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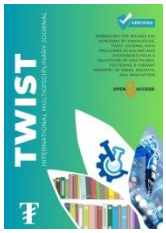

Evaluating the Impact of Project Management Methodologies on Construction Projects Delays in the Mangaung District, South Africa

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Abstract
In Mangaung District, construction project delay is a persistent and costly problem that is predominantly caused by a misalignment between project realities and the project management methodologies adopted. The central research question was the empirical insufficiency of applying either the inflexible waterfall methodology or the totally flexible agile methodology separately in large complex construction projects. To respond to this, the study employed contingency theory. The study employed a quantitative descriptive approach, where the study collected data from 20 construction experts that were conveniently selected in the Mangaung District. The online questionnaire survey and the google form platform were utilized. Waterfall methodology's sequential methodology caused significant phase-to-phase delays, and scope creep was a main problem due to the flexibility of the Agile methodology. The findings indicated that 70% of the participants strongly agreed that the hybrid methodology is the best way to mitigate delays. The findings indicated that 55,6% of participants use agile methodology found it to be moderately effective, further strengthened by the 44,4% of participants that found the methodology extremely effective. Furthermore, this suggests that the agile methodology is generally viewed as highly adaptable and suitable for handling project changes by participants. Therefore, the study recommends that in the interest of greater timely project delivery, local construction companies are advised to employ an immediate contextual hybrid project management methodology, emphasizing formalized planning integration and adaptive implementation. The study further recommended that project teams can manage unexpected challenges, organizations should invest in ongoing training and capacity building for project teams.

Keywords
project management, waterfall methodology, agile methodology, hybrid methodology, project delays

INTRODUCTION

Project teams are guided through every phase of the project lifecycle by a standardized and structured framework that is provided by project management methodologies as supported by (Villiers, 2024). Furthermore, project management methodologies provide the best tools and management processes to guarantee that projects are finished on schedule and with the expected quality. Team members can communicate more effectively, manage risks better, and accomplish project objectives through the assistance of methodologies if everyone adheres to standard project operations. The research conducted by Abdulla & Al-Hashimi (2019) indicated that adopting the appropriate project management methodology is essential for successful on-time delivery since it helps managers and project teams complete tasks within the project's scope, budget, and timeline. In the end, project management methodologies were developed to give both managers and team members the management skills that they need to deliver project tasks efficiently and effectively which contributes to overall success of on time project delivery (Abdulla & Al-Hashimi, 2019).

BACKGROUND OF THE STUDY

In South Africa project delays are still a persistent issue in the construction industry particularly in the Free State Province's Mangaung District as reported by (Tsimong, 2019). Tsimong, (2019) further stated that the Mangaung Metropolitan Municipality's wide range coverage is demonstrated by the Metropolitan which showcases the inclusion of surrounding local municipalities in addition to its major urban centres like Bloemfontein, Botshabelo and Thaba Nchu. To the north being the Mantsopa, Masilonyana and Tokologo Local Municipalities, located to the west being the Letsemang Local Municipality and to the west being the Kopanong Local Municipality and Mohokare Local Municipality exhibiting the Mangaung District's vastness geographical range (Metropolitan, 2020). Additionally, Tsimong (2019) research study further explains that these construction project delays have a negative impact on project timely delivery, project cost and project quality which lead to budget overruns, contractual disputes, decreased client satisfaction and reputational damages for contractors and stakeholders. Notable examples that can be exhibited in the Mangaung District region are the Botshabelo Fire Station project and the Thaba Nchu Community Centre project. An empirical evidence two projects reported by Writer (2025) and Zaghrah (2025) showcase poor planning and scheduling to be the root challenge of the construction delays in these two projects, this resulting from both projects experience misalignments in the appointments of the contractors and service providers. The significant delays that occurreincursse projects caused the Mangaung Metropolitan Municipality to incur cost overruns of R 3.6 million for the Thaba Nchu Community Centre and R 1.9 million for the Botshabelo Fire Station (Writer, 2025). Another example includes repeated construction delays exhibited in the Dark/Silver City housing development project located in the city of Bloemfontein, where poor planning and misalignment is yet again present between the contractors and municipalities project requirements as reported by (Koteli, 2023). Koteli (2023) coverage on the case study of the Dark/Sliver City housing development project showcases that the lack of adaptability in the execution phase of the project is what resulted in the continuous missed deadlines and the Mangaung Metropolitan Municipality incurring cost overruns of over R150 million. Persisting issues of poor project planning and execution presented in the Mangaung District public construction projects contribute to the increasing number incomplete projects within this region, thus negatively impacting the districts contribution to Free States gross domestic product which reduces the provinces' overall contribution to the development of the nation's infrastructure and economic growth (Villiers, 2024).

