologies in their business processes in order to boost the chances of project success. In this regard, Raji et al. (2021) highlighted that a strong collaboration among team members supports increased project success due to the APM approach. The study also indicates that team members' quick communication and collaborative decision-making processes aid businesses in finishing projects more successfully and economically. It also examines how timely, to-the-point, and clear information flow contributes to the success of projects with the help of the APM approach. Similarly, Chathuranga et al. (2023) suggested that many tools, such as stand-up meetings and digital project management offered by APM, enable team members to participate in important decisions during planning and execution for improved performance.

In addition to collaboration, this research examines the implementation of agility in the construction industry (Prakash et al., 2022). It explores the extent of decision-making autonomy and the flexibility that project teams have in adapting their workflows. Furthermore, the study investigates how institutional flexibility influences decision autonomy, particularly in adjusting project focus and scope across different phases (Malla, 2024). It also assesses the management of financial, human, and material resources within an Agile framework, analyzing the balance between organizational control and adaptive project execution. Considering the constraining nature of the construction industry, the research investigates how pervasive organizational boundaries and intercultural conflict hinder the use of Agile approaches (Baxter et al., 2023). Finally, the research describes the influence of some external contextual conditions, such as legislation and market dynamics, on the functionality and application of Agile approaches to construction projects.

By exploring the aforementioned elements, this study aims to understand the application of Agile methods in construction projects in developing countries. The results will enhance

understanding of the strategic, operational, and socio-cultural integrative prerequisites necessary for the effective implementation of Agile methods in construction. Consequently, there will be a shift towards the use of more flexible and effective management practices in the construction industry.

### **Definition of key terms**

- Teams within an organisation can respond flexibly to changes in project specifications, market conditions, and stakeholder needs with the help of **APM**, an iterative and flexible approach to project management (Arefazar et al., 2022). APM encourages flexibility in contrast to traditional methods by utilising feedback loops, short iterative cycles, and group decision-making.
- González-Anta et al. (2020) point out that **team collaboration** is the degree of interaction, communication, and sharing of authority within a project team in order to accomplish project goals. Good teamwork fosters trust, efficiency, creativity, and positive outcomes in projects.
- According to George and Zakkariya (2015), **organisational flexibility** refers to an organization's ability to adjust to shifting project requirements, inherent constraints, and external market conditions. It determines the degree to which a company manages uncertainty and incorporates novel strategies, like Agile techniques.
- According to Sui Pheng et al. (2019), the **construction industry** is responsible for the planning, designing, building, and managing of infrastructure projects, such as roads, bridges, and residential, commercial, and industrial buildings. It is distinguished by a variety of stakeholders, complex project environments, and the need for efficient resource management.

## **1.4 Structure of the Study**

This research is structured into five main chapters:

### **Chapter 1: Introduction**

This chapter starts with the background of the study. Later, it highlights the gap analysis, research objectives, and questions. Finally, it establishes the scope of the study and offers definitions of key terms used in the study.

**Chapter 2: Literature Review**

This section starts with a brief overview of the construction industry in developing countries, especially South Asia. Later, each variable is explained in its context, and the theoretical relationship between variables is developed. Finally, theories supporting the research framework are comprehensively discussed, and the theoretical framework is developed.

**Chapter 3: Research Methodology**

In this chapter, research philosophy, research approach, and research design are discussed in the first phase. In the second phase, population, sampling strategy, data collection, and data analysis techniques are presented. Finally, ethical considerations are drawn for the study.

**Chapter 4: Data Analysis and Findings**

This chapter starts with a demographic analysis of the data. Reliability and descriptive analysis are discussed later to check the reliability of the scale and patterns in the data. Later, correlation and regression analysis are discussed to find out the relationship between the variables and acceptance or rejection of the proposed hypothesis. Finally, a summary of the status of the hypotheses is presented.

**Chapter 5: Discussion and Conclusion**

In this chapter, findings of this study are compared with existing research work. Later, theoretical and practical contributions of the study are discussed. Finally, recommendations for the industry experts, limitations, and future directions for researchers are presented.

## 2. Literature Review

### 2.1 Comparison of Agile and TPM in Construction

There is a difference in how APM and TPM manage their construction projects. In comparison to APM, traditional project management usually runs a construction project through the waterfall approach, in which a project is divided into phases (Kalaiarasan, 2021). Once set, a project plan is extremely difficult to change. In comparison to TPM, APM takes on construction projects iterative and accommodating approaches and applies them in addition to incorporating sets of constantly changing project requirements. Traditional approaches provide scope to address issues that are encountered during the duration of the project, which often includes the loss of manpower or surge in material rates (Buganová & Šimíčková, 2019). This is done by setting a hierarchical scope of decision-making, which is rigid in nature and eliminates any possible changes. On the other hand, Agile encourages collaboration of clients and stakeholders, making it easy for projects to be developed and changes to be made on the go. However, Agile still has its adoption barriers, which stem from industry norms that are resistant to incorporating flexibility into their processes (Ciric Lalic et al., 2022).

Many case studies have shown how Agile approaches have worked well in construction projects (Kumar et al., 2020). One of the studies that Ng et al. (2023) did is focused on the Agile adoption for a large-scale commercial real estate development project. Some of the Agile practices that were employed, like incremental delivery, daily standup meetings, and sprint planning, improved stakeholder alignment and reduced project rework. Senior management with traditional approaches protested against Agile adoption, but the project managed to be completed in reduced time and cost compared to 15 percent and 10 percent, respectively, saving compared to traditional approaches. In the same line, Owusu-Manu et al. (2019) studied the full adoption of Agile in a midsize construction company based in the UK. Agile techniques deployment, like putting Kanban boards, improved workflow performance, and delays were reduced significantly. While the firm enjoyed benefits like greater stakeholder satisfaction and a 25 percent increase in the ability to adapt to design changes, some issues continued to remain regarding the lack of defined Agile positions within the slim organizational structure.

Agile adoption in developing nations has further hurdles owing to regulatory and monetary issues. As Arefazar et al. (2022) examined one Indian highway construction project, Agile practices were incorporated on a limited basis to manage risk and materials. An Agile approach allowed for a 20% reduction in material waste and greatly improved the ability to deal with problems that arose in real time. But the cost and scope of the project were mandated by the government, which forced Agile to be implemented in a restricted manner. At the same time, having an Agile approach caused the project expenses to be relatively low while improving the project's overall sustainability.

Although these case studies demonstrate that Agile offers a notable improvement in responsiveness, efficiency, and collaboration in construction projects, its adoption presents some industry-specific challenges. One of the most persistent issues, accompanied by a lack of organizational cultural readiness, is change resistance, which makes flexible organizational structures hard to implement (Ozorhon et al., 2022). Furthermore, the construction industry seems to benefit from compliance with regulatory frameworks through the use of some hybrid Agile and TPM model approaches to project control, which do embrace Agile's iterative and collaborative elements (Albalkhy & Sweis, 2021). This study aims to fill the gap in applying Agile methodologies to the construction industry by analyzing these comparisons and actual case studies.

## **2.2 Agile Project Management**

APM is a type of management that is focused on value delivery by using customer collaboration feedback. It is based on the concept of APM, which was formulated in 2001 (Beck et al., 2001). APM differs from managers due to its flexibility aspect, where customer collaboration is ensured and being responsive to changes is critical. Agile methodology works on breaking a project into smaller manageable sprints, so the project managers are able to quote at the end of each sprint. This allows teams to work better as all the simpler tasks make life easier. Some key aspects of APM include frequent observation and adaptation, constant communication with stakeholders, communication with other teams, and team empowerment (Albuquerque et al., 2020). APM has seeped into the construction and healthcare industries; businesses have started to pay attention to it and integrate it into their model because the approach APM is based on is beneficial—risk management is easier, ensuring timely delivery of projects (Arefazar et al., 2022).

### **2.2.1 Agile project management practices and project success**

The introduction of Agile methodology has been associated with substantial improvement in the rate of successful project completion in different sectors. According to APM research, practices like iterative development, adaptive planning, and collaborative decision-making have a high success rate of completing projects on time and within budget (Dingsøyr et al., 2012). These practices support a broader strategy for handling uncertainty and risk management in cases where there is frequent change in client requirements. APM's focus on small, but usable outputs or collaboration also enables the evaluation of the product to a great extent and to identify problems existing in the early stages; therefore, the chances of the final good being suitable to the client are high (Conforto et al., 2016). In addition, increasing transparency as well as engaging with stakeholders has improved ways of communication and enhanced the resolving of issues faster, which is helpful in very complex or big projects. As a result, the link between the use and application of Agile practices and the success of the project is clear, suggesting that project success is achievable by organisations that implement these practices in order to meet the project objectives, improve client satisfaction, and optimise the use of resources (Sandstø & Reme-Ness, 2021).

### **2.2.2 Agile project management practices and team collaboration**

Collaboration among team members is one of the key aspects of coordinating agile projects as well as working with Agile. Integrated and self-organising agile teams consist of people from different specialities who work together to achieve the goals of the project, as put forth by Serrador and Pinto (2015). Such teams have a sense of autonomy because they do not have to constantly consult higher management for approval, and as a result, they become more self-assured and take responsibility for the outcome of that specific project (Albuquerque et al., 2020). Internal collaboration within the Agile team is not restricted to the team members only but also includes clients, suppliers, and other external project stakeholders who assist in detailing and scoping the project (Ciriello et al., 2022).

