



Evaluation of Cost Implication of Virtual Project Management on Execution of Building Construction Projects during COVID 19 Lockdown

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ABSTRACT

This research was conducted to verify the impact of virtual project management in the construction industry on project cost with it associated project team productivity. Questionnaire were distributed for acquisition of primary data that were gotten from respondents basically of construction project management background. These data were analysed using statistical package for social sciences SPSS to find out the correlation between virtual project management and project cost reduction as well as correlation between virtual project Management and project Team productivity. The research results from statistical analysis shows that Virtual project Management was very helpful in construction project delivery during COVID 19 in line with project running cost reduction and increase in construction project productivity in the midst of global face to face onsite work restriction that created enormous difficulties in construction project execution and delivery, with its resultant effects on project cost overrun, project abandonment, project time overrun, low project productivity and output. Based on this research outcome, we recommend that virtual project management should be sustainably applied in project work places during periods of non-restriction of face to face or onsite project execution for construction firms' economic development and achievement of good value for money. Furthermore, within these period of non-restriction, Hybrid Project execution framework, comprising of both virtual and onsite project management methods should be adopted for successful project delivery at budgeted project cost.

Key words: Construction Project, Virtual Project, Management, Project Cost, Project Team, Productivity.

1. INTRODUCTION

Handling Construction Projects during COVID 19 became almost impossible if not for the opportunity of virtual project management that made it feasible to manage construction projects remotely from any desired location of project managers. On the global scale, different national

governments, initiated lockdown of the entire drivers of economic systems, resulting from global health policy on social distancing during COVID 19, affected all spares of project delivery in the construction industries, in areas like time of project delivery, running cost of the projects, project work practices for project team members, productivity input and output as well as health and safety of project work team members. Meanwhile, this research aims at evaluating the effects of virtual project management on cost of construction project in Nigeria.

According to [1], Construction projects as part of main frame of the Developing status of Nigerian economy, with its associated project developmental structure was negatively impacted upon by lockdown exercise during the pandemic, in all the regions of the country, especially in the country's capital (Abuja) and all the other state capitals, as well as other business and financial hubs with Lagos at the epicentre. This challenging situation created a large vacuum in revenue sufficiency that in turn, affected the state's economic capacity to fund construction projects to meet their immediate project delivery cost estimation within the expected timeline.

Virtual Project management could serve as panacea to construction project delivery high cost, during situations of disaster occurrences causing the Project Manager to employ virtual aided tools like, GIS Data Management Tools. Thus, the use of variety of technology based project management best practices during possible lockdown periods would enhance reduction in construction project management cost and improve profitability with improved value for money. Furthermore, computer-aided drafting and design (CADD) and other readily available technology tools are also employed in virtual construction project management during lockdown times.

Virtual project management (VPM) emerged as a critical tool for the construction industry during COVID-19 lockdowns as it offered advantages in both cost-saving

opportunities and potential cost increase like cost reduction, virtual site visit and Labour optimization while cost increase comes through technology investment, Cybersecurity and collaboration challenges [1].

1.1. Cost Reductions

This was achieved via travel and accommodation as reduced need for physical meetings translates to savings on travel and accommodation expenses for project stakeholders [2].

Virtual site visits: Virtual Project Management allows remote monitoring of construction progress through tools like 360° photos and video conferencing, potentially reducing the frequency of physical site visits.

Labour optimization: Improved communication and coordination through virtual tools can lead to more efficient use of labour on-site.

1.2 Cost Increases

Technology investment: Implementing VPM requires investment in software, hardware, and training for staff. While some costs may be recurring (e.g., software subscriptions), the initial setup can be significant [3].

Cybersecurity: Increased reliance on digital communication necessitates robust cybersecurity measures to protect sensitive project data.

Collaboration challenges: Building rapport and maintaining effective communication can be more difficult in virtual teams, potentially leading to rework or delays that increase costs.

Overall Impact: Studies suggest that VPM can offer a positive return on investment (ROI) for construction projects. However, the specific cost implications depend on various factors, including, Project size and complexity, Existing IT infrastructure and Team's experience with virtual collaboration tools [4].

[5] stated that the importance of collaborative technologies have become more useful for restoring, remodelling and renovating construction projects since the start of the coronavirus pandemic. Digital tools that directs communication and workflows that would help reduce high cost of construction projects are now of good use to building contractors for planning and executing their construction projects in a COVID-safe dimension. Remote collaboration becomes the ultimate means of effective and efficient construction project work teams during emergency lock down periods.

[6] [7] [8] in [9] stated that there should be a critical review of modelling organizing functions of construction Project works, in terms of poor quality, cost overrun, and time-delayed. Thus, this research focuses on possibility of

reduction of cost overrun in execution of construction project via application of virtual project management, giving rise to the question, to what extent has implementation of virtual project management affected the cost of building construction project?

