

EVALUATING THE IMPACT OF PROJECT MANAGEMENT TECHNIQUES ON REAL ESTATE DEVELOPMENT IN SOUTH WEST NIGERIA

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ABSTRACT:

Real estate development is a critical sector in Nigeria's economy, but it faces numerous challenges, including project delays, cost overruns, and quality issues. This study investigates the Impact of Project Management Techniques on Real Estate Development Programs in South-West Nigeria. The Structured questionnaire was administered on 126 respondents in real estate sectors. The results show that the adoption of project management techniques, such as Work Breakdown structures, PERT, CPM, Agile, and waterfall, significantly improves project outcomes, reduced project duration, cost savings, and enhanced quality. However, the study also reveals that the effectiveness of these techniques is influenced by factors such as project size, complexity, and stakeholder engagement. The study concludes that project management techniques can positively impact real estate development in Nigeria, but their adoption must be tailored to the specific project context. The findings have implications for real estate developers, policymakers, and project management professionals seeking to improve the efficiency and effectiveness of real estate development projects in the region.

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1.0 Background to the Study

Project management is the process of directing and coordinating human and material resources throughout the life of a project by using modern management techniques to achieve predetermined objectives of scope, cost, time, quality and participation satisfaction (Peter, 2013; Irefin 2013).

Project management arise from the required to invent, modify or replacement of organization aspect. Strong level coordination and efforts used in carrying out activities objectively are the major reasons for development of project organizations (Sderlund, 2004; Mostafa et al. 2020).

Many studies have shown project management as a system, the way of evaluation, implementation of professional knowledge, skills, tools and techniques and modus operandi to a wide range of activities for the achievement of requirement of a precise project (Qureshi et al., 2009; Tavan, and Hosseini, 2016; Mostafa et al. 2020). It is important to know that all processes of managerial, finance, legal, logistics and training involved in society transformation are contained in the works of project management (Ihesiene, 2014; Tereso et al., 2019)

Project management techniques such as Critical path Method (CPM) and Program Evaluation and Review Techniques (PERT), work break down structure (WBS), Gantt chart, Earned Value Method (EVM) were deployed to facilitate project scheduling and risk analysis, planning and project cost management, integrated project management scope and time management and improve project control and monitor to foresight project activities at completion (Radujković and Klepo, 2021; Varajão, Fernandesand and Silva, 2020).

The application of project management techniques can be seen in virtually all large organizations with huge budget such as aerospace builder, ship builder, construction companies, orders processing etc, (Fernandez and Fernandez, 2008; Fernandes and David, 2022). However, little has been said about the impact of project management technique adopted in Real Estate development. Tavan, and Hosseini (2016) defines a project a project as human activity stipulated to achieve a clear objective against a time scale. Project management techniques and concept are applied to a wide range of tasks that really do not have this singularity.

Real estate consists of property such as land and the building erect on it, is the work of expertise on building, selling or renting building, land or factory premises. It encompasses of various areas of investment opportunities such as residential, commercial, industrial, agricultural or recreational investment (Okoh, 2008; Oladimeji, 2008).

Real estate development projects in Southwest Nigeria face challenges that hinder their successful

delivery. Effective project management techniques are crucial to overcoming these challenges. Therefore, the study focusses on:

- i. Examine the level of application of project management techniques on the Real Estate development in southwestern Nigeria.
- ii. Examine the factors influencing the adoption of project management techniques in construction project of Real Estate firms, Southwest Nigeria.

2.0 Literature Review

Conventional Project Management Techniques

A framework or instrument applied in planning, coordinate, and executing a project is refer to as a project management technique. There are numerous approaches to project management. The ideal option for the project manager is to rely on his team's configuration, the size, complexity, and goals of the project.

1. Work breakdown Structure (WBS)

This is a project management strategy known as structure divides more complex projects into smaller, more manageable deliverables. With the overarching project objective at the top, WBS arranges your project in a tree-like hierarchy (Radujković and Klepo, 2021). The parent objective's dependencies are then found and, at the bottom, these dependencies are divided into individual tasks.

Workflow management software or Kanban boards are graphic project management technique that is commonly used in Work Breakdown Structure (WBS) projects to manage tasks and dependencies. WBS is excellent for managing a project's overall development, defining the project's scope, identifying dependencies, and predicting costs and schedules (Varajão, Fernandesand and Silva, 2020).