To mitigate these continuous delays, the root cause of the challenges should be tackled at its foundation by analysing the effectiveness of project management methodologies used by project teams and managers. On the other hand, the characteristic of the waterfall methodology has a strong emphasis on a liner structure and sequential process has been seen to be the top choice for the management of construction projects (Johnson, 2022). Even though the waterfall methodology prioritizes highly organized planning. Adeusi, (2024) findings stated that its lack of flexibility does not adapt well to unforeseen projects challenges that are common in large and complex construction projects. In contrast the agile methodology is characterized by its progressive and iterative approach as supported by (Gillis, 2023). This approach allows for an increase in flexibility and adaptability assisting project team and managers with quick recovery and response when encountered with unexpected project risks (Rasnacis & Beriza, 2017).

PROBLEM STATEMENT

The Mangaung District located in the Free State, South Africa, has significant challenges with completing construction projects on time as reported by (Tsimong, 2019). A study conducted by Villiers, (2024) emphasises on how project delays negatively impact on the local's construction sector and further lowering the district's GDP contribution to the Free State province. Furthermore, the use of ineffective project management methodologies is linked as the root cause of these delays as reported by (Writer & Zaghrah (2025), and Koteli, 2023). Although Johnson, (2022) stated that both modern techniques such as agile and more traditional approaches such as waterfall are frequently employed in the construction industry, there is not enough existing literature to determine which project management methodology is best at reducing project delays especially in the region of Mangaung District. This study evaluates the impact of project management methodologies on project delays. Furthermore, this study seeks to conduct a comparative analysis of how project management methodologies, waterfall methodology and agile methodology impact project delays in construction projects within the Mangaung District. Moreover, the gap identified by this research seeks to explore whether the implementation of a combination of both waterfall methodology and agile methodology creating a hybrid methodology could be an effective solution in reducing construction project delays.

OBJECTIVE OF THE STUDY

The main objective of this study is to evaluate the impact of waterfall methodology and agile methodology on project delays in construction projects.

SIGNIFICANCE OF THE STUDY

While there are numerous studies on waterfall and agile methodologies, there is a significant lack of research evaluating the effectiveness of these methods in the Mangaung District. The significance of this research is providing data-driven solutions for the Mangaung District. This study offers direct, actionable recommendations that can directly inform the practices of local construction professionals. The results will not only have practical solutions that can be used to reduce construction project delays but offer a replicable guide to future studies in other areas where they are faced with similar

problems. The study seeks to provide an efficient answer to a longstanding local issue of project delays and introduce new, empirical evidence to the academic body of knowledge on project management methodologies which is under-researched referring to context of Mangaung district.

THEORETICAL FRAMEWORK

This study adopted the contingency theory. The contingency plan is a principal theory of management that proposes that there is simply no best way to manage projects or an organisation (McAdam, et al., 2016). Instead of using a single best practice when various situations arise, the theory states that the most efficient management approach depends on specific internal and external factors in a certain environment (Prieto, 2015). The fundamental principles of the contingency theory are that the project structure and management style should be in line with the specific environment of the project to succeed. Furthermore, contingency theory states the importance of methodologies and to adopt suitable for unique environment and circumstances project performance to minimizing delays (Shala, et al., 2021). This theory clearly indicates the effective analysis tool to compare the effectiveness of the waterfall and agile methodologies in various project situations. It emphasizes the necessity to go beyond mere comparison of the two methodologies but rather to dig deeper into the context, in which each of the methodologies is most applicable as supported by (Nakhuda, 2024). The contingency theory is well suitable to discuss the essence of the problem of the study that project delays in the Mangaung District are due to the mismatch between the methodologies adopted in the project management and contextual factors of the construction projects.

