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EFFECT OF THE LAST PLANNER

Abstract

The Last Planner System combines a logistic framework and a visual management framework titled retrofitted KANBAN framework & JIRA respectively to form a resilient independent integrated project delivery system which is underpinned by the lien and agile theory which solve problem by pre-removal of the construction project management system and process errors that may occur in implementing the lien concept of the strategic construction project management stage using its components and can also be interoperable with other project delivery system in which it can track and give account of the: process groups, knowledge areas, health, safety, environment, and information management using a system approach of various project in real time. The aims and objectives of this research is to seek data-driven feedback on the awareness, adoption, and adaptability of the LPS strategies to aid its implementational improvement. The study significance is to unveil industry compliance with international standards, and an eye opener to road construction practitioners' professional bodies to the contribution to United Nations UN SDG 11 of sustainable cities and communities. This study will use a simple random sampling technique for data collection in which 500 questionnaires were distributed while 80% were retrieved

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representing 400 questionnaires, and served as the basis of analysis using descriptive and inferential statistics. The theoretical relationship of the study through data-driven approach is positive as it relates: Last planner system strategies, its awareness and adaptability effects on road project delivery in Lagos State, Nigeria. The conclusion drawn from this study is that LPS awareness and adaptability has a positive perception, the LPS holds the potential for enhancing project management in road construction. However, the study recommended that: enhance implementation of LPS strategies, bridge the awareness-application gap, improve adaptability of lps and strengthen professional development.

Introduction

The Last Planner System (LPS) is the final leg of the construction project management delivery model. Work is decomposed from the strategic accumulation point into the minute operational form in an error-free job execution. The last Planner System is a construction management project delivery model that uses the system approach and covers the process groups, knowledge areas, health, safety, environment, and information management. In achieving its function, the last planner system hopes to digitalize its function using a new method of achieving tasks. The last planner system is proposed to have a distinct construction project logistics delivery model adaptable to any construction project. The research study proposes an agile framework for adoption as a logistics delivery model. The use of Last Planner System, which is a project delivery alongside an adaptable logistics delivery model, will allow it to act as an independent project delivery system or be interoperable with other project delivery systems, either a Non-Integrated project delivery system or an integrated Project Delivery System to achieve its task in which is performance management, and success criteria can be viewed via a real-time graphical chart. The logistics model is scheduled to boast of a robust framework that has visual management to create a resilient system approach for a dynamic environment and distinct metrics of constructs (Robert *et al.,* 2022; Elon *et al.,* 2022; Madushanka & Ranadewa, 2022; William *et al.,* 2023; Anukriti & Garnesh, 2023).

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The Last Planner System delivery model is broken down into six (6) components, namely: Master/Milestone Schedule, Phasal Schedule/Pull Planning, Lookahead and Ready Process, Commitment/Weekly Work Planning, Daily Hurdle/Task Anticipated, and New Tasks. This represents task-loading phases that need to be decomposed into lower stages. It is necessary to note that the mother body theoretical concept is the lean concept, which forms the Master/Milestone Schedule and Phase/Pull Planning. The Master Schedule/ Milestone Schedule refers to mapping out the blueprint of a project, that is, the basic summary of a project into actionable points. The phrasal schedule/Pull Planning refers to breaking the blueprint into interconnection parts that make up the blueprint plan. The look-ahead schedule and make-ready schedule refer to exploding the activities, which makes the phrasal schedule/pull Planning into greater details to identify all the prerequisites for the activity before it enters the look-ahead window in addition to ensuring the process lead time (time for order to deliver) is estimated, the prerequisite is pulled, and the work is executed. This stage entails a duration of five (5) to six (6) weeks, which helps unbundle the error-free Weekly Work Plan (WWP). The Commitment/Weekly Work Planning refers to the upright selection of the working sequence according to the master plan, strategies, and constructability. The last planner system, a delivery model, is initiated as a mental direction to guide the transition from tactical to detailed operational management and execution in real-time monitoring as a delivery system. In contrast, the logistics delivery model is a mental powerhouse that is proposed to be adoptable and adaptable to overcome any constraints. The agile framework guides the operational phase of the execution of work. Agile Frameworks are numerous in which one or combination of more than one could be retrofitted to be adoptable and adaptable to other fields. The awareness, adaptability, and adaptability of agile framework to serve as a logistics framework for the last mile is factored on perceived relative advantage, perceived compatibility, and unified theory of acceptance use of technology theories (Luis *et al.,* 2014; William *et al.,* 2020; Farook & Omar, 2020; Luis, 2021; Osama, 2022; Camilo & Luis, 2022; Anukriti & Ganesh, 2023).