Therefore, larger, more intricate projects that require subdividing into smaller components are appropriate suited for the WBS project management technique. This is due to the fact that WBS excels in identifying, categorizing and anticipating the numerous dependencies and subtasks that frequently have in big projects.

2. Critical Path Method (CPM)

A project management framework called the critical path method (CPM) is used to determine the longest series of critical tasks required to finish a project on schedule (Trietsch, and Baker, 2012).

This so-called "critical path" shows how rapidly a project can be finished. Since every task in the critical path is sequential, any delays in one will result in delay in the totality of the project.

The CPM approach is used to determine a project's most crucial activities, expose task dependencies serially, and determine the task time for each crucial activity. Based on the length of each important activity, one can then determine the entire project timeline (Varajão, Fernandes and Silva, 2020). CPM usually assist in managing the project as a whole, the critical path is usually shown as a visual diagram with all sequential task dependencies and their estimated completion times.

Utilizing the CPM project management technique is highly endorsed for intricate projects where time is a critical or constraining element. If one in charge of a project with a lot of linear task dependencies, this method is also quite effective and reliable (Khan, Ali, Garai-Fodor and Csiszárík-Kocsir, 2023). This is not the same as the work breakdown structure method, this technique is appropriate for projects that have independent dependencies activities that may be carried out concurrently.

3. Waterfall

One of the best techniques for managing a linear project is the waterfall project management approach. Using this method, a project is divided into consecutive phases that must be finished in order to go on to the next (Aina et al., 2022). The Waterfall technique establishes interdependence early in the project and offers a clear plan from the outset. But since it's a strict method, it could be difficult if your project's goals or scope change over time (Aroral, 2021).

The Waterfall method consists of six stages which include: Requirements gathering, design, implementation, verification, deployment and maintenance. The Waterfall project management methodology works best for projects that require clear guidance from the beginning and are not expected to change over time (Khan et al., 2024).

4. Earned Value Management (EVM)

Earned Value Management (EVM) is a project management technique used to measure project performance and progress. It integrates project scope, schedule, and cost to provide a comprehensive view of project health. It contains the following main components which include: Planned value, earned value and actual cost (Li, 2023). The measurement of earned value management includes schedule performance index, cost performance index, schedule variance and cost variance. It applies various techniques such as earned value analysis, trend analysis,

forecasting and corrective actions (Matindana and Hassan, 2023). It provides project managers and stakeholders with following benefits includes improved project visibility, enhanced decision-making process, early warning system and increased accountability (Teixeira, et al., 2020). The best practice of earned value management involving; establishment of clear objectives and goals, utilization of EVM software tools, offering training and support to team members and monitor and review EVM metric at regular interval (Proaño-Narváez, et al., 2022).

Earned Value Management (EVM) is a powerful project management technique that provides comprehensive insights into project performance. By understanding EVM principles, metrics, and techniques, project managers can make informed decisions, identify potential issues early, and take corrective actions to ensure project success (Proaño-Narváez, et al., 2022).

5. Budgeting and cost management

Monetary management is a critical aspect of project management that ensures projects are completed within budget (Adolphe and Njenga, 2021). Effective budgeting and cost management techniques enable project managers to allocate resources efficiently, minimize costs, and maximize value (Pawar, Kulkarni and Pawar, 2022). Budgeting techniques includes, top-down budgeting, bottom-up budgeting, parametric budgeting and zero-based budgeting, while the cost management techniques are cost estimation, cost control, cost reduction and cost optimization (Ambetsa and Yusuf, 2022).

Budgeting and cost management are based on the following techniques cost-benefits analysis, break-even analysis, sensitivity analysis and variance analysis.

Effective budgeting and cost management techniques are crucial for project success. By understanding and applying these techniques, project managers can ensure projects are completed within budget, maximize value, and minimize costs (Titarenko and Titarenko, 2024).

6. Gantt chart

Project managers use this horizontal bar chart to show the tasks involved in the project as well as the time needed to finish each one. Three elements make up a Gantt chart: the tasks assigned to a project, their respective start and end dates (Khan, Ali, Garai-Fodor and Csiszárík-Kocsir, 2023). Next, a bar for each task is placed on the Y axis to indicate its start and end dates, and the tasks are arranged on the X axis in a sequential manner. Usually, programs like Microsoft Excel or Google Sheets are used to construct Gantt charts (Masahiro and Xuebin 2021).

