ESP-JETA
ESP Journal of Engineering & Technology Advancements
ISSN: 2583-2646 / Volume 3 Issue 3 September 2023 / Page No: 78-83
Paper Id: JETA-V3I7P110 / Doi: 10.56472/25832646/JETA-V3I7P110

Original Article

Developing a Hybrid Approach: Combining Traditional and Agile Project Management Methodologies in Construction Using Modern Software Tools

Rinkesh Gajera
Independent Researcher, USA.

Received Date: 07 August 2023 Revised Date: 05 September 2023 Accepted Date: 04 October 2023

Abstract: *This paper helps in the development of the concept of hybrid model project management that embraces traditional, agile, and lean approaches in the construction industry. It is to be integrated with traditional, agile, and lean methodologies to carry out effective research on the complexities, dynamic nature, and the challenges faced in modern projects in the construction industry. This approach will adopt agile practices, for instance, iterative development, client collaboration, as well as traditional frameworks, like Gantt charts and CPM, towards bettering the outcome of the project and minimizing delays and cost overrun. Key modern software tools applied during this project include BIM, project management platforms Asana and Trello, facilitating real-time communication and resource management. Thus, the hybrid suggests an approach that not only optimizes the execution of projects but also develops better collaboration and efficiency with increasingly complex construction environments.*

Keywords: *Hybrid Project Management, Traditional Methodologies, Agile Methodologies, Lean Management, Construction Industry, Modern Software Tools, Project Performance.*

I. INTRODUCTION

The construction industry is expected to deliver projects in terms of given parameters, such as timely delivery, cost control, and quality results. The sector earlier relied on structured approaches toward project management through an understanding of the underlying structure of the sector as similar to the Waterfall method: a paradigm in which work flows linearly through phases and rigorous planning. Since the project has become all the more complex, it would just be appropriate that more aggressive inclusions of agile methods within these projects-methods based on flexibility with iterative development-into a hybrid approach prove suitable. The benefits realized from this hybrid approach come from both traditional and agile practices wherein construction teams can plan extensively in advance yet adjust according to challenges that might arise on-site. All the work, with the aid of modern software tools, BIM, and a platform of Asana or Trello, can also be done in real-time, along with risk management that the resources may be brought into an effective distribution.

II. LITERATURE REVIEW

A. Hybrid Project Management within Construction Industry

According to Lalmi et al. 2021: Traditional plan-driven models are applied in construction projects throughout the globe, but such models become insensitive to the frequent changes that most projects experience. Agile methodologies respond better to such situations. Thus, the hybrid model presented in this paper uses the traditional, agile, and lean approaches together in a project's management process to account for the dynamic aspects that occur in construction projects (Lalmi et al. 2021). This is done by taking advantage of the structured planning available in the traditional approach, combining agile practices to enhance client collaboration and responsiveness to growing opportunities for project success, and by combining lean principles to eliminate waste while fostering efficiency gains.

It surveys literature on various project management methodologies and presents a hybrid model, which extensively focuses on key practices of traditional, agile, and lean approaches that might ensure optimized project outcomes within this new fast-changing environment.

B. Agile and Traditional Methodologies in Construction

According to Mohammed and Chambrelin, 2020: Construction project management, as a field, changes very rapidly. Schedules overruns and the overrun of budgets are common problems at the execution of its stage in construction projects. Literature also shows that repetitively occurring delays in design and change orders are the most significant reasons behind such problems. The objective of this paper is to frame a controlled framework that conforms with the dynamic conditions of construction projects (Mohammed and Chambrelin, 2020). This introduces agile methodology into the management of

construction projects, which has gained enormous acceptance within the computer science industry as an effective 'change management' tool. Effective change management during construction projects can be successfully generated by using a unified change discipline across the whole of the industry. Just like IT industries, the application of the sprint method in construction can streamline processes and obtain better outcomes for projects. This approach keeps track of maintaining an organized flexible framework which enhances the effectiveness of construction project management implementation.

