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INVESTIGATING EMERGENCE OF 'NEW TASKS' IN LAST PLANNER® SYSTEM: SOCIAL NETWORK PERSPECTIVE OF PLANNING BEHAVIOURS

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ABSTRACT

The Last Planner System (LPS) is a collaborative planning process aimed at ensuring the efficient and timely completion of construction tasks and fostering trust among project participants. Despite its widespread adoption, it has been observed that 'New Tasks' that deviate from the original plan often arise in construction projects. This paper investigates the planning behaviours behind the emergence of these New Tasks by examining the social interaction patterns within a construction project.

Three different construction projects with varying degrees of LPS implementation were studied to identify the New Tasks that emerge during the execution process. To understand the planning behaviours related to the New Tasks, the interaction patterns of the individuals involved in the look-ahead planning and the weekly commitment planning were mapped using Social Network Analysis. The findings suggest that a tightly bound network exhibits more cohesiveness and can be associated with effective communication and streamlined information flow which leads to fewer New Tasks. While insufficient coordination and ineffective collaboration can be correlated to emergence of higher number of New Tasks. Look-ahead planning is key in this regard as it incorporates collaboration between all stakeholders into the pull-planning of the tasks.

KEYWORDS

Last Planner® System, Lookahead Planning, Constraint Analysis, Planning Behaviors, Social Network Analysis

INTRODUCTION

Construction projects involve the interaction between unfamiliar groups of people who come together for the project execution and do not always have complementary objectives. Construction planning is seen primarily as a decision-making and scheduling activity with a primary emphasis on identifying deviations from planned activities rather than refining plans for the upcoming week (Laufer & Tucker, 1987). Traditional construction management systems typically involve the creation of comprehensive schedules at the start of projects. However, the inherent uncertainties in construction projects make it difficult to rely solely on deterministic project scheduling methods (Ahuja & Thiruvengadam, 2004). The variability of the highly fragmented construction industry is captured by the Lean philosophy, based on the Toyota Production System by Taiichi Ohno. It emphasizes customer value identification, elimination

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of non-value adding activities, creation of continuous production flow, and continuous improvement (Howell, 1999). Last Planner System (LPS) is one of the most developed lean tools adopted by the construction industry. With the growing complexity of construction projects, the use of LPS is growing in popularity to maintain project activities on schedule by reducing uncertainties in construction operations.

The implementation of the Last Planner System which was developed by Ballard and Howell in the 1990s, enhances work reliability and promotes better coordination among the project participants (Ghosh et al., 2019). LPS works through a series of steps that include the creation of a milestone schedule, a phase schedule, a look-ahead plan, and a weekly work plan involving commitment from the last planners at the site. This approach is based on a pull system as opposed to the traditional planning approach. Despite the systematic and well-planned collaborative efforts in LPS, the actual tasks performed on the job site may sometimes differ from the planned tasks. Tasks that were not previously included in the schedule or were incorrectly scheduled may need to be executed at the site. These are called **'New Tasks'** and arise during the week of the execution.

Hamzeh et al. (2008) first coined the term 'New Tasks' in their PhD dissertation describing them as the most under-reported tasks on a construction project site. These tasks, which do not make it through the look-ahead planning system but appear on the Weekly Work Plans (WWP), are within the project scope but their timelines change for various reasons. Similarly, certain tasks are neither included in the WWPs nor the Look Ahead Plans (LAP) but emerge during the execution week. The inclusion of these 'New Tasks' in the WWP, which were not addressed in the look-ahead planning, greatly impacts the overall workflow and adds additional burden to project planning (Rouhana & Hamzeh, 2016). The reasons for the emergence of these 'New Tasks' have caught the attention of various academicians and practitioners and have been extensively explored (Ballard, 1997; Hamzeh et al., 2012; Hamzeh & Aridi, 2013; Hamzeh et al., 2015; Wesz & Formoso, 2013; Da Alves & Britt, 2011). 'New Tasks' in the weekly work plans of LPS have been reported to arise due to planning behaviours, construction problems and uncertainties (Rouhana & Hamzeh, 2016).