To make sure you can finish a project on schedule and within budget, Gantt charts are useful for

monitoring project progress (Varajão, Fernandes and Silva, 2020). These are excellent charts for identifying dependencies and displaying the history of your project. You can use it in conjunction with most project management methodologies, particularly for complex project scenarios (Radujković and Klepo, 2021).

7. The program evaluation and review technique (PERT)

This is a tool and method for project management that helps determine how long a project will take. It is thought of as a more intricate form of the critical path method (CPM) or a Gantt chart (Trietsch, and Baker, 2012). The PERT Method begins by listing all of the tasks in a project and determines three possible completion times for each task: the most likely time, the pessimistic time, and the optimistic time.

The weighted average estimate for each task is then calculated using the three-time estimations. The project timeframe is then determined by identifying a key path of required tasks and using the weighted average time estimates (Khan, Ali, Garai-Fodor and Csiszárík-Kocsir, 2023). A flowchart is made to illustrate the relationship between tasks rather than their sequential order once the critical path has been determined (Yudistira et al., 2024)

When evaluating a project's timing, PERT can be more accurate than a Gantt chart or the critical path method (CPM). It should only be used for projects with a high degree of uncertainty where it is required to obtain many times estimates in order to arrive at an average, as it is more sophisticated than the other two procedures (Ndidiama et al., 2024).

Modern project management techniques

8. Continuous integration and delivery (CI/CD) Pipeline

A continuous integration/continuous deployment (CI/CD) pipeline is used to accelerate the software development process through automation. It allows organizations to build, test and deploy software projects continuously, making it easier for developers to integrate changes into the project (Shahin, Babar and Zhu. 2017). Jenkins, which was used in this research, is an open-source CI/CD pipeline for many combinations of languages and source code repositories. It integrates development life-cycle processes of various kinds, including build, document, test, package, stage, deploy, and static analyses (Zhu, Bass and Champlin-Scharff, 2016; Armenise, 2015).

9. Adaptive Project Management Model

In current world business scenario due to change in business climate, where needs are frequently changing and project team is not ready to adapt unwanted changes (Ranjan, 2021). So, in order to

sustain in the global market, it is necessary to adapt such unwanted changes by project team to achieve desire goal (Gabriel, Emerson and Nader, 2021). Adaptive project management is the tool, where we can easily cope of such changes to achieve desired goal. Adaptive project management (APM) adapt the changes occurred due to unknown factors and prepare the project team to avoid any risk. Project team learns from the output of project cycle and accordingly changes are made in any stage of project cycle to achieve desired goal. Frequent feedback not only helps to achieve the desire goal but also its help to reduce the time and cost overrun (Sommera, 2024).

Adaptive project management practices contribute to providing clarity, objectivity, and integration of these plans (Teles, 2014). Thus, the validations are executed every iteration, whether using specialized tools or not (Teles, 2014). Adaptive project management practices differ from traditional approaches, as they have more agile and effective processes within a project life cycle (Shenhar and Dvir, 2010; Koskela and Howell, 2002). Each life cycle becomes adaptive containing short and incremental iterations, making the project's scope flexible (PMI, 2017; Gabriel, Emerson and Nader, 2021).

10. Agile Project Management Methodologies

According to Fernandes and David (2022). study, agile project managers are more adaptable and quicker to deal with challenging circumstances in projects. Comparing them to standard project management approaches, they also react to managerial decision-making in project management more quickly and effectively (Fernandez and Fernandez 2008; Conforto and Amaral, 2016). Additionally, the study found that Agile methods are the most effective for small-scale projects since it gives liberty to the project team to assign roles and tasks on their own (Fernandez and Fernandez 2008; Milićević et al., 2019).

According to (Mostafa et al. 2020) the Agile project methodology is based on the following core principles:

1. Individuals and Interactions: Prioritize people and communication over processes and tools.
2. Working Software: Focus on delivering working software in short iterations, rather than comprehensive documentation.
3. Customer Collaboration: Collaborate closely with customers and stakeholders to understand their needs and deliver value.
4. Responding to Change: Embrace change and be flexible, rather than following a rigid plan.
5. Iterative Development: Break down work into smaller, manageable chunks, and deliver

incrementally.