Good communication, appropriate goal-setting, and the continuous provision of feedback are then fostered by a number of daily practices, including stand-up meetings, sprint planning, and sprint review sessions. These practices promote collaboration and result in good team integration (Rigby et al., 2016). According to research, teams that implement these clearly defined agile principles are able to provide superior outcomes, primarily due to greater

collaboration, which raises the project's success rate (Conforto et al., 2016; Conforto & Amaral, 2016).

## **2.3 Team Collaboration**

Collaboration aims at enabling a more self-managed style of work where every team member, regardless of inconsistency in their discipline, can address a joint goal in unison while exercising discretion in decision-making, sharing of resources, and imparting knowledge to each other (Slack, 2021). In terms of actual practice of management, collaboration is about the linkage of all the members on a continual basis, helping each other day to day, and integrating all the multifaceted parts needed to get a project worked on (Patel et al., 2012). Teamwork and cohesion are vital in the successful implementation of projects because different ideas are combined, duplication is minimised, and an enhancement of creativity occurs, resulting in a greater and better solution. Tannenbaum et al. (2012) observed that if collaborative teams are involved, it is easy to respond to the external environment, accurate decisions can be made, and high-quality work is produced. Collaborative practices are significantly crucial in Agile settings where adaptability and progressive incrementalism are two principles to follow.

### **2.3.1 Team collaboration and project success**

Improving cross-team collaboration allows for improved communication to occur as well as improved problem-solving processes and decision-making processes, which improves the outcome of the work (Cohen & Bailey, 1997; Radhakrishnan et al., 2022). In the agile context, teamwork makes it possible for groups to meet constant changes of requirements in a project. Collaboration among team members enables the sharing of ideas, proactive addressing of issues, and the coordination of activities towards specific goals, thereby improving the efficiency of the processes involved (Serrador & Pinto, 2015). In addition, the collaborative aspect of Agile projects makes it possible to achieve high-quality output, high stakeholder satisfaction, as well as a quick response to any unplanned developments, all of which are determinants of project success (Conforto et al., 2016).

### **2.3.2 Mediating role of team collaboration**

APM is highly dependent on team collaboration. According to Serrador and Pinto (2015), agile methodologies and the success of the project are completely reliant on the collaboration

taking place in the team. They state that when a measure of that collaboration goes up, the Agile principles are followed more closely; for example, the gathering of feedback is made possible, and a process of reiteratively meeting the new expectations and goals is fostered (Qaddumi et al., 2021). Still, team collaboration has a positive impact on decision-making, communication, and distribution of responsibilities and workload (Patel et al., 2012). This paves a way for the Agile methodologies to be executed properly and successful outcomes to be achieved. What is emphasised in this case is the fact that collaboration extends beyond simply facilitating Agile practices to become an active ingredient that shifts the practices toward end results.

## **2.4 Organizational flexibility**

An organisation's disposition towards upgrading its internal and external response system is known as organisational flexibility. It entails the ability to alter strategies, models, and frameworks in light of changing market, technological, or emergent circumstances (Nandakumar et al., 2014). Within the realm of project management, an organisation's versatility is fundamental in providing teams with the ability to accommodate alterations in the project scope, time, and resources available. Compared to their counterparts, organisations that possess heightened flexibility have the tendency to thrive in complex and changing project settings as they are able to adjust their focus when needed (De la Gala-Velásquez et al., 2023). In Agile environments, stakeholder feedback and the market dynamics tend to alter, which calls for greater flexibility and diversity in a project.

### **2.4.1 Moderating role of organizational flexibility**

Organisational flexibility is a crucial moderating variable for the nexus between Agile practices and project success (Turner, 2024). Agile processes delineate the ways of being able to manage a project under changing circumstances, but their application is strongly tied to the support structure inherent in the organization. In comparison to other organisations, the ones with higher flexibility are more suited for the implementation of the Agile processes such as incremental planning, frequent feedback, and changing scope (Rigby et al., 2016). It enables the teams to adapt to broadened project scope, changing requirements, and incidents, and thus increases the effectiveness of applying Agile strategies.

Furthermore, flexible companies are better equipped to handle the uncertainties and difficulties of project management (Albuquerque et al., 2020). They can foster team self-management and promote creativity and idea sharing, both of which are essential in an Agile setting. As expectations change, these businesses are adept at managing chaos and keeping everyone and everything on track, allowing these teams to produce superior outcomes that meet project objectives and customer satisfaction (Eisenhardt & Martin, 2000). This demonstrates unequivocally why it is critical to establish an organisational structure that is adaptable in order to fully utilise the potential of Agile techniques.

## **2.5 Project Success**

There are numerous ways to interpret the concept of project success. In the past, the triple constraint of project management—time, budget, and scope—has been seen as the key to project success (Shenhar et al., 2001). Though they take into account project stakeholders, deliverable quality, and other value creation aspects, contemporary definitions of project success do not completely realize this (Atkinson, 1999). For an Agile-based project, success can often be gauged through how well the project deals with changes, the quality of relations that the team has with other stakeholders, and even the nature of requirements in the client. The measure of success is largely influenced by how effectively the goals set out were completed, but true success is how well a project was able to improve and engage with its customer over the course of its lifecycle (Conforto et al., 2016; Turner, 2024). This broader understanding of success reflects the flexible and adaptive nature of Agile methodologies, which prioritise responsiveness and stakeholder collaboration over rigid goal-setting.

## **2.6 Theoretical Framework**

Like in any modern area of study, there needs to be a sturdy background on the theories to grasp how their implementation affects project success. Two broad perspectives, which are very important—Change Management Theory and Lean Management Theory—provide a broad scope on how agile techniques can be introduced into a very conservative industry. These theories go beyond explaining the transformation needed in construction project management techniques. They also explain how agile practices will achieve efficiency, flexibility, and collaboration within an organisation.

### **Change Management Theory and Agile Implementation**

Change Management Theory emphasises the need for a systematic shift from traditional project management to Agile approaches. Kotter's (1996) Eight-Step Change Model is particularly useful in this aspect as it details vital steps like the creation of urgency, coalition building, and strategy formulation, as well as the cultural embedding of changes. The construction industry, which is very conservative in its approach to practices, is highly resistant to the adoption of Agile. This resistance is often driven by unfamiliarity, limited knowledge of Agile, and extremely bureaucratic structures (Turner, 2021). Using Kotter's model, construction companies can effectively manage this change, ensuring that Agile is taught, embraced, and perpetuated in the project teams.

One more critical aspect of Change Management Theory is Lewin's Three-Stage Model (Lewin, 1951), comprising unfreezing, changing, and refreezing. In the "unfreezing" stage, the existing mindsets need to be changed, alongside questioning the traditional methods of project management. The "changing" stage comprises teaching construction teams Agile frameworks, which include iterative planning, stakeholder engagement, and flexible work arrangements. Ultimately, in the "refreezing" stage, the emphasis is on sustaining Agile components as an integral part of construction project implementation. Agile techniques in construction projects without any comprehensive change management approaches may not be effective, as the teams will use traditional techniques when faced with challenges.

### **Lean Management Theory and Agile Principles in Construction**

Lean management theory originated in the manufacturing industry. Similar to Agile methodologies, it places great importance on optimising efficiency, reducing redundancy, and improving processes continuously. Some of the major pillars of Lean, which include Just-in-Time (JIT) inventory augmentation, Kaizen (continuous improvement), and value stream mapping, were first introduced by the TPS (Toyota Production System) in 1988 (Ohno, 1988). These concepts are fully aligned with Agile's core principles. When dealing with construction projects, Lean principles enable one to overcome delays, reduce unnecessary steps, and improve coordination within the team, thus achieving Agile goals successfully.

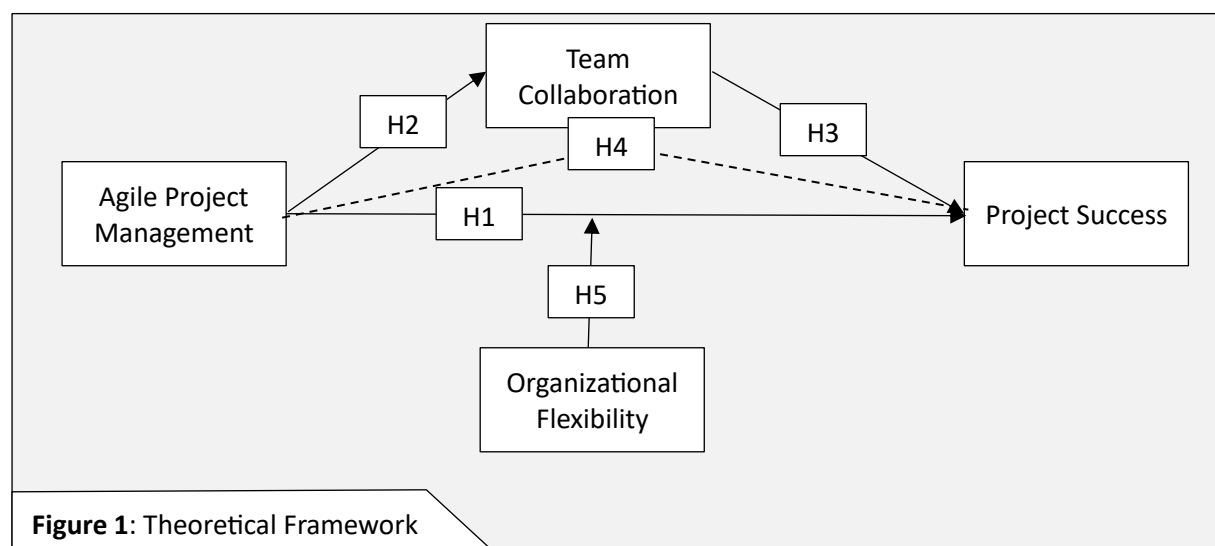
One of the main challenges in the management of construction projects is associated with the rampant waste of materials, poor communication, and inflexible contracts (Albuquerque et

al., 2020). Lean construction is a new field of study that was developed from lean management theory, and in conjunction with Koskela et al., it includes Agile through the use of collaborative scheduling, flexible workflow, and real-time issue resolution (Koskela et al., 2002). The Last Planner System (LPS) and Integrated Project Delivery (IPD) are examples of tools that construction teams put into use in order to adhere to Agile principles where work is done in iterations and feedback from stakeholders is constantly incorporated.