This research paper aims to examine the social interaction patterns, using Social Network Analysis (SNA), in planning behaviours and their impact on the emergence of 'New Tasks' in the Weekly Work Plans of the Last Planner System (LPS). To achieve this, a deep understanding of the planning process, which is influenced by the social interactions and communication patterns among project participants, is necessary. SNA has been used as a prominent tool by researchers to analyse the interactions and relationships between project participants involved in the LPS implementation in a construction project (Herrera et al., 2018; Castillo et al., 2018; Priven & Sacks, 2015; Abbasian-Hosseini et al., 2015; Cisterna et al., 2018). The emergence patterns of 'New Tasks' are investigated in three construction projects located in India that adopted the Last Planner System as their planning method. SNA is conducted to examine the communication and interaction patterns among the project participants involved in the planning process.

The following sections present the literature review, the research methodology, case studies, social network analysis and the conclusion of the study.

LITERATURE REVIEW

LAST PLANNER SYSTEM

The complexities of the fragmented construction industry are addressed by the Lean philosophy, which is based on the principles of the Toyota Production System (TPS) established by Taiichi Ohno for Toyota in Japan (Howell, 1999). Lean construction aims to better meet customer needs by using fewer resources and is a departure from traditional mass production and push-based management practices. It decentralizes organizations, challenges the hierarchical nature of these organizations, and relies on pull-based planning as a fundamental principle.

The Last Planner System (LPS) is one of the most developed lean tools adopted by the construction industry. It incorporates pull planning, in which the Last Planners at the site (foremen/site engineers) are involved in the planning process and are responsible for giving commitments for the work that can be executed within the week after the identification and removal of constraints. The involvement of site personnel in the planning process fosters a culture of trust and commitment amongst the members of the construction project. LPS has five major components: Master scheduling, Phase scheduling, Look-Ahead Planning, Weekly Work Plans and Learning (Ballard & Tommelein, 2016). It is increasingly being used in the construction industry to increase project reliability which leads to better project performance (González et al., 2007).

Look-Ahead Planning & New Tasks

Look-Ahead Planning is the most important, yet most overlooked aspect of the Last Planner System. Lookahead schedules in construction aim to focus management on future plans and promote present actions towards achieving those goals (Ballard, 1997). It involves the identification of activities to be carried out in the next four to six weeks in a collaborative manner involving all the speciality contractors and consultants. A poor implementation of look-ahead planning in construction projects reduces the reliability of the planning system by creating a large gap between long-term planning (master schedules) and short-term planning (weekly plans) (Da Alves & Britt, 2011). Look-Ahead Planning relies on anticipating the tasks by breaking down the tasks into sub-tasks at the operation level. These tasks are 'made ready' by the identification and removal of constraints six weeks before their actual execution. Hamzeh et al. (2008) conceptualized the phases in construction planning as 'boulders' which are broken down into 'rocks' that represent the processes. These rocks are further broken into 'pebbles' indicating the operations and finally, the steps are represented by 'dust'. Hamzeh, (2009) conducted a computer simulation study to understand the relationship between Tasks Anticipated (TA) in Look Ahead Planning and overall project duration. TA is a metric used to assess the ability to accurately predict tasks that will occur within the next two to three weeks. The simulation involved the addition of 'New Tasks' in the Weekly Work Plan of Look Ahead Planning. These new tasks were not a part of the Look-Ahead Planning and were not broken down or made ready systematically. Their appearance was believed to be caused by a lack of foresight and was presumed to add an extra burden to the planning process. The reasons behind the emergence of these 'New Tasks' were studied by (Rouhana & Hamzeh, 2016) and have been categorized as issues related to planning, issues related to ongoing construction, and uncertainties.

LPS Planning Behaviours

Gomez et al. (2019) explored the concept of Behaviour Based Quality, which suggests that the behaviours of individuals in an organization are influenced by the consequences they experience. This motivates project teams to behave in a way that produces the desired outcomes. Organizational behaviours are also affected by Respect for People and Psychological safety, a term coined by Amy Edmondson in 1999, which supports an individual's power of speaking the truth, making suggestions and asking for help knowing that the mistakes will be met with help rather than punishment. This concept supports the Lean principle of reliable promise-making in the Last Planner System (Ballard et al., 2009).