6. Continuous Improvement: Regularly reflect and improve processes, practices, and team performance.
7. Self-Organizing Teams: Empower teams to take ownership and make decisions, rather than relying on external direction.
8. Timeboxing: Use fixed-length iterations (sprints) to create a sense of urgency and focus.
9. Prioritization: Prioritize work based on business value, customer needs, and risk.
10. Transparency: Maintain open communication, visibility, and transparency throughout the project.

3.0 Methodology

A survey procedure and sample

A comprehensive questionnaire that measures the various variables was developed. The items in the questionnaire were initially derived after an extensive literature review and were subjected to comprehensive examination. The Study made use of 150 real estate developers' companies in the three selected states including Oyo, Ogun and Lagos states respectively. They were randomly selected from the directory of Real Estate developers Association of Nigeria (REDAN) which contained information on the activities of real estate sector in the economy. Then, the questionnaire was administered to the owner/project managers, or developers to give insights to the study.

The dependent variable was measured using the question "Does your company utilized project management techniques such as PERT, Gannt chart, CPM, WBS, among others? with a Yes or No scale to separate the samples into users and non-users. The independent variables were measured using the 5-point scale (strongly agree to indifferences) for the respondents to give their responses. Regression analysis was used to examine the relationship between project management techniques and real estate development.

4.0 Data Analysis and Results:

One hundred and fifty (150) copies of questionnaire were sent out to the 150 real estate firms, 126 responses were received for response rate of 84%. Given the lengthened and compressive nature of survey, the response rate was concluded to be reasonable. Among the 126 effective responses. Table 1 shows Utilization of project management techniques by Real estate companies in the study area. The technics are categorized into two (2) namely; conventional/traditional (Work Breakdown

Structure (WBS), Critical Path Method (CPM), waterfall model, Gannt chart, Project Evaluation Review Techniques (PERT)), and Modern (Agile methodologies, Adaptative project management, Dynamic System Development method). In the traditional/conventional category, 91.3% use a particular brand of technique in the project activities while 84.1% of the organization were using modern techniques. These results imply that the real estate firm do regularly use a project management techniques nature thus making the sample suitable for the study.

Table 1: Utilization of project management techniques by selected real estate in development of their project

S/N	Project management Techniques	Yes	%	No	%	Frequency	%
	Traditional techniques						
1	Work Breakdown Structure (WBS)	106	84.1	20	15.9	126	100
2	Critical part Method (CPM)	89	70.6	37	29.8	126	100
3	Waterfall model	45	35.7	81	64.9	126	100
4	Earned Value Management (EVM)	71	56.3	55	43.7	126	100
5	Budgeting and cost management	115	91.3	11	8.7	126	100
6	Gannt chart	105	83.3	21	16.7	126	100
7	Project Evaluation Review Technique (PERT)	69	54.8	57	45.2	126	100
	Modern techniques						
8	Continuous Integration and Delivery (CI/CD)	74	58.7	52	41.3	126	100
9	Adaptative project management	63	50	63	50.0	126	100

10	Agile project management	106	84.1	19	15.1	126	100
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The model in Table 2 shows that over 65% of the variation in Real estate development across the studied States was explained ($R^2 = .061$, $F (23, 121) = 1.245$, $p < .005$].

Project management technique have significant impact in real estate development program. The results showed that Work Breakdown Structure (WBS) was technique influencing the development of real estate program WBS is 3.436 times more likely ($\beta = 0.229$, $t = 2.051$, $p < 0.005$) to influence the real estate development program. It decomposes project or program into smaller, unit, and manageable tasks and activities

Critical path method 0.085 times more likely ($\beta = 0.111$, $t = 0.085$, $p < 0.005$) to influence real estate development program. This means that if the real estate manager or project manager apply and implementing critical path method in the project evaluation, it enables them to focused on identifying and managing critical tasks, activities that determine the project timeline.