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Statement of the Problem

The shortcomings of the traditional project delivery system, or the Non-Integrated project delivery system, cover the inability to balance parties' mutual interests, synchronize organization hierarchy, monitor performance and success criteria, and satisfy risk sharing. These shortcomings of traditional project delivery systems, such as design bid and build systems and lump sum project delivery systems, have caused a search for a modern project management model that satisfies the yearnings of larger stakeholders. This new delivery system will have a distinct logistics delivery model that is adaptable and adaptable to varying road construction projects. The gap to fill stems from having a data-driven knowledge of the extent of awareness of the Last Planner System and agile framework on the theoretical basis of perceived relative advantage over the traditional Project management model (William *et al.,* 2023; Mariana *et al.,* 2022; Andy, 2020; Kenneth, 2013).

LITERATURE REVIEW

Concept of Last Planner System

The Last Planner System (LPS) is the last leg of a sustainable construction operational project management delivery model that implements the agreement, bills of quantities, contract specifications, and drawings that exist in a contract document by the process groups (initiation, planning, execution, monitoring, control and post project review- "IPEMCP"), knowledge areas (Quality, Scope, Time, Cost, Communication, Human Resources, Risk, Integration, Procurement, and Stakeholder Management "Q-STC-CHRIPS"), HSE (Health, Safety, and Environment) aspects and Information management at the operational level of an enterprise and in consonance with the enterprise overall strategy.

LPS is composed of six sub-procedures, namely: Master/Milestone Schedule, Phase Schedule, lookahead schedule/ Make Ready Schedule, Weekly commitment schedule/Weekly Work Planning, daily schedule, and new task (William *et al.,* 2023; Madushanka & Ranadewa, 2022; Abdul *et.al.,* 2014).

The master schedule/Milestone Schedule consists of the peak of activities that umbrellas other subunits' pillars of activities in the contract documents. The

phasal schedule consists of the different pillar activities in the contract documents. The master and phasal schedules belong to an enterprise operation's tactical level. The lookahead schedule consists of subunits of activities of the contract documents' pillars that must be broken down into weekly tasks, work schedules, and requirements set in chronological order to remove errors. The lookahead schedule is scheduled for five (5) to six (6) weeks to resolve the work schedule gap. The lookahead consists of the following operations: the explosion, screening, and make-ready.

The explosion operations highlight the operations cycle and processes in greater detail, the screening operations highlight the number of tasks that will be carried out, and the make-ready operation consists of the lead time needed, the prerequisite needed, and the work to be executed. The weekly Work Plan and Learning/Weekly Ready Schedule entails tasks executed within the week. They are mostly error-free in procedures and regulations. The site manager is in charge of reporting and executing the work schedule. The daily schedule is decomposed from the weekly schedule. New tasks occur when there is an abnormality in planning behaviors, construction problems, and uncertainties (Anukriti & Ganesh, 2023; Madushanka & Ranadewa, 2022; Robert & Silva, 2022).

The activities of the Last Planner System (LPS) are defining operations, optimizing sequencing, coordinating tasks among project stakeholders, resource loading operations, sizing tasks to match available capacity, and analyzing tasks for soundness so that all prerequisite inputs are in place. The benefits of the Last Planner System are team alignment, client and management support, stakeholder alignment, and interactive learning and action cycles.