The adoption of Lean principles in construction projects is not without obstacles. The construction project environment is not like manufacturing. Site-specific, one-off construction projects are impacted by external factors like weather, available materials, and regulations (Sadeek, 2022). There is much unpredictability that inhibits the application of Agile approaches in a controlled manner. Even so, impactful success stories, like the use of Lean and Agile methodologies in modular construction projects, show that the integration of Lean, which focuses on efficiency, with Agile, which is flexible, can considerably improve the performance of construction firms (Owusu-Manu et al., 2019).

### Synthesizing Change Management and Lean Management for Agile Adoption

Although Change Management Theory attempts to explain the introduction and maintenance of Agile in construction, Lean Management Theory gives the reason why Agile is useful in increasing work productivity and minimising waste. The intersection of these theories suggests that Agile implementation in construction requires both a strategic transition framework (Change Management) and a process optimisation approach (Lean Management). Companies that adopt both perspectives are able to overcome the main challenges of Agile adoption—change aversion, process inefficiency, and inflexible project management—by developing a continuous improvement culture.



### **3. Methodology**

#### ***Research Philosophy***

This research philosophy is derived from the outermost layer of the Research Onion, focusing on the philosophical stance that guides methodological choices. Positivism, as the selected philosophy, is foundational for the subsequent decisions regarding research approach, strategy, and data collection techniques (Saunders, 2007). Under the Research Onion framework, the positivist philosophy informs the choice of a deductive research approach, which seeks to test pre-defined hypotheses based on established theories. This deductive reasoning is operationalized through a survey strategy, a commonly used method within quantitative research to collect large-scale data that aligns with positivist principles.

Thus, this research follows Positivism as its chosen philosophy. With this viewpoint, the use of a quantitative approach has coherence. This further affirms the aims of the study in determining the correlation between APM practices and the successful completion of construction projects. Creswell (2014) states that “positivism” regards reality to be objective and capable of being quantified through empirical data. This is consistent with the consideration of measuring the influence of Agile methodologies on the success of the project and the assumption testing that the study undertakes.

Positivism suggests that the researcher ought to remain detached in order to avoid personal bias in any given interpretation, which allows the results to be duplicated and utilised in distinct contexts (Saunders et al., 2019). An empirical technique is also used in this work in the form of measurements, computations, and objective data. Correlation and regression analysis were applied to examine the relationship between APM practices and project success. Gomm (2018) claims that one of the reasons why researchers rely on positivism in empirical research is because it enables them to formulate and test their assumptions in addition to determining the relationships of various phenomena. A hypothesis was formulated that APMs' efficiency can indeed be measured and is subject to control in the same way as any other universal principle that governs all projects regardless of the domain or context. This approach corresponds to the lower tiers of the Onion Model and focuses on the impact of Agile techniques on the construction industry (Saunders, 2007).

### ***Research Design***

In this study, a quantitative research methodology is used. The cross-sectional research strategy chosen for this study is suitable for evaluating the correlation between variables at a specific moment in time. According to Bryman (2016), cross-sectional studies may be useful when researchers are not interested in changes over time because they allow researchers to record a certain occurrence simultaneously across several subjects or organisations. This form allows for a concentrated analysis within the limitations of the study's schedule, reflecting the time-bound character of the research as indicated in the Research Onion.

This design makes use of the research onion framework and integrates both the deductive technique and the data collection instrument (survey) for methodological coherence. It makes it possible to evaluate the state of APM implementation in the construction industry in developing nations and its effects on project success in an intensely competitive environment. This design is particularly important because data is collected at one point from a reasonably large sample, making it possible to obtain generalisations without straining for extensive longitudinal data collection (Creswell, 2014). Moreover, the cross-sectional design further conforms to the principles of positivism because it allows for the quantification of the concepts being studied as well as the testing of predetermined theories. This option also provides a compromise between the scale, duration, and resources that were premised on the practical issues described by the Research Onion (Saunders, 2007).

Instead of using qualitative methods, this study was conducted using a quantitative approach with the goal of attempting to identify measurable relationships between APM practices and construction project success. The data collection method that is most appropriate for this study is cross-sectional design with the aid of quantitative techniques because it enables the collection of standardised data from a large number of respondents at once. The assessment of the influence of APM towards key performance indicators such as time, cost, and quality necessitate a more accurate analysis which is only achievable through quantitative analysis. While qualitative research allows for greater understanding of context, it is more open-ended and less effective in searching for patterns and drawing conclusions. In this context, a quantitatively focused approach makes it possible to evaluate the level of APM adoption in the construction industry of developing economies and achieve valid results without extensive time expenditure (Bryman, 2016; Creswell, 2014).

### ***Research Approach***

This research takes a deductive approach, which, according to Saunders (2007), implies testing hypotheses based on existing theories to assess their applicability in a particular context, including the construction industry. The second layer of the research onion defines how the research strategy fits within the chosen philosophy, which is positivism in this case. In linking the research method (survey) with the underpinning philosophy (positivism), the deductive approach creates methodological pluralism, which is integration, as was illustrated in the research onion. Because positivism places a high value on objectivity, reproducibility, and hypothesis testing, the structured form of deduction fits very nicely with it. As a result, the logical method described in the research onion guarantees that the study stays concentrated on confirming the claim that APM techniques have a beneficial effect on project success.

The research approach in this study is deductive in nature. This approach helps to test the existing theories and models using empirical data. Assuming that a set hypothesis or theory is present, a deductive method attempts to uphold or invalidate it through the collection of data (Saunders et al., 2019). This study assumed that APM practices positively contribute to project success in the construction industry. Therefore, the research aims to verify the above assumption by data collection from respondents. The deductive approach is considered an appropriate method for the current research because it supports the testing of hypotheses (Flick, 2018). By its nature, the deductive method serves well in circumstances where there exists a knowledge base, which is the case in respect to the agile methodologies, and outlines a clear process to ascertain the validity of given theoretical ideas in a given environment (Saunders, 2007).

### ***Research Method***

The current study employs the survey method as its principal technique for data collection. It allowed the author to collect data by sharing the structured questions with the participants. According to Bryman (2016), the survey method is one of the most common tools for conducting quantitative research. Moreover, this method provides the opportunity to gather extensive data from a broad spectrum of respondents in an effective and efficient manner. The survey is designed in such a way that the author can evaluate the application of APM practices in the construction industry.

This questionnaire has been designed to encapsulate core components of project performance, such as working within the timeline, cost optimisations, satisfaction of stakeholders, and overall adaptability. In order to ensure that the answers provided are meaningful and constructive, primary data is gathered from various senior people in the construction industry, like sector team leaders, project team members, and their supervisors. This way, the participants are most familiar with the projects and their scope, which in turn increases the credibility of the data gathered. A key asset of this research design is the level of accuracy and validity that the participants' focus is likely to yield. Regardless of the methodology applied, Saunders et al. (2019) underscore that surveys remain one of the superior methods for evaluating the impact of agile approaches on key project outcomes. To ensure the accuracy and reliability of the data, the survey design was intended to capture not only the impact of agile techniques in construction projects but also to corroborate the data collected and ensure that the study outcomes are relevant to real-life project management scenarios.

### ***Population and Sampling***

This study targets pivotal actors in the construction field, specifically project managers, other team members, and professionals who utilize Agile Project Management (APM) in the building industry of developing countries. Their lived experiences are essential for evaluating the use of APM and the difficulties accompanying its adoption. Grasping their viewpoints makes it possible to thoroughly assess how Agile processes work within the construction industry. The chosen research participants correspond with the primary participant selection objective, which is to validate a theoretical assumption by actual observation and implementation as stated in the Onion Model of Research. Participants are selected using convenience sampling, a type of non-probability sampling method where the subjects are chosen due to ease of access and willingness to participate (Etikan et al., 2016). This method fits well with the scope of the study in terms of time and resources. Furthermore, due to the institutional heterogeneity of the construction sector and the absence of adequate sampling frames in developing countries, convenience sampling also becomes a valid and reasonable choice.