Fauchier et al. (2013) connected the behaviours arising from the implementation of the Last Planner System and found that LPS promotes the formation of a social network with improved coordination. Organizations that adopt LPS exhibit a higher level of trust among members and create a social system with an increased flow of information. Key behaviours observed in LPS-implementing organizations include collaboration, long-term planning, pull planning, look-ahead planning, commitment planning, constraint identification, making tasks ready, measuring performance, root-cause analysis and corrective actions (Aslesen & Tommelein, 2016; Laufer et al., 1992; Hamzeh & Aridi, 2013; Hunt & Gonzalez, 2018; Perez & Ghosh, 2018; Viana et al., 2010).

Social Interactions & Social Network Analysis

The decision-making process in an organization is directly affected by social interactions and communication between the different team members. The interactions between participants can be both task-based and relational. Task-based interactions involve the discussion of ideas, opinions, and suggestions related to a specific task, while relational interactions involve interactions for demonstrating support, establishing values, and resolving differences (Wang et al., 2018). Ghosh et al. (2019) analysed two healthcare construction projects, one implementing LPS and the other using traditional planning practices, and found that the former showed a higher level of trust among the members and created a social system with a better flow of information.

Social Network Analysis (SNA) is a widely adopted research tool that is used to analyse the interactions and relationships among project participants involved in the LPS implementation at a construction project site. The use of Social Network Analysis (SNA) enables the capturing of valuable information and communication that takes place informally in an organization. Alarcón et al. (2013) highlight the ability of SNA to analyse social relationships and interactions that are task-based or relational. It allows for mathematical and graphical analyses of otherwise essentially qualitative data in the form of nodes and edges. The nodes represent an individual or organization. The connections between these nodes, called edges, represent the transfer of material resources, associations or affiliations, behavioural interactions, information or knowledge transfer or conflict resolutions. By assuming that individuals in an organization are independent, SNA provides metrics to quantify the otherwise invisible flow of information (Pryke, 2012). Some of the metrics used in SNA are:

Network Density: This is the measure of the total number of connections between nodes in a given network to the total number of maximum possible connections. This value falls between 0 to 1. The network density can be used to define the fragmentation of a project team and the degree to which the project participants are connected.

Network Diameter: This defines the maximum number of links required to connect two diverse nodes in the network. It is the longest of all calculated path lengths and gives the measure of how far the information has to travel to reach all nodes.

Average Path Length: This averages the shortest possible path between all nodes and provides a measure of the communication efficiency in the network.

Network Degree: This represents the average number of links per node. A node that has a large number of connections may have significant influence and access to information.

Centrality: This is used to highlight the most important node and its strategic positions in the network. It can be defined by degree centrality, closeness centrality and betweenness centrality.

SNA can be used for different problems that the planners face related to coordination, cooperation and trust; power and influence; organizational levels; informal organizations; information flow; and dynamic network development (Dempwolf & Lyles, 2012). It addresses the relationship patterns over time, and in turn describes how these patterns affect behaviours (Wang et al., 2018). SNA has become a prominent tool for understanding the informal interactions between the project participants and their consequent information flows in construction projects implementing the Last Planner System. (Herrera et al., 2018; Castillo et al., 2018; Priven & Sacks, 2015; Abbasian-Hosseini et al., 2015; Cisterna et al., 2018)

RESEARCH METHODOLOGY

The research adopted a mixed-method approach combining interpretive (qualitative) and positivist (quantitative) methods to address the research questions. The data has been collected using both qualitative and quantitative approaches and includes case studies, questionnaire surveys and direct observation at the construction sites. Social Network Analysis is adopted as a research tool to study the formal and informal communication networks between the project participants with an intent of understanding the collaboration and coherence as organizational behaviours. Three case studies were selected to understand the behaviours and attitudes of project participants that eventually lead to the emergence of New Tasks. The use of multiple case studies, each supporting the phenomenon of the emergence of New Tasks and the subsequent social networks formed, help achieve triangulation in the research. The rationale has helped in ameliorating the internal and external validity of the research. Data was collected through primary sources, such as interviews and questionnaire surveys, and secondary sources, such as Look-Ahead plans and meeting records from the case studies.