LITERATURE REVIEW

Waterfall methodology is one of the earliest and most structured approaches to managing a project. It is a systematic approach where each step of the processes such as planning, scheduling, evaluating and executing is broken down into sequences and it is seen as the most favored methodology to use in large construction project (Kerzner, 2017). Waterfall model follows a phase-based process which requires gathering, designing, executing, testing and development and all must be finished in a precise order before moving on to the next stage. According to Heldman (2021) clear documentation, dependable workflows and strict oversight are all supported by its design, which is in line with the structural and regulatory requirements of building projects. This approach provides advantages such as better planning and less risk in construction settings where projects scopes are typically established beforehand (Weaver, 2019). However, in unstable and dynamic construction environments of today, this structure poeses a significant limitation. When unforeseen site conditions, stakeholder demands or environmental variables arise, the rigidity of the waterfall model can make it difficult for the project to adapt to change, which can result in higher cost of delays (Alnahhal &Emsley, 2020). The waterfall methodology's lack of flexibility is one of the main drawbacks. It is frequently expensive, and time consuming to go back and make changes in earlier stages of the project as it moves to the new phase (Kerzner& Kerzner, 2017). According to research by Alnahhal and Emsley (2020), planning models that are unable to account for mid-courses corrections, particularly when using the waterfall methodology are frequently the causes of project delays in South African construction projects.

An example where the waterfall methodology was used only for it to have drawbacks would be the Berlin Brandenburg Airport (BER) project in Germany that is showcased in research study done by Grote and Teich (2019). It was finally completed in 2020 after nearly ten years of delays and more than €4 billion in cost overruns. It was originally planned to open in 2011. The project's strong reliance on strict sequential project management model identical to the waterfall model hindered the integration of stakeholder feedback and rapid changes which ultimately made it scheduling issue worse (Grote & Teich, 2019). Waterfall's lack of flexibility frequently results in higher project risks, longer project completion times and unhappy stakeholders. Because of these drawbacks, it is challenging for construction professionals to proactively address changing project requirements (El-Sabek & McCabe, 2018). According to recent research from PMI (2021), modern building projects call for more adaptable and hybridized strategies that permit iterative modifications without sacrificing overall structure.

The waterfall method makes project planning clear and structured, but it struggles to adjust to the complex relationships and changing conditions in modern construction (Withum, 2024). In places such as Mangaung District, where flexibility is key, its inability to adapt leads to major delays, making it less effective on its own.

AGILE METHODOLOGY

In contrast, by splitting up the project life cycle into shorter pieces known as sprints, the modern Agile project management approach focuses on an adaptive and iterative process over the classic Waterfall Methodology. The sprints allow for ongoing project construction, feedback, and adaptation (Gillis, 2023). Although agile was developed specifically for the software industry, some other sectors such as the construction sector are now examining if it would make their projects more efficient in mitigating project delays. Applying agile principles is reported to generate cost savings, collaborative software development and higher client satisfaction (Jethva & Skibniewski, 2022). The agile method encourages project team collaboration and rapid responses, advantages of which are particularly beneficial in project situations that are prone to immediate changes. Agile methodology is overwhelmingly demonstrated through empirical evidence in software and technology-based projects, despite its benefit as reported by (Albuquerque, 2020). There is a lack of practical studies evaluating its use and impact in the construction industry, especially in areas such as

Mangaung District where adhering to project timelines is still very difficult. Moreover, Agile's main advantages of flexibility and adaptability might not sit well with the rigidity of planning and unbending structures usually needed for construction projects. Jin (2017) further highlights that construction projects usually have set objectives and deadlines, it might be challenging to apply Agile's flexibility to the maximum. Whether or not Agile alone is able to handle the complexity of construction projects is an issue of increasing concern brought about by the insufficiency of adequate empirical case studies and the difficulty of using Agile independently in construction projects.

METHODOLOGY

Research Philosophy

A research philosophy, according to Gamage (2025), refers to a set of assumptions and beliefs about the development of knowledge in a particular field. It has the essential concepts that form a researcher's view of reality, the world, and the research process. Research philosophies provide a consistent and reasonable framework by guiding the researcher in developing their research design, data gathering, and analysis (Jansen, 2025). This research study has adopted a Positivism research philosophy. The positivism research philosophy relies on the assumption that science, involving systematic observation, measurement and hypothesis testing, is the best way to acquire knowledge (Creswell & Creswell, 2018). This philosophy is best suited for this study because it aligns with the study's quantitative research design and enables the researchers to gather numeric data to quantitatively measure the effectiveness of both project management methodologies. It provides research results that are valid and free from biasness and conclusions that are generalizable (Maksimović & Evtimov, 2025).

Research Design

This research study conducted using a quantitative research approach. Creswell, (2018) describes a quantitative method as a research approach that identifies patterns, connections or trends among research project variables by the means of numerical data collection and analysis. This research approach consists statistical techniques that researchers can use to measure variables, test hypotheses and produce unbiased conclusions (Creswell & Creswell, 2018). The quantitative research approach is the best method for this research in understanding patterns and making comparisons between the two project management methodologies waterfall methodology and agile methodology ultimately answering the primary research question. Babbie, (2013) further emphasises that the quantitative research approach's measurability ensures that researcher obtain reliable results as the approach quantifies and precisely describe research variables and outcomes (Babbie, 2013). In addition to the quantitative research method, a descriptive approach was used when conducting our investigation. The descriptive approach assisted the researchers to identifying patterns without changing the project variables and correctly explaining and describing data findings of key research elements and the target population (Burns & Grove, 2010).