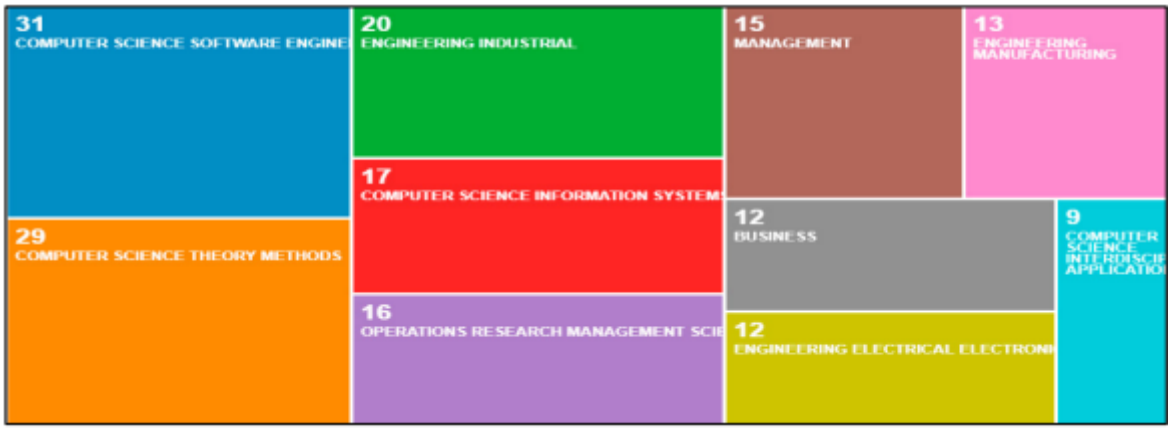

Figure 1: Top 10 Most Used Domains in Publishing

(Source: Lalmi et al. 2021)

C. Combining Waterfall and Agile in construction

According to Noha, 2024: A unified change discipline throughout the entire industry will satisfactorily generate effective change management throughout the entire construction project. Similar to the case of IT industries, the sprint method in construction should be taken such that the processes may be streamlined, and better results will be obtained for the projects under consideration. This method also tracks maintaining an organized flexible framework to enhance the effectiveness in implementing construction project management. The process of construction project management is aimed at devising solutions meant to cater to the needs of a customer while ensuring business goals are achieved within projects undertaken (Noha, 2024). Although it has remained the most utilized method to date, the complexity in construction projects involving various parties exposed the gap that existed between expectations and the implementation of projects.

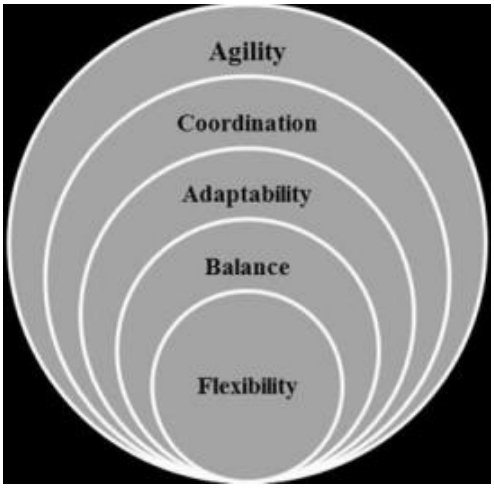

Figure 2: Conceptual Layers of Agility

(Source: Noha, 2024)

On the other hand, with a wide adaptation of traditional methods, little has changed by the adaptation of changes amid increasingly complex construction projects that are no longer simple and linear. This paper questions whether Agile project management-scoped to Scrum-can be adapted to be used both on the design phase as well as during the construction phase.

D. Modern Project Management Practices In Construction

According to Yan and Li, 2022: It details work done to determine which steps of construction project management agile principles should infiltrate, an assessment of how agile methodologies help projects regarding performance, and a

comparison with the traditional waterfall approaches. Thus, it seeks to establish whether one is more effective than the other to enhance the performance of construction projects. Backed with national as well as local government support, modern information technology has developed very rapidly in the country's information sector since the IT revolution (Yan and Li, 2022). In keeping with rapid development in modern information technology brought about by the IT revolution and government policy support, the information sector of their country has achieved significant development penetrations in all walks of fields. Improved by society, needs for construction engineering standards generate even more sophisticated management requirements for the project. Increased efficiency is achieved through an information management model that has become necessary for adoption. With this background, the paper argues why project management informatization is important and then moves into the critical issues that are involved in a technology implementation process by finally strategizing on how modern technology can be integrated with the information process of the project management in order to enhance the effectiveness and efficiency of engineering management.