As the research predominantly deals with informal networks built on social conventions rather than a formal binding contract, a *realist approach to boundary specification* in the Social Network Analysis has been applied. In this approach, the boundary networks are defined by the nodes (individuals) themselves. For example, a few individuals who are interviewed would identify other nodes with whom they would have to interact to achieve the project objectives (Pryke, 2012). The questionnaire survey for SNA was designed in a way that allowed the participants to list names of people with whom they interact regarding LPS. The questionnaire was further filled out by the people identified through the survey thus completing the interaction network.

The respondents chosen for the questionnaire were individuals involved in the look-ahead planning and the weekly planning of the Last Planner System in the projects selected for the case study. The links between the two nodes consisted of their formal and informal interactions. The data collection included the traditional approaches of surveys, interviews and direct observations and the use of big data of a passive nature including meeting minutes and timesheets. The collected data were edited, coded and translated into the SNA language. Data analysis was performed using Gephi, version 0.9.2, a multiplatform free software used for creating social network metric graphs. This software was used for both the graphical representation of the networks formed and the calculation of SNA metrics. The edges were defined using a source and a target, indicating the information flow between nodes.

The nature of interaction obtained from the survey was categorized into three LPS planning behaviours and the frequency of interaction was used to assign the weights to the edges. The paper investigated planning behaviours observed on the case study projects and those reported in the literature. Behaviours of similar nature were aggregated into one group; for example, all 'planning' behaviours such as updating the master plan, look-ahead planning and commitment planning were grouped into the 'Planning & Commitments' family. Similarly, two other groups, 'Constraint Analysis' and 'Continuous Improvement' were defined. The grouping was performed for convenience, was non-comprehensive and was solely based on the author's reasoning. Table indicates the planning behaviour categories and the weights decided for the analysis.

A cross-case analysis was performed to compare the number of New Tasks that emerged in each project. A scatter diagram was plotted to relate the percentage of New Tasks that emerged in each case study to the network cohesiveness represented by the network density. This gives a cause-and-effect relationship between the two parameters and is used to conclude the research.

Table 1: SNA Planning Behaviors & Edge Weights

Nature of Interaction	Planning Behaviour	Frequency of Interaction	Weight
Updating Master Plan	**Planning and Commitments**	Monthly	1
Look Ahead Planning		Fortnightly	2
Commitment Planning		Weekly	3
Constraint Analysis and Removal	**Constraint Analysis**	Daily	4
Problem-Solving		More than once daily	5
Corrective action of Non-completed Tasks	**Continuous Improvement**		
Decision Making			

CASE STUDIES

Three case studies were chosen for the exploratory part of the research and New Tasks were observed for six weeks during the study. The organizations chosen for the case studies had been implementing lean practices, specifically the Last Planner System for over a year ensuring a high level of lean maturity and the successful overcoming of initial cultural barriers in the implementation process. Each of the three selected projects had a planning system in place, with a designated planning engineer responsible for maintaining regular updates to the look-ahead and weekly plans. The case studies were selected to represent different sizes and scales, including one large-scale, one medium-scale, and one small-scale project, with the first two case studies being from the same organization and the third from a separate organization. Table 2 presents the location, type and size of the project, lean tools adopted, look-ahead planning duration and the total number of planned and New Tasks.

Table 2: Description of Case Study Projects

Case Study	1	2	3
Location	Mumbai, India	Khalapur, India	Ahmedabad. India
Built-up Area	93,000sqm	306,500sqm	56,000sqm
Project Type	Residential	Industrial Mega Park	Residential
Lean Tools Adopted	LPS, Work Sampling, Value Stream Mapping	LPS, Value Stream Mapping, Work Sampling	LPS
Look Ahead Planning	6 weeks	6 weeks	4 weeks
Planned Tasks	225	270	220
New Tasks	39	61	71

In all case studies, based on the secondary data collected from the site in the form of weekly plans and look-ahead schedules, a comprehensive list of ‘New Tasks’ that emerged within six weeks of site execution was prepared.