Population and Sample Design

In research, a population is the entire group of cases, individuals, or elements having the attributes on which the researcher is interested in conducting research. It is the group from whom data can be gathered or from which a sample can be obtained for the general conclusion-making (Bell, et al., 2022). The target population for this research design are construction professionals. These are professionals such as the project managers, construction managers, site engineers and construction supervisors that work on construction projects and have had experiences with construction project delays within the Mangaung District. Researchers of this study had a pool sample size of 20 participants with an expected minimum of 2 to 5 years of experience within the construction field. Due to the limited number of construction companies within the Mangaung district, the researchers' survey questionnaire accommodated participants who have acquired experience in the construction industry that are outside the expected experience criteria. By doing so this ensured that researchers are not being limited to the access of participants available within this region and focusing on a broad scope of construction professionals will be more practical and beneficial to our research study.

Kumar (2019) describes sampling design as a structured process or technique used to specify how the members of a population will be picked in order to create a sample is known as a sampling design. To confirm that the information gathered is typical and suitable for analysis, it entails choosing a sampling frame, a sampling procedure and a sample size. For this research study a convenience sampling design was adopted. Due to the limited number of construction companies in Mangaung district. Convenience sampling allowed the researchers to collect data from readily available construction experts (Etikan & Bala, 2017). Convenience sampling is cost-effective this is beneficial to the researchers as they do not obtain a source of income. It is also time-efficient to ensure that researchers were able to collect their data and conduct their research within required timeframe (Etikan & Bala, 2017).

RESULTS

The results findings from the questionnaire survey that consisted of the 20-participants provided valuable new information on the impact of project management methodologies on construction projects delays in the Mangaung District. For the Waterfall Methodology, participants' results highlighted that delays between project phases, rigid planning at the beginning, and a lack of ability to react to change are all relatively important causes of delays in projects.

Impact of delays on project schedules under Waterfall Methodology

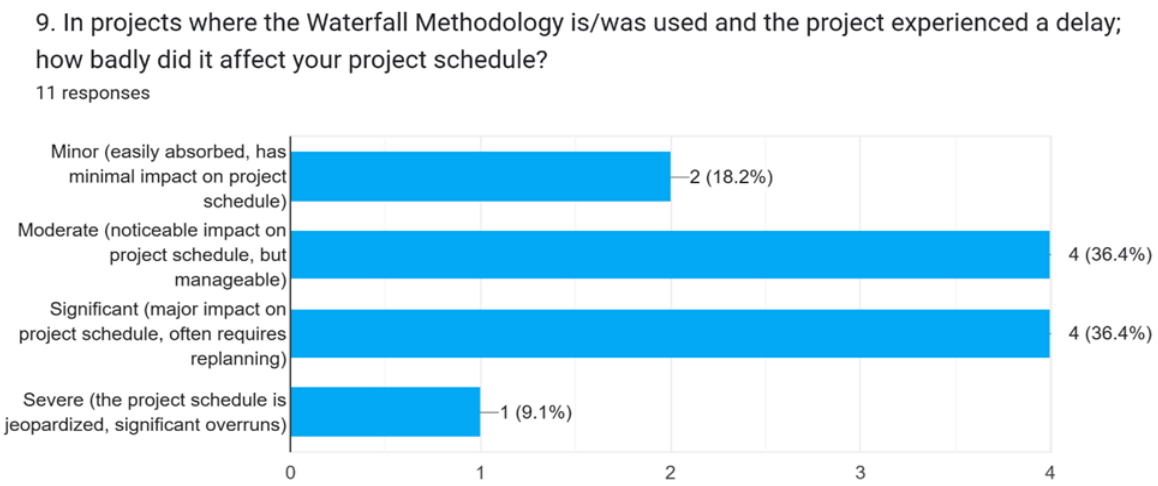

Fig. 1 Impact of delays on project schedules under Waterfall Methodology

The figure above indicates the impact of delays on schedules in waterfall projects. Project delays have an almost equal chance of having either moderate impact (noticeable impact on project schedule, but manageable) (36.4%) or significant impact (major impact on project schedule, often requires replanning) (36.4%), while (18.2%) of participants reported minor impacts (easily absorbed, has minimal impact on project schedule). Only (9.1%) of participants noted severe impact (the project schedule is jeopardized, significant overruns). This data leans towards supporting the literature's caution that the Waterfall Methodology's rigidity presents a risk of high impact. Literature findings by Alnahhal & Emsley (2020), that the methodology struggles to adapt when changes are introduced, usually incurring replanning and a higher cost of delay, is supported by the combined majority of delays with significant or moderate impact (72.8%). The data empirically confirms that the waterfall methodology delays are rarely minor and require extensive management intervention, which is consistent with the structural constraints noted by Grote and Teich (2019), even though the rate of "severe impact" is low.