III. METHODS

A. Data Collection and Data Processing

With this method, essentially there is a design approach that combines many data from sources that follow the right preprocessing stages for proper analysis. In the main sources of data collected, there are:

1. Historical Project Data: Previous construction projects will be covered: These will follow the more conventional ways of Gantt charts, Critical Path Method or CPM, or Project Evaluation and Review Technique or PERT (Papadakis and Tsironis, 2020). It is what has to be obtained-the timelines of such a project, allocation of resources, budget adherence, and the outcome of such a project, thereby insight into traditional construction management practices.
2. Measure agile practices incorporating Scrum or Kanban in construction or related fields. These data would represent the iterative planning, client's involvement, and flexibility of the scope change. This may uncover some hidden insight about how agile methods can supplement these traditional approaches.
3. Software tool adoption data: Using modern BIM, Asana, Trello and MS Project-based management, a study will be carried out on how the creation of communications, resource, and scheduling supports are created in construction projects (Getyengana, 2020).
4. Stakeholder interviews: Projects Managers, Contractors, Architects, and Clients would qualify information regarding the practical application of traditional and agile construction methods. There would be an interview indicating some discussion challenges with opportunities on its integration.
5. Market Reports and Industry Trends: Check construction and technology reports or industry trends to get informed, updated information regarding the best practices, challenges, and emerging techniques that might be applied when synthesizing traditional and agile approaches toward project management.

B. Data Processing

There will be several preprocessing steps assured for retaining the quality of the required data.

- Data Cleansing: This will ensure an absolute elimination of every inconsistency, duplication, and missing values to produce a proper analysis of the data collected (Lalmi et al. 2022).
- Normalization: Numerical features such as time, cost, and variables associated with resources are normalized. This is because they require normalization so that across projects, similar parameters can be compared with uniformity in the dataset.

C. Designing the Hybrid Project Management Model

The hybrid project management model will employ the following methods in the construction process.

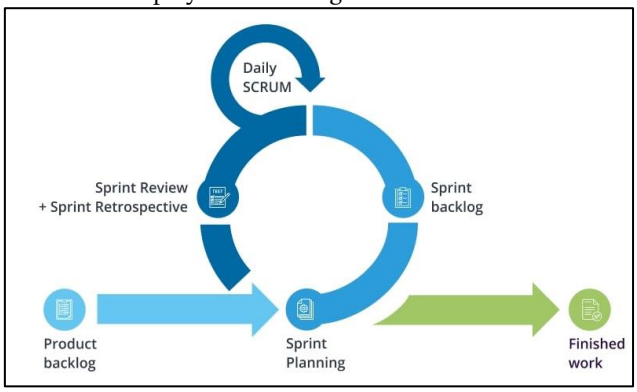

Figure 3: Hybrid Project Management Approach

(Source: https://www.azoft.com/blog/hybrid-project-management/)

- Predictive models. Adaptive Regression models will help predict the impact of hybrid approaches to forecast the project success, lead times, and resource utilization for achieving optimal trade-offs concerning structural vs. flexible planning.
- Time-Series Analysis: Techniques like ARIMA will be used in the analysis of a project timeframe so as to identify whether times are feasible so that delays in projects can occur (Bianchi et al. 2021). Phases are also identified for Agile methods flexibility without being put at the risk of losing the schedule.
- Clustering: After having k-means-like clustering performed, the projects would be aggregated based on similarities either in size or complexity or stakeholder involvement. It discovers patterns therefore in the blend between traditional and agile approaches.

D. Implementation and Deployment

- Integration: The hybrid will be integrated into available project management tools that will make possible real-time collaboration and tracking of different components in both agile and traditional projects.
- Model Validation: Here will utilize actual construction data in the implementation of the hybrid model in order to compare different project performance against results on budget, timeline, and quality as the effectiveness in terms of performance (Copola Azenha et al. 2021).
- Monitoring and Adjustment: There is monitoring to modify the model based on the feedback regarding the performance and must ensure flexibility with the changing conditions of a project.

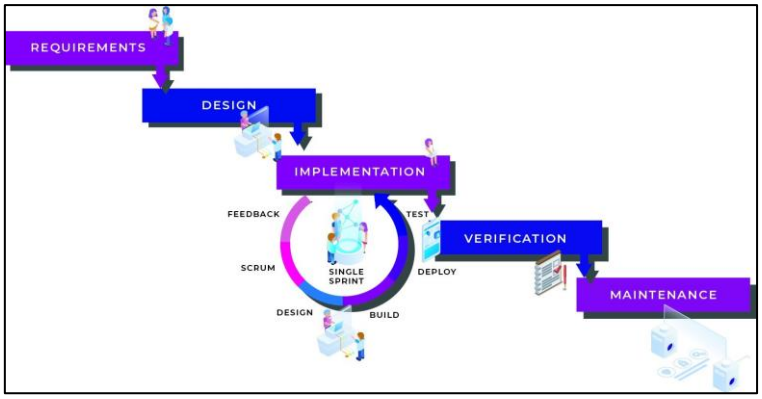

Figure 4: The Practical Choice of Hybrid Project Management

(Source: https://www.linkedin.com/pulse/hybrid-project-management-practical-choice-sakib)

IV. RESULTS

A. Hybrid Project Management in Construction

All traditional, agile, and lean methodologies combined can result in hybrid project management, which is very well-balanced and flexible and can offer solutions to the complexity of construction projects (Diem, 2021). Traditional methodologies have provided a structured basis for planning and managing risk components for the tasks involved; they were considered indispensable for big projects. Hybrid techniques allow for more flexibility in the execution phase since relative changes that may emerge during the same phase. As Lalmi et al. (2021) note, hybrids invite even more collaboration and response from the client so that the results of the project are better.