The challenges encountered while implementing LPS are improper timing concerning social skills and knowledge, lack of support, resistance to change, time of execution, partial implementation, and compromise. The improvement to overcoming LPS shortcomings is introducing a visual management tool and an agile framework such as Scrum to manage the work logistics. An LPS visual management tool allows the dissemination of both the management cycle and management process to stakeholders, while the agile tool allows for proper

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coordination between connected stakeholders (William *et.al.,* 2023; Madushanka & Ranadewa, 2022; Manoella *et.al.,* 2022).

Project Delivery

This refers to the format in which the project delivery system criteria will be selected, which will align favorably with project execution, transaction environment (project external environment), project transaction subjects (owners and contractors), transaction object (project), and government policy and framework. In summary, it is a project delivery approach that balances the project's external environment with the project's internal environment in terms of business models, logistics models, and operational management. Project delivery systems are subdivided into two, namely, traditional Project delivery systems (Non-Integrated project delivery systems) and modern project delivery systems (Integrated project delivery systems).

Empirical Review

The works of Ganesh (2023) revealed that the Last Planner System (LPS) seeks to build confidence among project participants and guarantee the timely and effective completion of construction tasks. On the other hand, it has been noted that "New Tasks" frequently emerge, departing from the initial strategy. The article aimed to identify the New Tasks that arise during the execution process by analysing three building projects with different levels of LPS implementation. In order to comprehend the planning behaviours associated with the New Tasks, Social Network Analysis was utilised to map the interaction patterns of persons involved in weekly commitment planning and look-ahead planning. According to the results, fewer New Tasks in a closely knit network are marked by efficient communication and smooth information flow. The works of William (2023) revealed that 'Making-do' and efficient Lookahead planning, which minimises variation, are key ideas that promote better construction task performance. By including craftspeople in task breakdown and design, enhanced Lookahead planning can improve project delivery by increasing activity and trade flow. Increased constraint detection and improved on-time resolution were the outcomes of proactive and

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conscientious constraint screening and flow walks, which also helped to create a manageable backlog. Immediately after doing a first-run study, production increased. A key element of lean project delivery is understanding the fundamentals of production planning and control. Practitioners should go further into the original literature to improve their understanding and proficiency with the Lookahead planning function.

The works of Robert & Silva (2022), in order to improve the organisation and execution of the Comprehensive Community Educational Project (PEIC) in the Venezuelan educational sector, the paper addresses the application of elements of the Last Planner System (LPS) methodology. The LPS is a collaborative cascade planning system based on commitment. It aims to reduce variability in execution by applying four basic principles: personal commitment, coordination of the last planners through periodic meetings, use of a basic control indicator called Percentage of the Completed Plan (PCP), and public visibility of the weekly results obtained. Using the LPS in the PEIC execution requires a grasp of strategic planning and a shift in the mindset of the educational community members.

In the works of Madushanka *et al.* (2022), the study found 42 issues related to five phases of the Last Planner System (LPS) for the Sri Lankan construction industry. It was discovered that the phases of master planning and phase planning presented greater difficulties than the previous stages. In order to increase output, cut waste, and minimise building errors, LPS must be implemented in Sri Lanka's construction sector. It also contributes to a reduction in project duration and an increase in end-user satisfaction. Ineffective risk management, inefficient building phases, and lower productivity are problems that can be resolved by adopting and applying LPS in the construction sector. It is possible to propose that LPS is a useful instrument for incorporating risk management and influencing the impact of project stakeholders on project performance.

The works of Elon *et al.* (2022) revealed that the Last Planner System (LPS) in lean construction projects has enhanced worker productivity, promoted teamwork, and enabled ongoing learning. The study's participants stated that utilising LPS had little effect on their objectives. The study pointed out that

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scheduling techniques applied with LPS can irritate users and lessen their utility. According to the results, practitioners who use LPS may find it advantageous to fix these issues in upcoming initiatives.