Impact of delays on project schedules under Agile Methodology

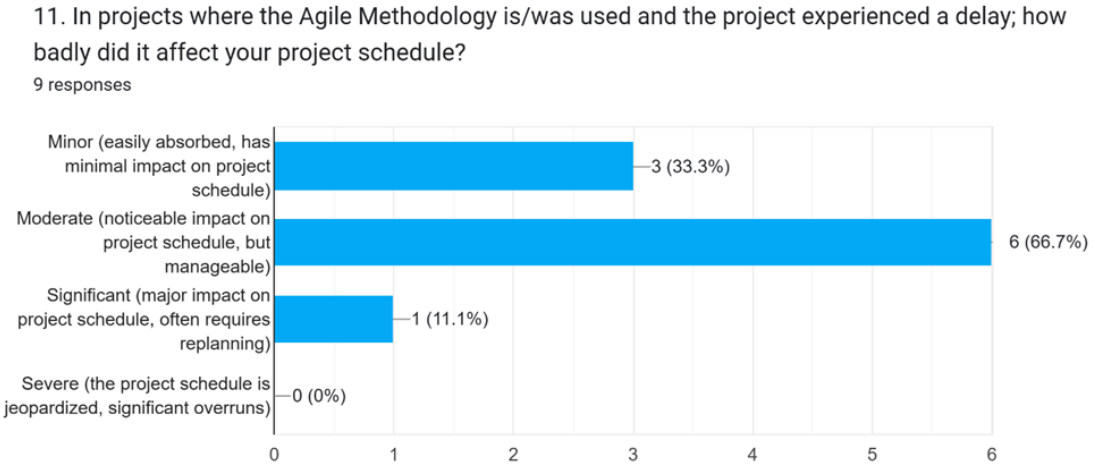

Fig. 2 Impact of delays on project schedules under Agile Methodology

The figure above shows the severity of delays under Agile Methodology. Majority of participants (66.7%) indicated that delays had a moderate impact (noticeable impact on project schedule, but manageable), while 33.3% of participants said the impact was minor (easily absorbed, has minimal impact on project schedule). Only (11.1%) of participants reported a significant impact (major impact on project schedule, often requires replanning), and none reported severe impact (the project schedule is jeopardized, significant overruns). This result strongly agrees with Gillis (2023) literature for the core advantages of the Agile Methodology. The lower severity level indicates how the Agile Methodology's emphasis on a flexible and iterative process enables project teams to respond rapidly to problems and adjust to change without experiencing the major schedule impact that comes with sequential models (Gillis, 2023).

Overall effectiveness of Waterfall Methodology in managing construction projects

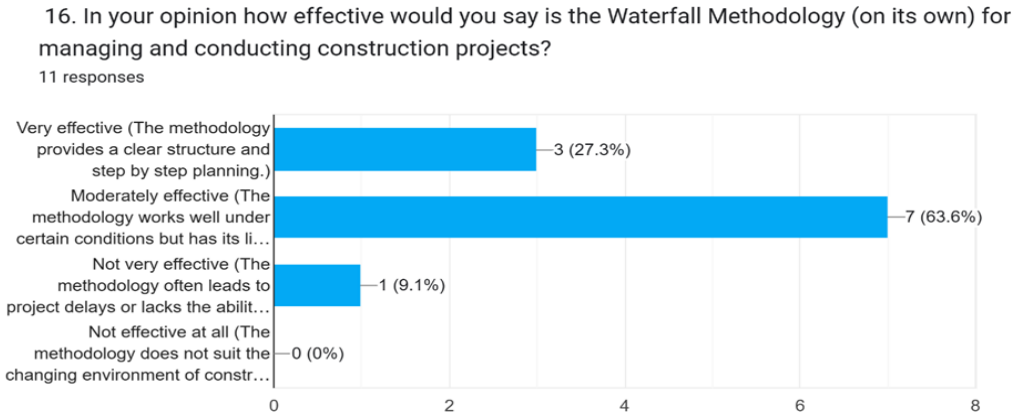

Fig. 3 Overall effectiveness of Waterfall Methodology in managing construction projects