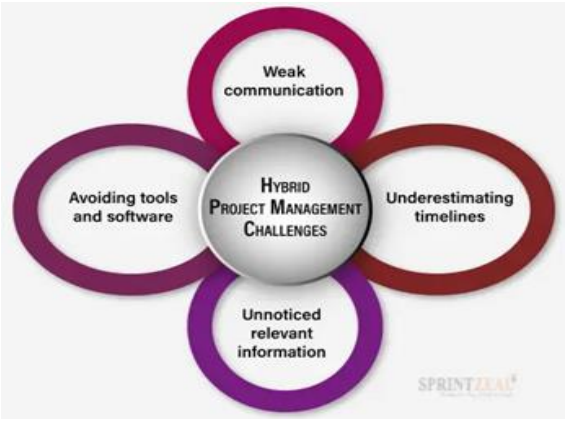

Figure 5: Hybrid Project Management Challenges

(Sources: https://www.sprintzeal.com/blog/hybrid-project-management)

B. Managing Delays and Budget Overruns

Changes in design and change orders are in likelihood causes of the initial delay and cost overrun in construction projects, according to Mohammed and Chambrelin, 2020. Techniques applying sprint planning from agile methodologies can break up a project into more workable and achievable phases and hence maintain constant interaction with quicker response rates for change (Ozorhon et al. 2022). With the controlled agile framework, construction teams may be able to respond appropriately to the project needs on time and cost, thus enhancing the overall in-performance projects, bringing them closer to the client's expectations.

C. Agile versus Waterfall in Construction

Noha (2024) refers to some similarities as well as differences regarding agile and waterfall approaches, primarily considering construction projects. A waterfall approach is derived from well-planned structuring and applies mainly in the introductory stages of a project. Agile practices are better suited to address changes that manifest in the evolution of requirements while a large and complex project or projects, having many stakeholders, are in the design and construction phases (Ciric Lalic et al. 2022). Implementation in this phase, therefore, would be contributing toward greater adaptability, irrespective of any existing or past success with waterfalls that are high-effectiveness for both overall management of projects as well as long-term planning.

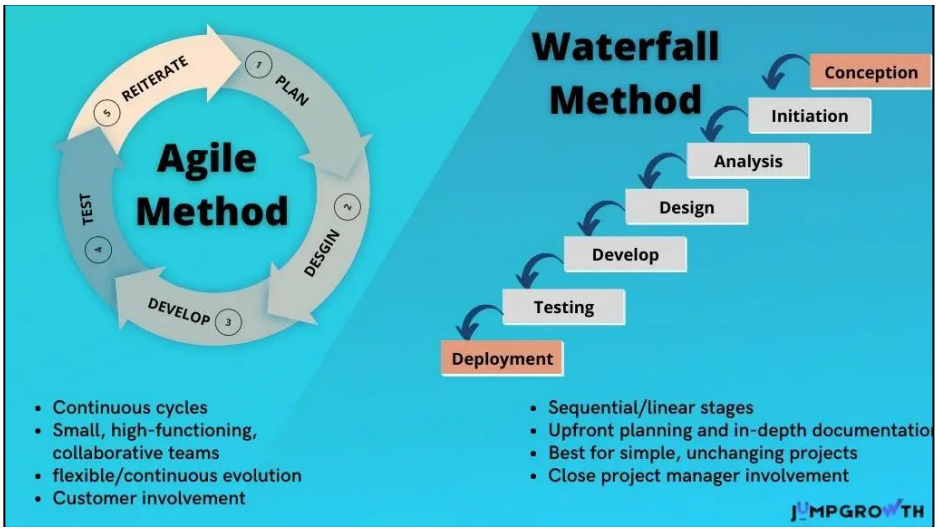

Figure 6: Agile vs waterfall

(Source: https://jumpgrowth.com/agile-vs-waterfall-methodology/)

D. Leveraging Modern Software Tools

Modern software tools in construction project management are a focal point especially of Yan and Li, (2022). With the rise in the smart city, with the complexity that construction requires, information management systems, and the modern software tools have to be exploited for greater achievements. They improve communication, enhance decisions, allow real-time monitoring. In turn, this will distribute resources and minimize errors. The general effectiveness of construction project management increases with the use of such technologies.