The works of Manoella *et al.* (2022) revealed that the study investigated how the construction sector uses digital visual management (VM) tools to implement the Last Planner System (LPS). An action research study was carried out in a Brazilian construction company to evaluate the digital visualisation methods and technologies implemented at various planning stages. According to the study, traditional methods were better suited for the operational level of LPS implementation, but digital tools were more appropriate for the tactical and strategic stages. There was a discussion about how digital virtual machine tools affect collaborative production planning, emphasising the necessity of more process transparency and real-time information exchange. The construction industry's digitisation of virtual reality (VM) and virtual collaboration was expedited by the COVID-19 context and physical boundary restrictions. The study indicates that collaborative production planning, especially at the strategic and tactical levels, can improve the transparency and predictability of building projects using digital virtual machine (VM) tools. Even yet, operational-level planning might benefit more from using conventional techniques.

The works of Mariana *et al.* (2022) revealed that in Colombian construction projects, the Last Planner System (LPS) has produced several advantages, such as shorter execution times and lower levels of uncertainty and unpredictability. Unfortunately, difficulties and roadblocks have arisen during LPS implementation, resulting in changes and only partial implementations. The study found eight demands the LPS update can meet, other suggested solutions, and thirteen (13) major implementation and use perspective roadblocks broken down by user type. The suggested answers include organisational transformation from a human perspective and a thorough description of the entire process from a practical standpoint. The LPS can be further enhanced, and its advantages can be utilised in the Colombian construction sector by addressing these issues and needs.

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The works of William *et.al.* (2020) highlights the adaptable benefits of the Last Planner System in commissioning and Qualification Delivery. It listed the benefits of including these areas: improved collaboration and prominence in workflow visibility, which has a significant output on productivity, schedule alignment, safety, cost, and client value-added benefits.

Abdul *et.al.* (2014) concluded that applying the Last Planner System helps users achieve suggested construction findings during execution by decreasing delays, optimising resources, and reducing project costs. It was also noted that the last planner system helps understand the construction process and make accurate predictions.

The works of Luis *et.al.* (2014) establish modes of factoring success metrics on a project by analysing patterns obtained from indicators on projects.

Each system is unique in its view and has its project selection criteria. The difference between Integrated Project Delivery Systems and Non-Integrated project delivery systems is that the system approach is prioritized over the process approach, mutual risk and reward shouldering over risk shifting, and real-time onboarding of key stakeholders over piecemeal engagement. Project external environment refers to the irrational factors that may overstress the constraints of the project delivery systems. A project's external environment includes market forces, regulatory feasibility, regulatory effects, technology accessibility, material availability, and political effects.

The project's internal environment refers to the irrational factors affecting project delivery systems' constraints regarding parties' common interests, organization congruence, performance criteria, and risk sharing. The conditions for project delivery systems are early engagement of key stakeholders, mutual risk and reward, joint decision-making and control, jointly approved initiated goals, liability exemptions among critical participants, and multi-lateral agreement among parties.

The procedural approach to identifying project delivery factors rests on the ability to determine the selection criteria, recognize the theoretical analysis, and clear-cut transaction process and implementation (Alaa et.al., 2022; Mohd, 2022; Endah, 2022; Ajaelu & Reuben, 2020; Mathew & Kevin, 2020; Limin et.al., 2019; Bingshang et.al., 2018; Phillip, 2018; Zahra et.al., 2017).

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Aims and Objectives

The broad objective of the study is to assess the last planner system considerations on road project delivery to ascertain the contribution of the modern project management approach in the construction industry to achieving the UN's SDG ambition of sustainable cities and communities by 2030. The specific objectives are to;

i. assess the effect of the Last Planner System on Road Project Delivery in Lagos State, Nigeria.

RESEARCH METHODOLOGY

This research employs the use of descriptive and inferential quantitative informational tools, in which we can get the demographic distribution, weighted mean, sum count, ranks, frequency count, average mean, percentage, research objectives, research hypothesis , and discourse analyses of the respondents which will help focus on putting the data in context and involve analysing different levels of communicationThe study population is five thousand (5000) which comprise of construction professionals registered with their professional Bodies engaged in Road Construction (Obtained from the directory of their association) under these key regulatory bodies: the National Society of Engineers (NSE) and the Council for the Registration of Engineers in Nigeria (COREN) within Lagos State, Nigeria. The expected number of respondents is estimated to be three hundred and fifty-seven (357) using Krecjcie-Morgan Formula.