The figure above indicates participants' opinions on the overall effectiveness of waterfall methodology. Most participants (63.6%) considered it moderately effective (The methodology works well under certain conditions but has its limitations.), while 27.3% of participants rated it very effective (The methodology provides a clear structure and step by step planning.). A small portion of (9.1%) thought the methodology was not very effective (The methodology often leads to project delays or lacks the ability to be flexible), and none rated it as ineffective (The methodology does not suit the changing environment of construction projects.). This result agrees with the Contingency Theory framework used in the research study. It validates the principle that there is no one best way to manage a project (McAdam et al., 2016). The data confirms the Waterfall methodology's effectiveness depends on how well it can modify itself to fit the specific environment and conditions of specific Mangaung projects, since it is not rated as being ineffective (Shala et al., 2021).

Overall effectiveness of Agile Methodology in managing construction projects

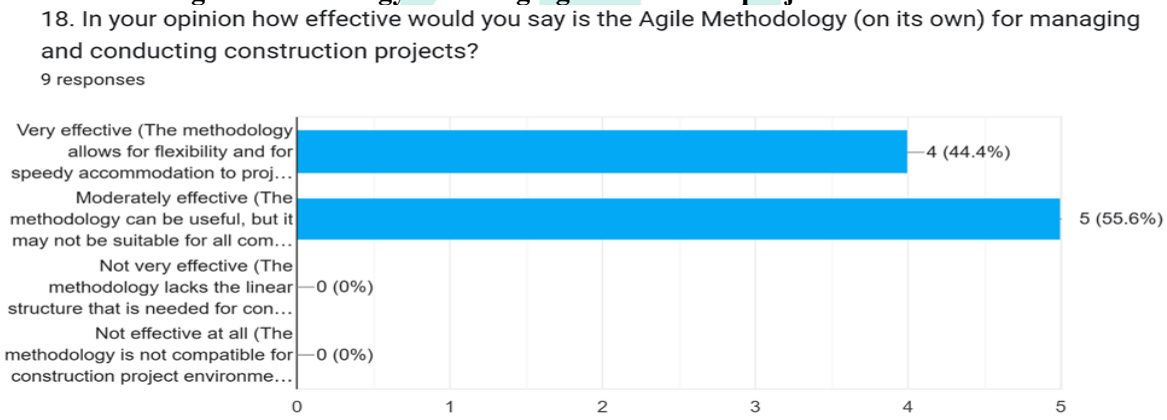

Fig. 4 Overall effectiveness of Agile Methodology in managing construction projects

The figure above presents participants' opinions on Agile methodology's overall effectiveness. Most participants rated it moderately effectively (The methodology can be useful, but it may not be suitable for all components of construction projects.), while 44.4% of participants rated it very effective (The methodology allows for flexibility and for speedy accommodation to project changes.). None thought it was not very effective or completely ineffective. This result agrees with the Contingency Theory. The high overall effectiveness rating testifies to the situational relevance of success. The fact that not all users rated the modern methodology as "very effective" aligns with Jin (2017)'s literature findings that the Agile Methodology's flexibility may not be compatible with the ridge structures traditionally required in construction projects.

Perceptions on combining Waterfall and Agile to reduce project delays

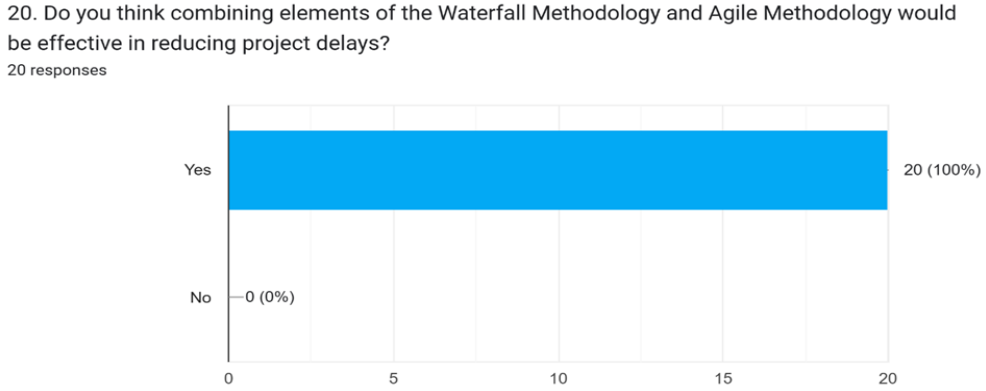

Fig. 5 Perceptions on combining Waterfall and Agile to reduce project delays

The figure above showcases participants' views on adopting a hybrid methodology. All participants (100%) agreed that combining elements of both methodologies Waterfall and Agile would be effective in reducing project delays. Where previous research merely indicated that adaptable and hybridized methodologies are needed for modern projects (PMI, 2021), this data provides concrete empirical proof from Mangaung construction practitioners, validating the effectiveness of a hybrid methodology and addressing the trade-off between the pure models.