The study aimed to achieve a sample target of 80 respondents selected based on their accessibility and representation of the specific industry, which guarantees statistically accurate results with a 5% margin of error and a 95% confidence level. The convenience

sampling technique is employed in order to collect data within time and resource constraints while still including relevant knowledgeable participants (Chandler & Shapiro, 2016). The main reason random sampling could not be utilised is the challenge of contacting specialists who are scattered over various projects and different organisations. The study makes a claim on accessible professionals with firsthand knowledge of Agile paradigms and therefore provides an analysis of APM's effect on the success of construction projects in a practical context. This sampling technique is also relevant within the context of the research onion due to issues of data availability, focus relevance, and time constraints (Saunders, 2007).

### **3.1 Data Collection**

For collecting data to analyse the implementation and application of APM in construction projects, the study mainly relies on structured questionnaires. Structured questionnaires are one of the most common tools in quantitative research, as they offer data uniformity, assuring reliability and comparability (Bryman, 2016). The questionnaire captures success measures of a project in terms of time, cost, stakeholder satisfaction, and quality and features closed-ended questions that gauge the level of agreement and the adoption frequency of Agile methodologies in the projects. Standardisation of questions and replies enhances effective computation of statistical data (Creswell, 2014). The technique corresponds to the Research Onion framework guiding systematic data collection while observing the study's deductive philosophy (Saunders, 2007).

Since the APM and project success measures underpin the APM, the survey's focal participants were construction project managers, construction team leaders, and other construction professionals. The prepared structured questionnaire enables the respondents to answer a multitude of questions quickly, which enhances the level of accuracy and trust in the findings (Saunders et al., 2019). To reinforce participants, correct knowledge, the survey contained some eligibility requirements, including at least one year of Agile project experience in the construction field. The use of structured questionnaires allows the researcher to combine the information on the adoption and success of the Agile methodology systematically and objectively. This was done to meet the requirements of the research aim, which is centred on analysing the established hypotheses and aims to provide a broad scope of application information within the boundaries of the theoretical and practical aspects of the Research Onion model (Saunders, 2007).

With the aid of purposeful sampling, a wide array of construction practitioners, project managers, and team members from several developing nations are intentionally selected to ensure variety. Participants come from construction projects with varying magnitudes of complexity and different types, such as residential, commercial, and infrastructure. The study captures the perspectives of several professionals by including both large and small firms with varying degrees of APM practices. This aids in understanding APM adoption and its impacts. Furthermore, the credibility and comprehensiveness of the findings are improved by applying stratified sampling to key demographics such as years of experience, project role, and project type.

### **3.2 Data Analysis**

This analysis focuses on the correlation between the success of the project's objectives and APM practices. Multiple tests were performed for reliability and validity. The research utilised a computerised survey which was later analysed by the SPSS. The first step of the analysis was demographic. Age, professional experience, and industry of the respondents were captured to ensure that the results' interpretation is well contextualised. The results obtained from the survey can be reliably generalised. The next step was verifying the reliability using Cronbach's alpha. This step assesses how consistent survey items are with each other, assuring that the scales of measurement are credible. This was followed by correlation analysis to evaluate the degree and type of relationships among some primary variables, including APM, TC, OF, and PS. Through the use of linear regression analysis, this analysis attempted to detect how Agile adoption influences project success and to what extent. Other aspects of Agile practices influencing the project's outcomes were also investigated in terms of moderation and the extent to which organizational flexibility reduces or enhances the Agile practices' impact. These techniques were used as focal techniques to analyse the study's hypotheses.

Demographic analysis is important for understanding how the members of the respondent group are structured and whether the sample has a representative distribution of industry professionals. It also aids in comprehending the nuances in professional experience, job titles, and the structural complexities of organizations, which is crucial in interpreting the findings and attempting to address possible biases in the data. This is followed by reliability analysis where Cronbach's alpha is applied. In this case, the survey instrument is evaluated for consistency, and the scales for measuring Agile practices, collaboration, flexibility, and project

success are confirmed to be valid. Values of alphas above 0.7 are deemed to be reliable, which means that varying samples can be confidently administered to the instrument and reliable results will be obtained. For correlation analysis, the interrelationships of study variables are obtained using Pearson correlation coefficients. This portion attempts to verify whether Agile adoption, collaboration, and flexibility are associated with project success. The presence of these phenomena is a strong positive correlation, which illustrates that the variables reinforce one another and is supported by abundant literature on the notion of relationships between Agile practices and the successful execution of projects. However, again, correlation does not equal causation, and so additional statistical analysis is performed using regression models.

Employing linear regression assists in determining the causal relationships using the approach that measures how much Agile adoption predicts project success. The standardised beta coefficient ( $\beta$ ) and coefficient of determination ( $R^2$ ) help measure the explanatory power of Agile practices regarding project outcomes. Nevertheless, analysis of regression misses out on indirect effects and contextual analysis effects. So, collaboration or flexibility is examined to determine if it acts as a mediating variable that explains the relationship between Agile adoption and project success. This approach helps outline whether project success is determined by Agile directly or if other organizational factors help determine the impact. On the other hand, moderation analysis determines if the relationships are affected by some external conditions like constraints of the industry or rigidity of the organisation. While these advanced statistical techniques help understand deeply the effectiveness of Agile, they bring about issues like multicollinearity problems and large sample sizes to provide adequate statistical power. Still, using these methods aids in creating a thorough understanding of the effectiveness of Agile methodologies and provides the project management research with both practical and theoretical benefits.

### **3.3 Ethical Considerations and Methodology Limitations**

Ethical considerations are carefully made to safeguard respondents' rights and uphold the veracity of the research. Confidentiality and privacy for respondents are given top priority, confirming that informed consent is gained in accordance with ethical guidelines (Saunders et al., 2023). Before agreeing to contribute, respondents receive a clear explanation of the objectives of the study, chosen research methodology, and possible outcomes of the study under consideration (Creswell, 2014). To protect participants and their companies from

introduction to delicate information, conflicts of interest, or power disparities, data is anonymised and combined while stored in two separate locations, thereby preventing the identification of individual contributions.

The author has stored data at two different storage facilities to ensure the security of the data and avoid any kind of deliberate or unintentional misuse of the respondent's personal data. Besides, it is the only author who has access to the data. Furthermore, the respondent's data will be deleted after 3 to 4 months once the findings are presented. The ethical committee was engaged, and ethical permission was obtained before starting the research so that the research would comply with laws and regulations. These measures are taken in order to reduce associated risks, proactively address the ethical concerns of respondents, and increase the reliability and integrity of the research.

The current research admits certain limitations that may influence the applicability of results to wider society. The research has used a cross-sectional design, which has the limitation of capturing data for a certain period only, hence ignoring change over time. Moreover, the author has used non-probability convenience sampling, which also has certain potential bias issues. This makes the findings less demonstrative of the wider population working in the construction industry in the targeted countries.

Another limitation stems from the use of self-reported responses, which carries a potential risk of response bias. This could be solved by using triangulation strategies that blend survey data with qualitative data and objective performance measures. Lastly, for the reasons that this particular study concentrates on the construction industry from developing countries, the results may not be relevant in other domains or more developed contexts. This could be solved with future studies that would look into comparing different industries or regions and see how Agile practices are incorporated in those different settings.

## 4. Analysis and Discussion

### 4.1 Demographics of sample

**Table 1.** Respondents' country

Country	Frequency	Percent
Bangladesh	38	50.7
Pakistan	12	16.0
Nigeria	4	5.3
Sri Lanka	2	2.7
Nepal	8	10.7
India	11	14.7
Total	75	100.0

Respondents from Bangladesh comprised 50.7% of the sample population in the study, followed by Indians at 14.7%, Pakistanis at 16.0%, Nepalese at 10.7%, Nigerian respondents at 5.3%, and respondents from Sri Lanka at 2.7%. There was a large number of respondents from Bangladesh, which suggests that APM is popular in the construction industry in that area. The inclusion of respondents from other countries makes it possible to compare APM in economies that are not as well developed. Males dominated the respondents, with 68.0%, which mirrors the construction sector's male bias; however, the 32.0% female respondents indicate a shift towards gender balance in the project management domain of construction.

**Table 2.** Demographic characteristics of sample

<b>Gender</b>		
Male	51	68.0
Female	24	32.0
Total	75	100.0
<b>Age</b>		
18-26 Years	28	37.3
27-35 Years	27	36.0
36-44 Years	15	20.0
Above 44 Years	5	6.7
Total	75	100.0
<b>Qualification</b>		
High School	17	22.7
Bachelor's	26	34.7
Master's	28	37.3
Doctorate	4	5.3
Total	75	100.0

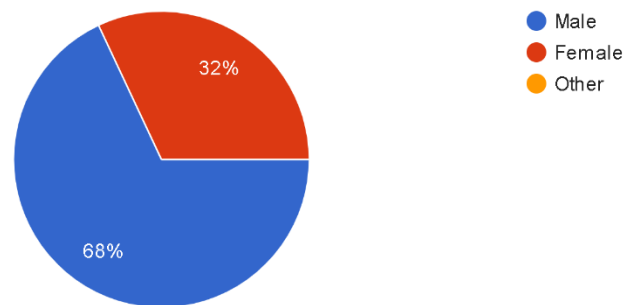
<b>Job Position</b>		
Project Manager	44	58.7
Site Engineer	13	17.3
Architect	14	18.7
Contractor	4	5.3
Total	75	100.0

<b>Years of Experience</b>	<b>Frequency</b>	<b>Percent</b>
Less than 2 years	31	41.3
2–5 years	18	24.0
6–10 years	12	16.0
More than 10 years	14	18.7
Total	75	100.0

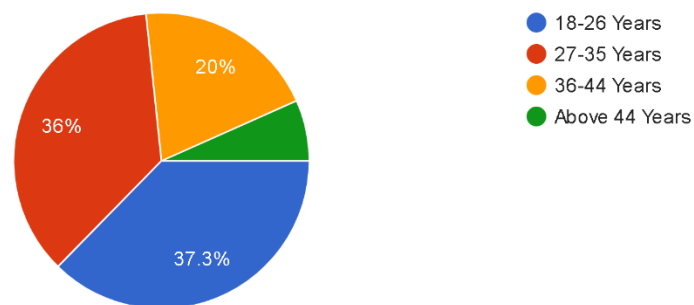
What is your gender?