V. DISCUSSION

Analyse the hybrid of methodologies combining the traditional elements with agile and lean management, makes an ideal foundation for successful construction projects, allowing flexibility and getting rid of waste. Use of techniques such as sprint planning in agile help companies to combat delay and cost overrun because of constant communication and flexibility. Traditional approaches are apt for the stages of planning, while agile methods improve adaptability in the course of execution (Gemino et al. 2021). Modern software tools assist in improving decisions, real-time monitoring, and communication, which accordingly optimizes resource allocation and minimizes the number of mistakes on this overly complicated construction site.

VI. FUTURE DIRECTION

Further into the future, research will be needed on hybrid management models concerning these specially developed styles, but which seem to be biased towards both agile and traditional approaches. This will consider the use of application software tools in the pursuit of achieving full productivity towards realization by project management relating to predictive analytics and real-time data analysis (Leong et al. 2023). Then hybrid models can then be applied to test scalability with respect to small-sized developments and large and complex developments.

Figure 7: Future of Hybrid Work

(Source: https://hrone.cloud/blog/future-of-hybrid-work/)

It would have proven handy to better team coordination and the results of the project with combining the sharing of experience and other cooperation tools with a more reliable communication system.

VII. CONCLUSION

Here mainly conclude that the hybrid approach to the project management with a combination of usage of traditional, agile, and lean methodologies offers a wide array of benefits. The integration of structured planning with agile practice narrows down on the key issues of better response toward changeability, more collaborative forms with the client, and fewer delays. Integration with modern software tools improves the basis of communication, resource management, and decision-making. Hybrid model is applied for optimum project execution of increasingly complex construction projects.

VIII. REFERENCE

[1] Bianchi, M.J., Conforto, E.C. and Amaral, D.C., 2021. Beyond the agile methods: A diagnostic tool to support the development of hybrid models. International Journal of Managing Projects in Business, 14(5), pp.1219-1244.

[2] Ciric Lalic, D., Lalic, B., Delić, M., Gracanin, D. and Stefanovic, D., 2022. How project management approach impact project success? From traditional to agile. International Journal of Managing Projects in Business, 15(3), pp.494-521.

[3] Copola Azenha, F., Aparecida Reis, D. and Leme Fleury, A., 2021. The role and characteristics of hybrid approaches to project management in the development of technology-based products and services. Project Management Journal, 52(1), pp.90-110.

[4] Diem, G., 2021. Agile and traditional project management: comparing agile, traditional and hybrid project management practices (Doctoral dissertation, Heriot-Watt University).

[5] Gemino, A., Horner Reich, B. and Serrador, P.M., 2021. Agile, traditional, and hybrid approaches to project success: is hybrid a poor second choice?. Project management journal, 52(2), pp.161-175.

[6] Getyengana, N., 2020. Effective implementation of a Hybrid project management methodology combining agile and traditional methods for IT-based projects in South African organisations. University of Pretoria (South Africa).

[7] Lalmi, A., Fernandes, G. and Boudemagh, S.S., 2022. Synergy between Traditional, Agile and Lean management approaches in construction projects: bibliometric analysis. Procedia Computer Science, 196, pp.732-739.

[8] Lalmi, A., Fernandes, G. and Souad, S.B., 2021. A conceptual hybrid project management model for construction projects. Procedia Computer Science, 181, pp.921-930.

[9] Leong, J., May Yee, K., Baitsegi, O., Palanisamy, L. and Ramasamy, R.K., 2023. Hybrid project management between traditional software development lifecycle and agile based product development for future sustainability. Sustainability, 15(2), p.1121.

[10] Mohammed, K.N. and Chambrelin, K.S., 2020. An analytical approach in usage of agile methodologies in construction industries–A case study. Materials Today: Proceedings, 33, pp.475-479.

[11] Noha, A., Agility Opportunities in Construction Project Management "Exploring Opportunities in Construction Projects in integration with Waterfall Methodology.".

[12] Ozorhon, B., Cardak, F. and Caglayan, S., 2022. Investigating the agile hybrid approach in construction. Journal of Management in Engineering, 38(4), p.04022022.

[13] Papadakis, E. and Tsironis, L., 2020. Towards a hybrid project management framework: A systematic literature review on traditional, agile and hybrid techniques. The Journal of Modern Project Management, 8(2).

[14] Yan, H. and Li, M., 2022, November. Application of modern information technology in information construction of project management. In Proceedings of the 5th International Conference on Information Technologies and Electrical Engineering (pp. 132-135).