$RPD = \beta O + \beta 1\ LPS + \beta 2\ AWA + \beta 3\ ADA + e$

RPD is Road Project Delivery

LPS is Last Planner System

AWA is Awareness of Last Planner System

ADA is Adaptability of Last Planner System

βO is intercept

$\beta 1$, $\beta 2$, $\beta 3$ are the parameter co-efficients.

E is error term

Results and Discussions

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This study will use a simple random sampling technique for data collection in which 500 questionnaires were distributed while 80% were retrieved representing 400 questionnaires, and served as the basis of analysis using descriptive and inferential statistics.

Multiple Regression Model Summary of the Effect of the Last Planner System Strategies on Road Project Delivery in Akure, Ondo State, Nigeria.

Table 4.4.1.1: Multiple Linear Regression

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	-.108	.199		-.542	.588
	Key milestones and budget are established and shared with the team	.011	.035	.011	.321	.748
	Pull plan had been developed for any phase that is anticipated to start within the next 45 days	.264	.034	.252	7.742	.000
	Plans shown to be constraints free on the Lookahead Plan (LAP) really ready for work-loading only the application of Labor and prerequisite task	.022	.042	.020	.524	.600
	Project had a mood of ambition and determination	.776	.034	.709	22.807	.000
	Percentage project completion (PPC) plan charted is on an improving trend	-.017	.034	-.016	-.490	.624
	Completions are reported publicly on a daily basis	-.008	.031	-.007	-.251	.802
	I understand project outcome increases its value	-.003	.033	-.003	-.078	.938
	The project delivery system can be integrated with existing project delivery systems	-.005	.042	-.004	-.112	.911
a. Dependent Variable: Completion within original budget is a strong criteria to project success						

Source: Field survey 2024

DISCUSSION OF FINDINGS

This section discusses the findings from the analysis of the Last Planner System (LPS) strategies and their impact on road project delivery in Lagos State, Nigeria.

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Effect of the Last Planner System Strategies on Road Project Delivery

This result suggests that the implementation of LPS strategies does not significantly influence road project delivery outcomes in Lagos State.

Reviewing Table 4.8, which details various LPS components like milestone schedules, phase schedules, and weekly commitments, the mean scores and rankings indicate mixed perceptions among respondents. For instance, the highest mean score was for the effectiveness of weekly work planning (mean = 4.85), which ranked 1st in promoting project success. Conversely, other components like daily scheduling and new task management had lower mean scores, indicating inconsistent application or perceived effectiveness.

This lack of significant impact could be attributed to several factors, including inadequate implementation of LPS components, lack of alignment with local project conditions, or insufficient training and support for effective LPS use.

Conclusion and Recommendation

The conclusion drawn from this study are;

I. the Last Planner System holds the potential for enhancing project management in road construction, its current implementation in Lagos State does not significantly improve project delivery outcomes.
II. Although there is a high awareness of LPS strategies and a positive perception of their adaptability, these factors alone are insufficient to drive substantial improvements in road project delivery.
III. Addressing the identified gaps, enhancing practical application, and focusing on professional development and gender diversity may contribute to more effective utilization of LPS strategies and better project outcomes.

Therefore, this study recommends the following;

a. Enhance implementation of LPS Strategies through investment in comprehensive training programs to improve the understanding and execution of LPS strategies
b. Bridge the awareness-application gap by establishing clear guidelines and support systems for applying LPS strategies effectively on-site.
c. Improve adaptability of LPS adjusting the system to address specific local conditions and project requirements more effectively.

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d. Strengthen professional development through training programs should focus on both technical skills and project management practices to build a more experienced and capable workforce in road construction.

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