75 responses



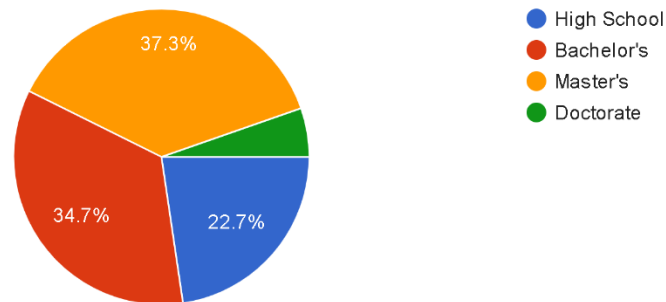
What is your age group?

75 responses



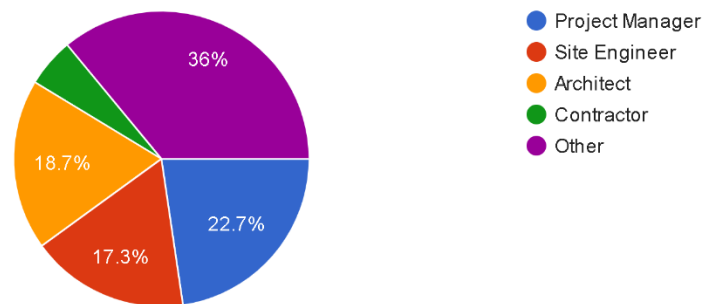
### What is your Qualification?

75 responses



### What is your role in the construction industry?

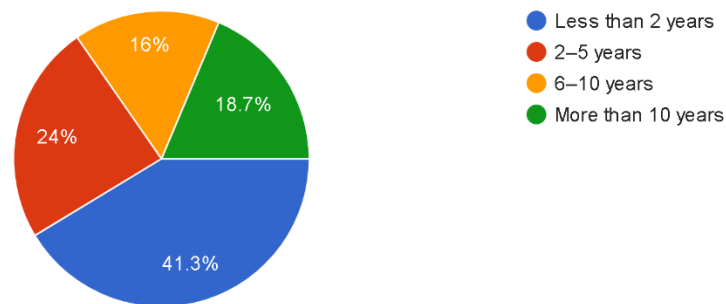
75 responses



Out of the respondents, a dominant number are young professionals, with 37.3% falling within the age range of 18-26 years, while 36% fall within the age range of 27-35 years. This indicates that Agile practices tend to be embraced by more youthful generations of project managers. Relatively, a good part of the respondents has higher education, where 37.3% have a master's degree while 34.7% have a bachelor's degree, signifying the contribution of educational achievement towards project management. 58.6% of the respondents were project managers, while the rest were represented by architects (18.7%) and site engineers (17.3%). The level of knowledge is mixed, so 41.3% have less than 2 years of experience, 24.0% have 2-5 years, and 16.0% have 6-10 years, which brings a blend of perspectives from both newer and older professionals.

How many years of experience do you have in the construction industry?

75 responses



## 4.2 Respondents' experience with APM

In this particular section, we discuss the respondents' views on Agile methodologies, their awareness of Agile concepts, and the frameworks implemented in their region's construction industry. These elements determine the degree of Agile adoption and how it is utilised in construction activities.

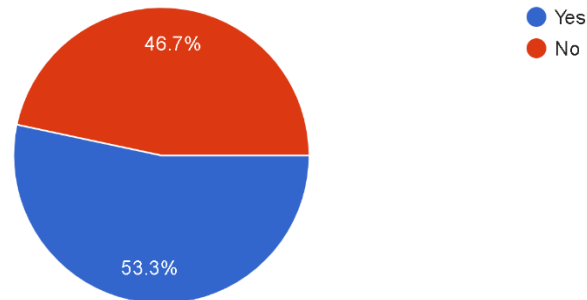
**Table 3.** Knowledge of APM

<b>Experience with Agile</b>		
Yes	40	53.3
No	35	46.7
Total	75	100.0
<b>Familiarly with Agile</b>		
Not familiar at all	21	28.0
Slightly familiar	26	34.7
Moderately familiar	17	22.7
Very familiar	11	14.7
Total	75	100.0
<b>Usage Frequency</b>		
Never	19	25.3
Rarely	18	24.0
Sometimes	19	25.3
Often	10	13.3
Always	9	12.0
Total	75	100.0
<b>Agile Frameworks Used</b>		
Scrum	20	26.7
Kanban	29	38.7

Lean Construction	25	33.3
SAFe	18	24.0
None	24	32.0

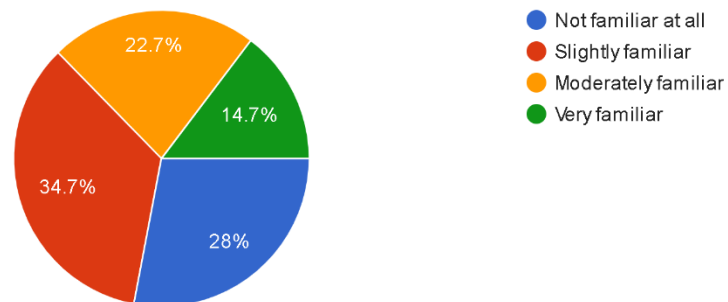
Have you previously worked on projects that adopted Agile methodologies?

75 responses



How familiar are you with Agile project management principles?

75 responses

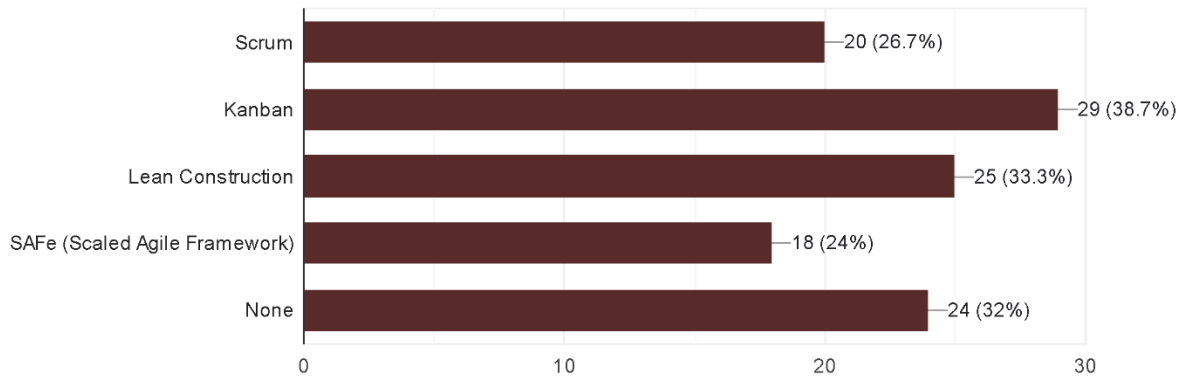


The review suggests that there is a slowly progressing but irregular implementation of APM in the construction sector of developing nations. Although 53.3% of respondents have participated in Agile-based projects, a significant 46.7% still have not, proving that older methods are still very dominant. There is a great deal of difference regarding knowledge of Agile principles. As an example, 28.0% of professionals reported having no familiarity at all, while only 14.7% reported being very familiar. This data gap indicates that many professionals within the industry may lack the skill set to employ Agile appropriately. Furthermore, 25.3% of respondents reported never using them, while a mere 12.0% of respondents reported using them reliably, proving that Alaska is not embracing Agile frameworks; however, these results point towards the industry's sluggish adoption of Agile, most likely due to the singular

complexities involved in construction endeavours, including preset deadlines and restrictive policies.

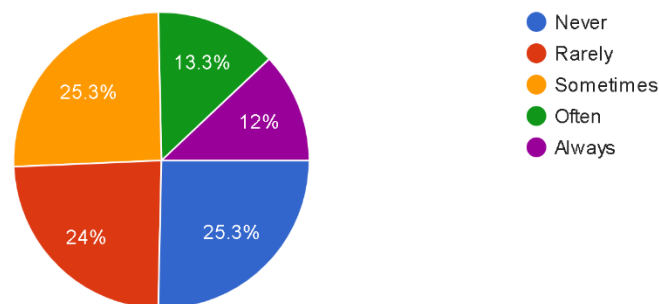
Which Agile frameworks have been used in your construction projects? (Select all that apply)

75 responses



How frequently does your organization apply Agile principles in project execution?