Best project methodology to reduce construction project delays in Mangaung District

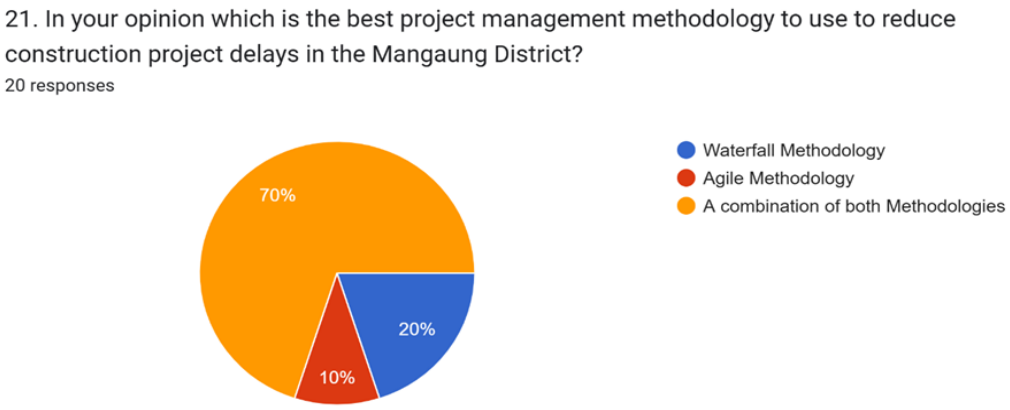

Fig. 6 Best project methodology to reduce construction project delays in Mangaung District

The figure above presents participants' opinions on the most effective project management methodology. A majority (70%) of participants favored a combination of Waterfall and Agile. 20% of participants preferred Waterfall methodology, and 10% of participants chose Agile. The foundational Contingency Theory is strongly supported by this preference for a combined methodology, highlighting the reality that the most effective project management methodology is contingent upon both internal and external factors (Prieto, 2015). It empirically confirms that the best solution for the Mangaung District is not a single, pure methodology but a Hybrid methodology that best suits the unique complexities of its construction environment.

DISCUSSION

The overview of the literature review and the empirical data from the study's questionnaire survey results provide both validation to the literature's Contingency Theory and offer a clear evidence-based approach for project management in the Mangaung District. Clear from the results of the questionnaire survey is that residential projects contribute to 60% of construction delays in the Mangaung District, followed by industrial projects at 25%, and infrastructure projects at 20%. This reveals where a better project management methodology would be best applied. The research study emphasises that there is no single methodology that is inherently superior thus confirming the Contingency Theory as a fundamental principle. The questionnaire survey results highlight this fact. In line with literature, construction professionals are aware of the inherent strengths and weaknesses of both project management approaches, as shown by the 63.6% of the Waterfall users and the 55.6% of the agile who stated that each approach is moderately effective meaning the methodology can be useful, but it may not be suitable for all components of construction projects on its own (Alnahhal & Emsley, 2020; Jin, 2017). The existing literature by Heldman, (2021) and Weaver, (2019) highlights the waterfall methodology's strengths of thorough upfront planning, predictability, and formal compliance with regulatory requirements of building projects. This perspective is supported in the questionnaire survey results where participants indicated that clear establishments of project requirements and detailed upfront planning, schedule and budget predictability characteristics are strengths of the Waterfall Methodology in reducing project delays. However, the critical weakness of this methodology. Literature and questionnaire survey both highlight how rigid sequential techniques and not being able to respond promptly to unforeseen circumstances lead to project inefficiencies. For example, according to the study's questionnaire survey results, 45.5% of participants that use waterfall methodology reported to have experienced moderate impact project delays, and 36.4% of participants that use the waterfall methodology indicates that project delays have a considerable effect on project timeline. This was further reinforced by the questionnaire survey data, where participants rated strict upfront planning and phase-to-phase delays as moderately significant contributing characteristics to project inefficiencies. This is consistent with research evidence showing that the inflexibility of the Waterfall model can increase delays in complicated construction environments (Alnahhal & Emsley, 2020).