Logically, comparative analysis of onsite project management and virtual project management, in terms of efficient delivery related to cost of management during COVID 19, will showcase logical arguments in favour of Virtual Project management, concerning reduction in cost of transportation and cost of renting or acquiring office buildings for execution of building construction works while onsite project management will argue that more cost will be incurred for acquisition of Project management Soft wares, Computers, Electricity and Internet facilities for successful project execution. This actually made this research more significant in other to allow us explore the advantages of application of virtual project management in organizational workplace which includes lower operational Cost that are related to infrastructure like company's office building which will no longer be in use and at such money will not be budgeted for payment for rent of such building or total acquisition. Virtual Projects teams are meant to meet in the curse of managing projects only when it is obviously important to discuss or carry out compulsory 24-hour work. It is part of the advantage of working virtually, that company can work 24-hour using shift method applicable in different city and country which accelerates productivity. **Work Flexibility:** Hiring a flexible employee in virtual teams implies that company can scale up or downscale easily and the money extracted from reduction in number of workforce can be put into more productive use [10].

2. THEORETICAL FOUNDATION AND RESEARCH MODEL

Virtual project management operates using virtual teams who work from different locations at stipulated times from the same or different time zones, thus operating interactively based on three collocation system that include, people, process and technology [11]. Figure 1 below depicts the components of virtual project teams:

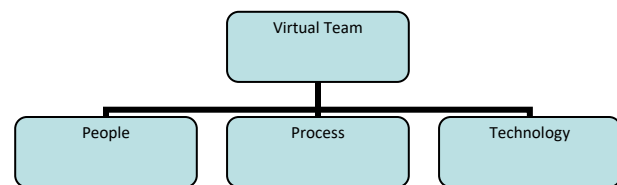


Figure. 1: Components for VP teams [11]

The cost implication of management of virtual projects has a fundamental difference from the cost of traditional project management. The cost Implication of virtual project management becomes more acceptable as methodology of best practice that reduces cost in the management process of building construction projects, resulting from combine perspectives in a seamless way with skills and technology that could provide integrative blueprints. Thus, theoretical frame of patterns helped us in proposing such view. Three

underlying theoretical elements for identifying patterns of effectiveness in virtual project management are considered as coordination, communication, and control. These patterns were identified using specific patterns, via organizing series of virtual focus groups with participants from industry who had real experience with virtual projects [12].

Virtual Project Management uses Adaptive approach such as Adaptive Project Framework as the closest to be suitable for use in virtual environments. Adaptive Project Framework is based on iterative planning in which mid-level Work Breakdown structure and functions prioritization is done initially, and more detailed planning and time scheduling done prior to each cycle.

Considering the fact that this research aims adopting virtual construction Project management as a means to reducing cost of construction during possible lockdown periods, the earliest stages of construction project design should be allowed to capture development methods of cost planning using the available cost data while application of such techniques should be considered an integral part of construction project design geared towards effective cost management and control as solution to construction project cost overrun that can lead to abandonment of project [13].

Working remotely, allows the construction industry the sole responsibility of boosting economic growth of any state that will be based on the government’s fiscal policy and budget. The formulation of policy plan on how to execute project development within such budget as well as giving the state the expected construction Project quality efficient environmental development [13].

Virtual project framework for efficient construction project execution during lockdown is expected to follow these different stages of Virtual platform, Virtual Team Members, Remote processes, Technology Application, Project Cost Reduction, Quality Project Execution, Efficient Project Delivery, Stipulated Project time frame actualization, Project evaluation, Project Commissioning and Clients and end user feedback. Figure 2 below is the VP framework for efficient construction project execution:

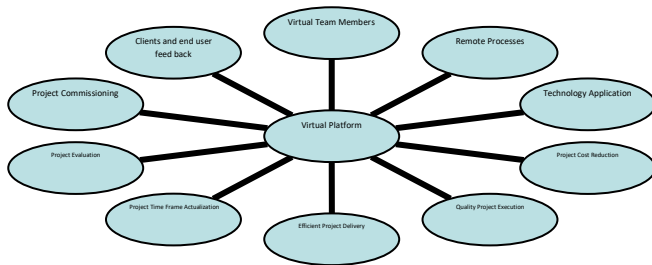


Figure 2: Virtual project framework for efficient construction project execution for lockdown time

Virtual platform like Built2Spec, in [14] is a remote tool that may be integrated in a virtual, BIM-enabled, cloud-based construction management platform which is structured to mirror the most advanced integrated design and delivery

frameworks for the building sector. Such platform provides installation guidelines, shared design specifications, 3D models and relevant information on regulatory frameworks which will include cost regulatory framework and also allow workers and their supervisors to access workflow, status, training information as well as product data sheets through their tablets. This platform allows operations integration compatibility, for small and medium enterprise contractors, as well as large construction company and end user client’s consortium, and work program activities, with assurance of systematic scientific performance measures as well as feedback and powerful exploitation. Virtual project management can be established as a tool that can enhance job availability for IT project experts with the capacity to reduce job destruction during lock-down periods as part of improvement in construction project environment. Thus, [15] stated that there should be improvement in quality of institutional environment will reinforce levels of job availability as well as reduce job destruction.