75 responses



Kanban (38.7%) and Lean Construction (33.3%) are the most commonly used Agile frameworks, likely because of their relative ease of integration into construction processes and focus on productivity. Scrum (26.7%) and SAFe (24.0%) are used less often, perhaps because their iterative and scalable methodologies are not as compatible with the rigid frameworks of construction projects. Furthermore, 32.0% of respondents claim that no Agile frameworks are employed within their organizations, which illustrates the prevailing reliance on traditional approaches to project management systems. From these observations, it can be concluded that while Agile is being adopted in certain regions, a macro-level shift in the

industry will require more robust efforts in training, greater organizational support, and fundamental changes to how Agile is integrated into construction project workflows.

### 4.3 Reliability Analysis

To ensure that the items consistently measure the intended constructs, reliability analysis evaluates the internal consistency of the measurement scales used in this study. Cronbach's Alpha ( $\alpha$ ) is a commonly used indicator for this measure, which signifies reliability with a cut-off point of 0.70. Furthermore, reliability is strong with numbers above 0.80 (Hair et al., 2020). In this analysis, all the variables included in the study are considered reliable since their Alpha values lie between 0.833 and 0.845, which also proves the strength of the survey instrument used.

**Table 4.** Reliability analysis

Variable	Alpha Value	No of questions
Agile project management	845	5
Team collaboration	841	5
Organizational flexibility	833	5
Project Success	834	5

The alpha value of APM is 0.845, which denotes a strong level of agreement among the five items quantifying this construct. Likewise, Team Collaboration's reliability coefficient stands at 0.841, indicating that this scale measures collaboration within Agile teams effectively. Also, Organizational flexibility has a high reliability of 0.833, confirming the consistency of this construct regarding flexibility in a project context. Finally, Project Success had an alpha value of 0.834, which indicates high reliability regarding the evaluation of the project's success. These results are consistent with other studies or research (Nunnally & Bernstein, 1994), which states that reliability coefficients above 0.80 indicate more valid research outcomes. These findings support the validity of the study's measurement paradigm, guaranteeing that subsequent data analysis and hypothesis testing are predicated on a stable and consistent dataset.

## 4.4 Correlation Analysis

**Table 5.** Correlation analysis

	APM	TC	OF	PS
Agile project management	1	.830**	.809**	.797**
Team collaboration		1	.850**	.811**
Organizational flexibility			1	.793**
Project Success				1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The examination showed that all the variables are positively correlated with quite strong numbers ranging from 0.793 to 0.850. This means that these factors are likely to be related and are expected to enhance project success in the construction industry. These results correspond to literature where Agile techniques were observed to have positive effects on the performance of projects (Rigby et al., 2018).

Examining correlation dependencies, it is evident that TC and OF have the highest correlation of 0.850 ( $p < 0.01$ ), which shows that these two components are mutually dependent in an Agile environment. In addition, APM is also closely associated with both TC ( $r = 0.830$ ,  $p < 0.01$ ) and OF ( $r = 0.809$ ,  $p < 0.01$ ), confirming that Agile methods are supported in accomplishing collaboration and flexibility in the project management processes (Serrador & Pinto, 2015). Moreover, all other variables are correlated with project success, the highest correlation being with TC ( $r = 0.811$ ,  $p < 0.01$ ). These findings are consistent with other studies emphasising the importance of collaboration and flexibility to accomplish success in complex and dynamic industries (Dingsøyr et al., 2019). It can be concluded that these results confirm that applying Agile approaches improves collaboration, flexibility and hence, project success.

## 4.5 Regression Analysis

### 4.5.1 Linear Regression

**Table 6.** Linear regression

S/N	IV	DV	R2	Beta	t-test	f-test	p
H1	APM	PS	0.636	0.797	11.283	127.312	0.000
H2	APM	TC	0.688	0.83	12.701	161.316	0.000
H3	TC	PS	0.558	0.811	11.862	140.713	0.000

Examining the relationship between APM and project success, the linear regression study's R<sup>2</sup> result of 0.636 suggests that it has a significant predictive potential. Hence, 63.6% of the variance in project success may be attributed to APM approaches. A considerable positive influence is demonstrated by the beta coefficient ( $\beta = 0.797$ ,  $p < 0.001$ ) and statistical tests ( $t = 11.283$ ,  $p < 0.001$ ;  $F = 127.312$ ,  $p < 0.001$ ), which support the model's dependability. Prior studies have demonstrated that agile enhances project flexibility, cooperation, and efficiency, all of which contribute to improved performance. The results validate the theory. The results show that agile boosts project results by promoting iterative development, continuous feedback, and flexible planning.

According to the second hypothesis, APM has an effect on teamwork. The results show a substantial positive correlation with an R-squared value of 0.688, indicating that 68.8% of the variation in team collaboration is explained by APM practices. APM significantly improves team cooperation, as indicated by the beta coefficient ( $\beta = 0.83$ ,  $p < 0.001$ ). The robustness of the relationship is shown by statistical testing ( $t = 12.701$ ,  $p < 0.001$ ;  $F = 161.316$ ,  $p < 0.001$ ). These results corroborate other studies that demonstrate how Agile promotes teamwork and improves communication, information sharing, and decision-making. Studies by Albuquerque et al. (2020) and Serrador and Pinto (2015) indicate that Agile encourages transparency, adaptability, and real-time feedback, all of which enhance team responsiveness and productivity.

The correlation between team collaboration and project success is analysed in the third hypothesis, and it is found that an R<sup>2</sup> value of 0.558 is highly valuable. This implies that 55.8% of what is measured in project success can be attributed to team collaboration. The value of beta highlighted ( $\beta = 0.811$ ,  $p < 0.001$ ) that higher collaboration translates to better project results. This relationship proved to be significant with the statistical tests ( $t = 11.862$ ,  $p < 0.001$ ;  $F = 140.713$ ,  $p < 0.001$ ). The results confirmed the existing literature regarding the contribution of collaboration in Agile settings. The results of the current studies are in line with Conforto et al. (2016) and Radhakrishnan et al. (2022). In their studies, they suggested that collaboration helps organisations in reducing risk and problem-solving abilities and ensures more effective utilisation of available resources, contributing to quicker, superior-quality delivery of projects with higher satisfaction of stakeholders.

#### 4.5.2 Mediation

**Table 7.** Mediation analysis

Total, direct, and indirect effects of APM on project success through team collaboration					
<b>Total effect of X on Y</b>					
Effect	se	t	p	LLCI	ULCI
0.78	0.069	11.2833	0.000	0.6406	0.9155
<b>Direct effect of X on Y</b>					
Effect	se	t	p	LLCI	ULCI
0.39	0.1114	3.4857	0.000	0.1662	0.6104
<b>Indirect effect(s) of X on Y</b>					
	Effect	BootSE	BootLLCI	BootULCI	
TC	0.3898	0.1201	0.1604	0.6361	

This section examines the mediating role of team collaboration in the relationship between APM and project success. The total effect of APM on Project Success ( $\beta = 0.78$ ,  $p < 0.001$ ) suggests a strong positive influence of Agile practices on project success. However, when controlling for team collaboration, the direct effect of APM on project success drops to 0.39 ( $p < 0.001$ ), indicating that a significant portion of the effect is mediated by team collaboration. The indirect effect of APM on Project Success through Team Collaboration ( $\beta = 0.3898$ ,  $\text{BootSE} = 0.1201$ ,  $\text{BootLLCI} = 0.1604$ ,  $\text{BootULCI} = 0.6361$ ) confirms that team collaboration partially mediates the relationship between APM and Project Success. This result is statistically significant, as the confidence interval does not contain zero.

These results corroborate previous research. Serrador and Pinto (2015) reiterate that Agile methodologies facilitate iterative processes in collaboration, feedback, and adaptive problem-solving, which boosts the performance of a project. Based on the research work of Qaddumi et al. (2021), teamwork has the ability to increase innovation and ensure the exchange of knowledge, which increases the chances of effective decision-making and ultimate project effectiveness. Patel et al. (2012) note that extensive teamwork and communication improve the chances of success in a project and reduce associated risks, especially in the construction industry, which is often considered complicated. This study reinforces the importance of developing strong collaborative teams within Agile frameworks to maximize project success in post-COVID-19 construction projects in developing countries.

### 4.5.3 Moderation

**Table 8.** Moderation analysis

<b>Model Summary</b>						
<b>R</b>	<b>R-sq</b>	<b>MSE</b>	<b>F</b>	<b>df1</b>	<b>df2</b>	<b>p</b>
0.8372	0.7009	0.4035	55.4691	3.000	71.000	0.000

<b>Model</b>						
	<b>coeff</b>	<b>se</b>	<b>t</b>	<b>p</b>	<b>LLCI</b>	<b>ULCI</b>
<b>Constant</b>	3.4308	0.0979	35.0325	0.000	3.2355	3.6261
<b>APM</b>	0.3999	0.1258	3.1797	0.0022	0.1491	0.6507
<b>OF</b>	0.4507	0.1147	3.9297	0.0002	0.222	0.6794
<b>Int_1</b>	-0.0371	0.0621	-0.5981	0.5517	-0.161	0.0867

This segment analyses the moderating effect of organizational flexibility on the correlation between APM and project success. The model summary ( $R^2 = 0.7009$ ,  $F(3,71) = 55.4691$ ,  $p < 0.001$ ) indicates that 70.09% of the variability in project success is explained by the model, which is impressively high. Both APM ( $\beta = 0.3999$ ,  $p = 0.0022$ ) and organizational flexibility ( $\beta = 0.4507$ ,  $p = 0.0002$ ) have direct effects that are significant and favourable in relation to project success, thereby reinforcing their impact on realised project success.