For the Agile Methodology literature by Jethva & Skibniewski, (2022) and Gillis, (2023) notes its flexibility, iterative approach, stakeholder involvement and speedy identification and resolution of project challenges as the merits of the agile methodology. The findings support this with 55,6% of participants that use agile methodology found it to me moderately effective further strengthened by 44.4% of participants that found the methodology extremely effective. This suggests that the agile methodology is generally viewed as highly adaptable and suitable for handling project changes by participants. Participants reported flexibility and quick response of stakeholders as key characteristics, with 66.7% of participants responding that the Agile methodology typically has a moderate effect on project timelines. This further indicates that delays in Agile projects are generally manageable and less disruptive compared to Waterfall projects.

However, scope creep and poor stakeholder availability were cited as strong delay factors, supporting literature findings (Jin, 2017). The above findings suggest that although Agile improves responsiveness and flexibility, when used on its own in construction projects, it is unable to completely address all issues.

The high inclination toward a Hybrid methodology is a significant alignment of existing literature and the study's questionnaire survey results. To manage complex construction projects, literature emphasises on the growing significance of hybrid methodologies that merge Waterfall's formality with Agile's flexibility (PMI, 2021; Withum, 2024). This view is reinforced strongly by the research study's empirical findings. 70% of the participants reported the hybrid methodology as the best methodology for managing unforeseen project changes, followed by a strong 50% of participants reporting the methodology as the best methodology at minimizing project delays. 100% of participants thought applying some elements of both approaches would be beneficial. This convergence shows that professionals in construction in the Mangaung District identify the hybrid methodology solutions as real-world practical solutions and not just theoretical proposals.

RECOMMENDATIONS

Recommendations are made based on research findings to enhance project management practices and prevent delays in construction projects in the Mangaung District. The first is that, according to 70.4% of the participants, the best way to reduce delays is using a hybrid project management methodology that incorporates the flexibility and responsiveness of Agile Methodology with the formal planning of Waterfall Methodology. Secondly, risk and challenge identification in the early phases should be of utmost concern for project managers, especially in residential projects that were seen as the most prone to delays by 60% of participants, followed by infrastructure projects with 20% participants and industrial projects with 25% of participants. Delays from phase-to-phase and surprising interruptions can be minimized through the introduction of proactive frameworks for risk assessment. Third, to ensure that project teams can manage project unexpected challenges successfully, organizations must invest in ongoing training and capacity building for project teams. This should emphasize both the principles of structured planning and adaptive iterative processes. Fourth, existing literature and survey results had shown that the strengths of agile methodology such as quick feedback and iterative problem solving are not optimized when stakeholder involvement is poor, stakeholder involvement and communication channels are advised to be improved. Lastly, as supported in the Contingency Theory, construction companies in the Mangaung District should use situational-specific project management approaches, matching the choice of the methodology to the nature, size, and complexity of the project. Local construction projects implementing these suggestions should enjoy increased customer satisfaction, lower cost overruns, and faster delivery, which in turn will support the growth of the Mangaung District's infrastructure and economy.

Future Study Recommendations

While this study has provided significant information on Waterfall and Agile project management methodologies contribution to construction project delays in the Mangaung District, further research could expand it by studying specific aspects that have not been explored. Future research could investigate which practices or elements of the Waterfall methodology and Agile methodology are most effective together in reducing delays in construction projects and therefore providing more specific guidance for construction professionals on construction sites. Future Research could also examine the types of construction projects in this study that were found most affected by project delays in residential industrial and infrastructure. To examine how the Hybrid methodology might be tailored specifically to accommodate the unique challenges of each project type.

CONCLUSION

In conclusion, this study was able to combine empirical data that was collected from Mangaung District construction professionals with the theoretical requirements of the literature review. The results undeniably confirmed the Contingency Theory by showing that neither the Waterfall nor the Agile project management methodologies are adequate for the complex projects of the Mangaung region on their own. Interestingly, the conclusions of the primary study indicated a strong preference for a hybrid methodology that incorporates the flexibility and rapid-response mechanisms of Agile methodology with the up-front planning and formality required by Waterfall Methodology. The implementation of the Hybrid methodology aligned with situational recommendations offers a successful, evidence-based methodology for the reducing project delays in construction projects and the rise in overall project on time delivery rates in the Mangaung District.

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DISCLOSURE STATEMENT

No potential conflict of interest was reported by author(s).

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