3. RESEARCH METHOD

This research involved pilot within Construction Project Management firms. This was done through questionnaire distribution to both contractors and subcontractors in the construction industry firms. The questionnaire was restricted response types of the Likert scale format responses of strongly agreed (SA), Agree (A), Disagree (D), and strongly disagree (SD). The feedback from the distributed questionnaire from our respondents were extracted and statistically analysed using SPSS software application; Statistical Package for Social Sciences for correlation analysis. Correlation was used to compare the opinions of our respondents.

Secondary data was also obtained from the construction company on percentage impact of virtual project management on cost reduction, cost savings and overall impact.

4. RESULTS AND DISCUSSION

Statistical analysis was conducted to verify the possibility of virtual project management to reduce the running cost of construction project during COVID 19 lockdown displayed on Table 1.

Table 1. Correlations result on relationship between implementation of virtual project management and Cost of Construction Projects

		VPM	CCP
CCP	Correlation Coefficient	1.000	.860*
	Sig. (2-tailed)		.002
	N	120	120
VPM	Correlation Coefficient	.860*	1.000
	Sig. (2-tailed)	.002	
	N	120	120

*. Correlation is significant at the 0.05 level (2-tailed).

Table 1 shows the correlation result of 0.860 to be significant at 0.002 level of significance. This means that at 0.05 level of significance, there is a correlation between construction project running cost and Virtual project management during COVID 19 lockdown. In this regard, this research draws up accepts that implementation of Virtual project management directly affects work cost of construction projects during COVID 19 period by reducing the running cost of construction project execution.

This research also considered the possibility of virtual project management to increase productivity in the construction industry in line with reduction of running cost of project execution. Table 2 below displays the impact of virtual project management on productivity of construction industry.

Table 2: Impact of Virtual Project Management On the productivity of Project Teams

		Sum of squares	df	F	sig
VPM	Between groups	263.311	4	5.422	.000
	Within groups	4362.325	115		
	Totals	4625.636	119		
PPT	Between groups	315.522	4	8.320	.000
	Within groups	1412.000	115		
	Totals	1727.522	119		

VPM = virtual project management, PPT = productivity of project teams.

The result shows that at 1percent level of significance, virtual project management was significant with productivity increase of project team members during execution of construction projects.

Table 3: Impact of Virtual project management on Cost savings, Potential cost increase and overall impact during COVID 19

S/ N	Cost Reduction	% Reduction	Cost Increase	% Increase	Overall Impact	% Impact
1	Virtual site visit	72	Technology Investment	37	Positive Return on investment	92
2	Labour Optimization	60	Cybersecurity	34	Positive Impact on IT infrastructure	72
3	Reduced cost of accommodation	73	Collaboration Challenges	23	Positive Impact project Team	75

Source: [16]

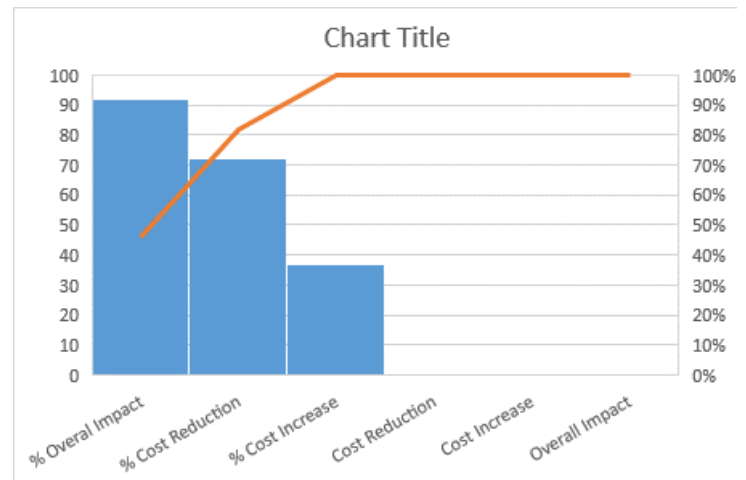


Figure 3: Impact of Virtual project management on Cost savings, Potential cost increase and overall impact during COVID 19.

Table 3 and Figure 3 above reveals the impact of virtual project management on cost savings, potential cost increase and overall impact during COVID 19.

5. CONCLUSION

This research discovered that Virtual project Management was very helpful in construction project delivery during COVID 19 in line with project running cost reduction and increase in construction project productivity as shown in our statistical analysis results, in the midst of global face to face onsite work restriction that created enormous difficulties in construction project delivery with its resultant effects on project cost overrun, project abandonment, project time overrun and low project productivity and output. It is recommended that virtual project management should be sustainably applied in project work places during periods of non-restriction of face to face or onsite project execution for construction firms’ economic development and increased achievement of good value for money.

6. RECOMMENDATION

Thus, within these period of non-restriction, Hybrid Project execution framework comprising of both virtual and onsite project management methods should be adopted for successful project delivery at budgeted project cost. Thus, the Impact of Virtual project management on Cost savings,70% Potential cost increase 35% and overall impact during COVID 19, 90%.

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