However, the interaction term (Int\_1:  $\beta = -0.0371$ ,  $p = 0.5517$ ) is statistically insignificant, suggesting that organizational flexibility does not significantly moderate the relationship between APM and project success. This suggests that both APM as well as organizational flexibility have a positive impact on project success. However, the extent to which Agile practices improve project performance seems to be constant with regard to the level of organizational flexibility. Organizational flexibility is critical in energetic conditions; however, its moderating impacts may vary because of industry limitations (Turner, 2024). Rigby et al. (2016) noted that although Agile approaches are most effective in flexible environments, inflexible ones do not completely negate their usefulness. In the same way, Albuquerque et al. (2020) suggested that some external factors, like those set by an industry or regulatory bodies, may diminish the degree internal flexibility can have on Agile project success.

## 5. Conclusion and Recommendations

### 5.1 Summary of Key Findings

This particular case study chosen was in construction and focused on how APM affects project success alongside the factors of collaboration and organizational culture. Five primary hypotheses were formulated for these relations. The conclusions strongly support the claimed advantages of Agile methods regarding project delivery, stakeholder participation, and flexibility.

The results of the linear regression analysis proved APM to be a significant predictor of project success ( $\beta = 0.797$ ,  $R^2 = 0.636$ ,  $p < 0.001$ ). These results corroborate with the recent literature which claims the adoption of Agile methods improves the general performance of projects, stakeholder participation, and productivity (Dingsøyr et al., 2012; Conforto et al., 2016; Sandstø & Reme-Ness, 2021). This correlational evidence further supports the argument that Agile practices, including iterative project cycles, feedback collection, and planning changes, actively contribute to better completion of construction projects in spite of the challenges in the industry.

The analysis found a significant correlation between APM and team collaboration ( $\beta = 0.830$ ,  $R^2 = 0.688$ ,  $p < 0.001$ ). This verification demonstrates that APM assumes the existence of collaborative practices. It further confirms the argument that Agile approaches promote teamwork and collaboration (Serrador & Pinto, 2015; Albuquerque et al., 2020; Ciriello et al., 2022). Agile methods advocate openness, planning in increments, and division of work, which allows project teams to manage more effectively. Therefore, construction projects reduce time and resource wastage, thereby increasing efficiency and project success.

As team collaboration increases, so does the likelihood of project success, which is estimated at 0.811 and statistically significant ( $R^2 = 0.558$ ,  $p < 0.001$ ). This finding aligns with literature concerning the role of teamwork and communication in achieving project objectives (Serrador & Pinto, 2015; Conforto et al., 2016; Radhakrishnan et al., 2022). Such well-functioning teams are necessary for Agile settings, which have low barriers to communication and teamwork, leading to enhanced decision-making and improved project performance.

In the mediation analysis, team collaboration was found to function as a partial mediator in the relationship between APM and project success, having an indirect effect of 0.3898 (BootLLCI = 0.1604, BootULCI = 0.6361). This demonstrates that the collaborative nature of

Agile methodologies is one of the factors that allows project success to take place, which makes sense of why Agile methodologies are known to improve collaboration and teamwork (Serrador & Pinto, 2015; Qaddumi et al., 2021; Patel et al., 2012). This result highlights an important aspect of APM, which is that, although the approach enhances project results, the extent to which it does so depends on the level of team participation in using Agile practices.

Determination of the level of organizational flexibility as a moderator in the relationship between APM and project success revealed no significant results ( $\beta = -0.0371$ ,  $p = 0.5517$ ). This means that although flexibility is valuable for enabling adaptability during the course of a project, it does not necessarily enhance the impact of APM on success (Turner, 2024; Rigby et al., 2016; Albuquerque et al., 2020). The implication of this is that simply having flexible systems in place is not enough; real Agile success requires effective leadership, well-defined procedures, and a collaborative culture.

The importance of APM in enhancing project results in the construction sector is generally supported by these findings. The findings show that while teamwork is crucial to optimising Agile benefits, organisational flexibility may not be sufficient on its own to increase Agile effectiveness.

## **5.2 Theoretical Contributions**

This study makes several key theoretical contributions by broadening the scope of APM in the construction sector. First, it supports the use of Agile practices in a highly inflexible industry by showing that team collaboration (Serrador & Pinto, 2015; Conforto et al., 2016) bears a significant positive relationship with the success of projects. In contrast, Agile has received a lot of attention in software development (Dingsøyr et al., 2012); its coverage in the construction sector is scarce. The study fills that gap by demonstrating, through empirical data, that the application of Agile tenets results in better communication, participation, and engagement in complex projects.

The study also contributes to the literature on team dynamics by providing evidence that team collaboration acts as a mediating variable in Agile implementation. This confirms that Agile's influence on project success is, at least in part, the result of improved team collaboration, consistent with the concepts of collaborative project management (Qaddumi et al., 2021; Patel et al., 2012). This illustrates the body of existing research that argues that Agile is not

merely a methodology; rather, it is a change in organizational culture that requires effective interpersonal collaboration.

The study provides additional perspectives on the moderating effect of organizational flexibility. Surprisingly, organizational flexibility did not significantly enhance the strength of the Agile-success relationship, which is significant because it is widely believed that flexibility should make the results of Agile more positive (Turner, 2024; Rigby et al., 2016). This suggests that although a certain amount of flexibility is beneficial, its value is contingent upon other organizational factors, such as the leaders' level of dedication, the suitability of training, and the organisational structure in relation to Agile principles. To strengthen the current justifications for applying Agile outside of the information technology industry, it is necessary to examine these gaps in the literature.

### **5.3 Practical Implications**

The study's conclusions have a significant impact on the real world, where legislators, construction firms, and project managers work. First and foremost, companies aiming to implement Agile approaches should concentrate on encouraging teamwork, as it is crucial to the success of the project (Albuquerque et al., 2020; Serrador & Pinto, 2015). Instead of concentrating on process compliance, agile training sessions should emphasize collaboration, communication, and handling stakeholders. Using collaboration technologies, such as digital project management software, can also help increase the adoption of Agile.

The next stage is for construction companies to recognize that Agile methodologies require a shift in project management practices. Also, rigid, top-down structures may not be conducive to Agile functioning. Therefore, organisations should develop self-sufficient, autonomous, cross-disciplinary teams that can work iteratively (Conforto et al., 2016; Radhakrishnan et al., 2022). Adopting Agile together with Lean Construction practices could provide a way of ensuring that flexibility is not at the expense of project stability and that compliance and standardisation requirements are not undermined.

In the third place, the research implies that while organizational flexibility is beneficial, it is not an isolated driver of improved effectiveness in Agile. Organisations need to support flexibility with strong Agile governance, leadership, and training to achieve better outcomes with projects (Turner, 2024; Rigby et al., 2016). These boundaries are important because

unsupported flexibility can simply be an excuse for a greater lack of direction rather than improved responsiveness.

At last, authorities and industry policymakers must give thought to the adoption of Agile-centric policies within the scope of construction projects. The adoption of Agile methodology is difficult because most contract types and procurement methods inhibit the constructive processes within development projects. Changing the rules to permit phased approvals of projects, active participation of stakeholders throughout the project cycle, and gradual funding allocations would help facilitate a transition to Agile management in construction projects.

#### **5.4 Limitations of the Study**

This study is not complete without discussing some limitations. First and foremost, this study was only looking into APM in the construction industry, an industry characterised by inflexible plans and highly linear processes. It is an industry with inflexible plans and highly linear processes. While the results are helpful, it is plausible that not all sectors will be able to adopt these methods comprehensively, especially in agile-heavy sectors such as software engineering and manufacturing (Serrador & Pinto, 2015; Conforto et al., 2016). Further studies should focus on how the implementation will work in different industries to broaden the scope of the literature.

The data collected during a particular cross-sectional timeframe, which made analysis more effective in determining the relationships between different variables. However, in the case of Agile adoption and project outcomes, this strategy does not provide baseline measures for change over time (Albuquerque et al., 2020). With a longitudinal approach, it would be more straightforward to understand how Agile practices are adopted over time and whether these practices continue to yield success in executed projects.

Relying solely on self-reported data creates the possibility of response bias. Respondents may be influenced by social desirability bias and, therefore, may have provided an exaggerated or downplayed account of their level of engagement with Agile practices, teamwork, or project results (Qaddumi et al., 2021). In future research, more accurate results could be achieved by using objective measures of performance, such as the time taken to complete projects, cost differences, or the number of faults detected.

Fourth, as previously discussed, this study showed strong relationships between APM, team collaboration, and project success, but correlation is not causation. While the analyses of mediation and moderation provided better net benefits, experimental or quasi-experimental designs would enhance causal claims (Ciriello et al., 2022). Later research should attend to controlled experimental situations to pinpoint the effects of Agile practices more clearly.

Finally, the study was limited to a specific geographic area and organisation, which, as noted by Turner (2024), poses a limitation to generalising the results to other regions and industries with differing regulations, culture, or project management practices. Discussing the results in comparison to different contexts would refine and complement the results as well as validate the outcomes.

### **5.5 Recommendations for Future Research**

To build on the identified limitations, several critical gaps can be addressed. First, further studies should focus on the use of Agile in different sectors to determine how it functions in various organizational contexts. Checking the possibilities of Agile outside of construction, such as in nursing, teaching, or banking, can enrich our understanding of its intersectoral effect (Serrador & Pinto, 2015).