The results also show that application of Earned Value Management (EVM) ($\beta = .0.261$, $t = 2.476$, $p < 0.005$) was found to be a positively significant technique that influencing the real estate development program. This means that there will be advancement in the activities of the real estate sectors when they use it to measures project performance by comparing planned and actual progress. Thus, the understanding (EVM) principles, metrics, and techniques, project managers can make informed decisions, identify potential issues early and take corrective actions to ensure project success.

The results also showed that Budgeting and cost management were significantly positive predictors of development of real estate program ($\beta = 0.172$, $t = 1.611$, $p < 0.005$). This implies that when manager or project manager understanding and applying these techniques can ensure projects are completed within budget, maximize value, and minimize costs.

Also, the application and implementation of Gannt chart in real estate program ($\beta = 0.134$, $t = 1.183$, $p < 0.005$), was found to be a positively significant influencing the development of real estate program, it visualizes project schedules, tasks and dependencies by using bar charts.

Meanwhile, Project Evaluation Review Technique (PERT) has a significant and positive association with the development of real estate program is 0.911 times more likely ($\beta = 0.123$, $t =$

0.911, $p < 0.005$) to increase the real estate development program in the study area. The Manager or project manager of the firm uses probabilistic estimate for task or activities duration includes earliest starting time and latest finishing time of program or project

In the same vein, Continuous integration and Delivery (CI/CD) were also important. That is used methodology which automated build, test and deployment of software application, that ensuring constant integration of code changes and continuous delivery of working software to the project or program manager, was found to be a positively significant ($\beta = 0.022$, $t = 0.186$ $p < 0.005$). this implies that proper understanding and implementing of CI/CD techniques, project managers

Furthermore, Adaptative project management (APM) was a significant and positive association with development of real estate program in the study area. Adaptative project management (APM) is 0.262 times more likely ($\beta = 0.031$, $t = 0.262$, $p < 0.005$) approaches that allow project team to respond quickly to change, uncertainty and complexity in project or program. This implies that proper understanding and implementing Adaptative project management (APM) techniques enhancing team deliver of high-quality outcomes and achieve success in the face of uncertainty. Likewise, Agile methodologies ($\beta = 0.168$, $t = 1.410$, $p < 0.005$), were found to be positively significant technique influencing the development of real estate program or project. This may be due to iterative and incremental approach to project management that emphasizes flexibility, collaboration and rapid delivery. This implies that adequate utilization of agile values, principles and practices, teams can deliver better quality results and achieve success in intricate and uncertain environments

Selection of the best equipment supplies was 9.568 times more likely ($\beta = 0.430$, $t = 9.568$, $p < 0.05$) to influence the development of capabilities. The result showed that ability to collaborate and make purchase decisions, which involves providing the best tools that is most appropriate for machine fabrication was a significant factor influencing the reverse capabilities.

Table 2 result of regression analysis

Model	Unstandardized coefficients		Standardized coefficients		t	Sig
	B	Std.Error	Beta			
1	(Constant)	2.669	.361		7.391	.000
	WBS	.521	.254	.229	2.051	.001
	CPM	.020	.236	.011	.085	.000

	Waterfall	.092	.208	.055	.443	.659
	(EVM)	.424	.171	.261	2.476	.001
	BCM	.484	.301	.172	1.611	.001
	Gannt chart	.287	.243	.134	1.183	.000
	PERT	.200	.220	.123	.911	.000
	CI/CD	.036	.196	.022	.186	.000
	APM	.051	.193	.031	.262	.001
	AGILE	.383	.271	.168	1.410	.000

5.0 Conclusion

The study evaluating the impact of project management techniques on real estate development programs in South West Nigeria reveals a significant positive correlation between effective project management and successful project outcomes. The study demonstrates that project management techniques such as Agile, Waterfall, Work Breakdown Structure, PERT and CPM approaches can improve project delivery time, reduce costs, and enhance quality in real estate development projects.

The findings suggest that Agile methodologies are more suitable for projects with uncertain requirements and changing stakeholder needs, Waterfall approaches are more effective for projects with well-defined requirements and fixed timelines.

The study conclude that the effective application of project management techniques can significantly impact the success of real estate development programs in South West Nigeria. Developers, contractors, and stakeholders must adopt and adapt these techniques to suit their project needs, ensuring timely, within-budget, and high-quality delivery of real estate projects. By doing so, they can contribute to the growth and development of the region's real estate sector, ultimately benefiting the economy and communities.

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