Second, a longitudinal research design should be employed to track Agile adoption over extended periods. This approach would provide insights into how organizations sustain Agile methodologies, adapt to challenges, and refine their practices over time (Albuquerque et al., 2020). Third, future studies should integrate both qualitative and quantitative methodologies. While this study primarily used quantitative measures, qualitative approaches such as in-depth interviews or case studies could offer richer insights into the nuances of Agile implementation, including cultural and behavioral factors (Conforto et al., 2016).

Fourth, additional research should consider other styles of leadership in relation to the success of Agile projects. Collaboration among the team was one of the factors identified to have a great mediating effect, but other forms of leadership, such as transformational or servant, may greatly determine the effectiveness of Agile projects (Radhakrishnan et al., 2022). Examining how Agile techniques relate to the leader's actions may bring out important insights to be used in management.

Finally, these authors hope that other researchers will study the political and institutional issues that arise from using Agile methodologies in more regulated sectors, such as construction. Industry policymakers and managers must ensure that business agility is aligned with compliance, which makes it pertinent to examine policies that allow Agile adoption while ensuring safety and quality limitations (Turner, 2024).

## **5.6 Conclusion**

This report analyses the impact of APM on the construction industry in an effort to gain a better understanding of APM. The study employs robust statistical analysis to demonstrate that the use of Agile frameworks improves project performance, with team collaboration as a key mediating factor. The study also notes that while organizational flexibility is critical, it does not appear to significantly moderate the Agile-success relationship, which has previously been assumed to be important in the context of adopting Agile. While this research makes notable contributions, its gaps indicate that the application of Agile is a multi-faceted, context-bound issue that requires further study. There are contextual boundaries, such as those specific to an industry, leadership approaches, and regulations, that dictate Agile's usefulness and necessitate a more sophisticated integration of Agile into traditional project management methodologies.

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# Appendices

## Appendix A: Questionnaire

Where are you from? Country name \* \_\_\_\_\_

What is your gender? \*

- Male
- Female
- Other

What is your age group? \*

- 18-26 Years
- 27-35 Years
- 36-44 Years
- Above 44 Years

What is your Qualification? \*

- High School
- Bachelor's
- Master's
- Doctorate
- Other...

What is your role in the construction industry? \*

- Project Manager
- Site Engineer
- Architect
- Contractor
- Other

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How many years of experience do you have in the construction industry? \*

- Less than 2 years
- 2–5 years
- 6–10 years
- More than 10 years

Have you previously worked on projects that adopted Agile methodologies? \*

- Yes
- No

How familiar are you with Agile project management principles? \*

- Not familiar at all
- Slightly familiar
- Moderately familiar
- Very familiar

Which Agile frameworks have been used in your construction projects? (Select all that apply) \*

- Scrum
- Kanban
- Lean Construction
- SAFe (Scaled Agile Framework)
- None

How frequently does your organization apply Agile principles in project execution? \*

- Never
- Rarely
- Sometimes
- Often
- Always

Agile Project Management						
S/N	Items	SD	D	N	A	SA
APM1	Our organization follows Agile principles in project execution.	1	2	3	4	5
APM2	Agile methodologies help in adapting to project changes quickly.	1	2	3	4	5
APM3	Using Agile improves project transparency and accountability.	1	2	3	4	5
APM4	Agile adoption has led to better project scheduling and planning.	1	2	3	4	5
APM5	Agile methodologies enhance communication among project teams.	1	2	3	4	5

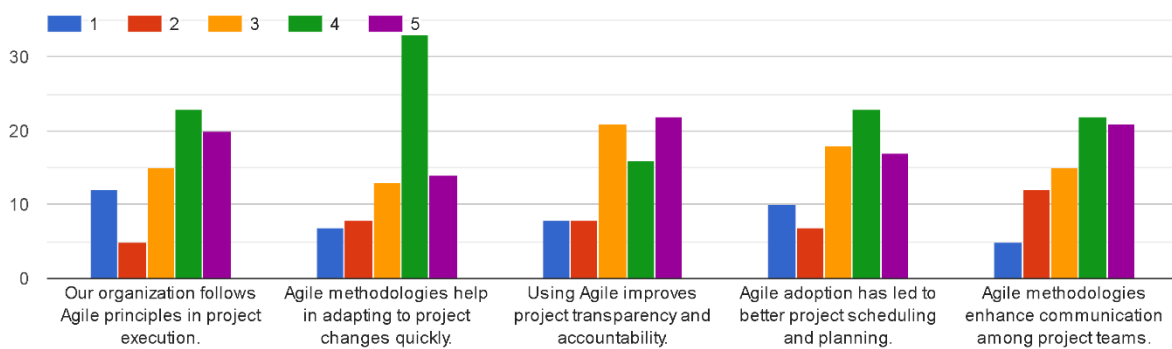
Team Collaboration						
S/N	Items	SD	D	N	A	SA
TC1	Agile methodologies encourage teamwork and collaboration.	1	2	3	4	5
TC2	Daily meetings (e.g., stand-ups) improve communication and coordination.	1	2	3	4	5
TC3	Team members actively contribute to decision-making in Agile projects.	1	2	3	4	5
TC4	Agile collaboration tools (e.g., Kanban, Scrum boards) improve efficiency.	1	2	3	4	5
TC5	There is a culture of trust and openness in Agile project teams.	1	2	3	4	5

Organizational Flexibility						
S/N	Items	SD	D	N	A	SA
OF1	Our organization quickly adapts to changes in project requirements.	1	2	3	4	5
OF2	Management supports Agile implementation.	1	2	3	4	5
OF3	Agile principles have improved decision-making flexibility.	1	2	3	4	5
OF4	We frequently update project plans based on Agile feedback.	1	2	3	4	5
OF5	Employees receive adequate Agile training.	1	2	3	4	5

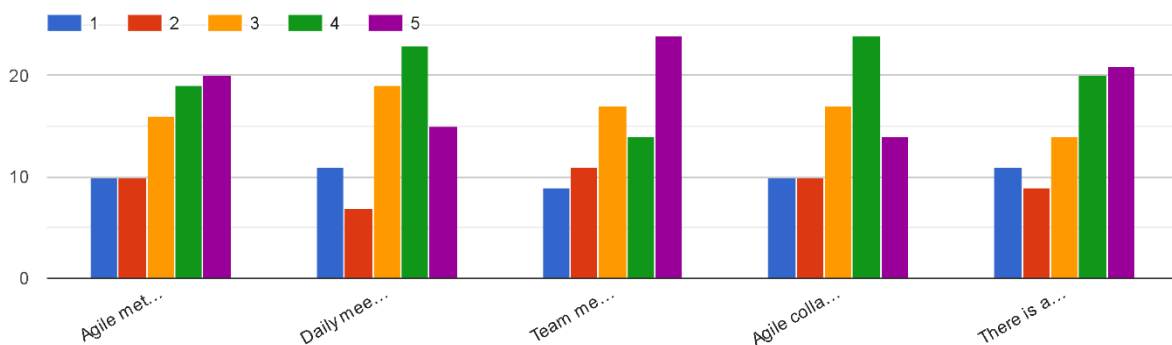
Project Success						
S/N	Items	SD	D	N	A	SA
PS1	Agile has helped complete projects within budget.	1	2	3	4	5
PS2	Agile methodologies improve project quality.	1	2	3	4	5
PS3	Agile reduces project risks and enhances problem-solving.	1	2	3	4	5
PS4	Customer/stakeholder satisfaction has increased with Agile.	1	2	3	4	5
PS5	Agile ensures timely project delivery.	1	2	3	4	5

### Appendix B: Survey Results

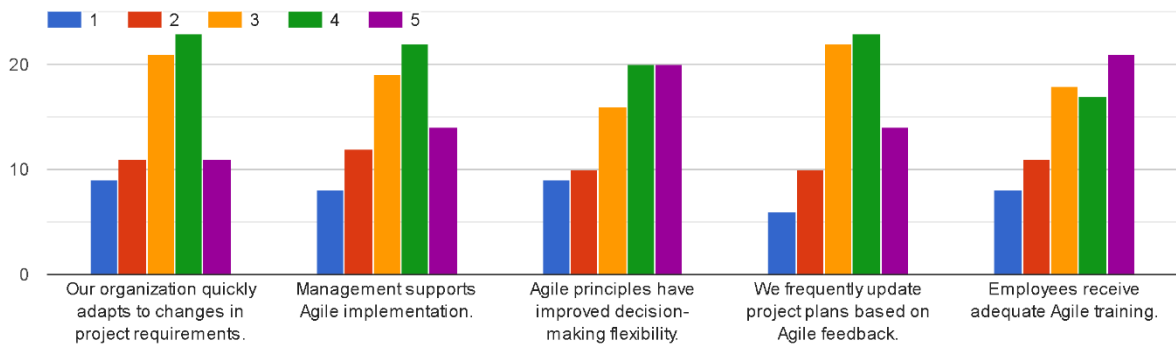
Agile Project Management (APM) How strongly do you agree with the following statements about Agile Project Management in your construction projects? (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)



Team Collaboration How would you rate the collaboration within Agile project teams?



### Organizational Flexibility How flexible is your organization in adapting to Agile methodologies?



### Project Success How has Agile Project Management influenced project success in your organization?