CASE STUDY 1

The project was chosen because the organization had been implementing lean since 2011 in facilitation with ILCE (Institute of Lean Construction Excellence), IIT Mumbai and IIT Madras. The data for the SNA questionnaire survey was gathered from individuals involved with the Last Planner System of the case study. The questionnaire for SNA was completed by 20 respondents involved with different stakeholder groups in the Big Room Meetings. In Case Study 1, 39 New Tasks emerged from a total of 225 tasks planned for each of the six weeks. Lack of communication between the project team was the cause of most New Tasks and delays at the site. A few other reasons were lack of coordination, improper task sequencing, clash detection at the site and unexpected arrival of information. The emergence of New Tasks had a direct impact on the Percentage Plan Complete (PPC), as tasks that were not constraint-free could not be completed in the execution week. Deploying resources on the New Tasks that emerged caused the incompletion of the already planned tasks in the Weekly Work Plan.

CASE STUDY 2

The implementation of the Last Planner System in the project began in 2018, with senior management leading the effort and with guidance from IIT Mumbai and IIT Madras. Each industrial plant within the project had its separate implementation of the LPS. The project made use of Big Room Meetings and Steering Committee Meetings to help with planning. The biggest challenge in the effective planning of this project was the involvement of multiple stakeholders in the form of customers and the complexities in their requirements. The data for the SNA questionnaire survey was completed by 15 participants involved in the Last Planner System. Case Study 2 accounted for a total of 61 New Tasks from 270 tasks planned for the six weeks of study. The New Tasks emerged mostly due to inefficiencies in the planning of the project. The scope of work was not clear from the client's end and there were multiple design revisions causing rework on the site leading to New Tasks. Similarly, when unplanned material was delivered to the site, additional tasks were added.

CASE STUDY 3

The organization had been practising lean construction, particularly the Last Planner System (LPS), since 2018. The project blended traditional practices, such as the Critical Path Method (CPM), with the lean practice of LPS. The planning software used for this project was Microsoft Project and an in-house software developed by the organization was used to update the weekly and daily reports. Unlike the first two case studies, the look-ahead plan was not prepared collaboratively by mapping out the constraints and taking inputs from all the vendors assigned for different work packages. The weekly work plans were prepared by the supervisors on-site, but since the work was based on a repetitive cycle, these plans did not change radically from one week to another. The supervisors added comments about some details and the constraints that might occur during the week. The data for the SNA questionnaire survey was completed by 12 participants involved in the Last Planner System. Case Study 3 had a total of 71 New Tasks from a total of 220 planned tasks over the six weeks of study. Some of the reasons for the emergence of these tasks were lack of coordination, unexpected completion of previous work and the addition of labours at the site.

SOCIAL NETWORK ANALYSIS

The behaviours related to the occurrence of New Tasks were analysed through Social Network Analysis (SNA) to understand the interaction patterns between individuals involved in the Last Planner System (LPS) approach. The SNA data was both qualitatively and quantitatively interpreted. The planning behaviours were compared qualitatively based on the SNA maps created for each case study, as shown in Figure .

It can be seen that the social network patterns for the 'Planning and Commitments' network of Case Study 1 form almost a geodesic structure implying strong connections among the members of the network. The network maps for Case Study 2 show some cohesiveness while Case Study 3 has a greater number of isolates. The 'Constraint and Problem-Solving' network corresponds to the process of constraint analysis and removal between different team members of an LPS organization. The network diagrams for Case Studies 1 and 2 show stronger cohesiveness than Case Study 3. This can be attributed to the daily constraint removal between the subcontractor groups in Case Studies 1 & 2 compared to Case Study 3 where constraints were only removed when the problems arose. In Case Study 1, all project actors had similar *network degrees* implying that all members participated in the process of constraint analysis. For the 'Continuous Improvement' network, all three case studies exhibited little cohesiveness and had a small number of nodes. Only the members at a higher level in the hierarchy participated in this process. The emergence of repetitive New Tasks across six weeks in all three cases can be attributed to poor involvement in the continuous improvement process.

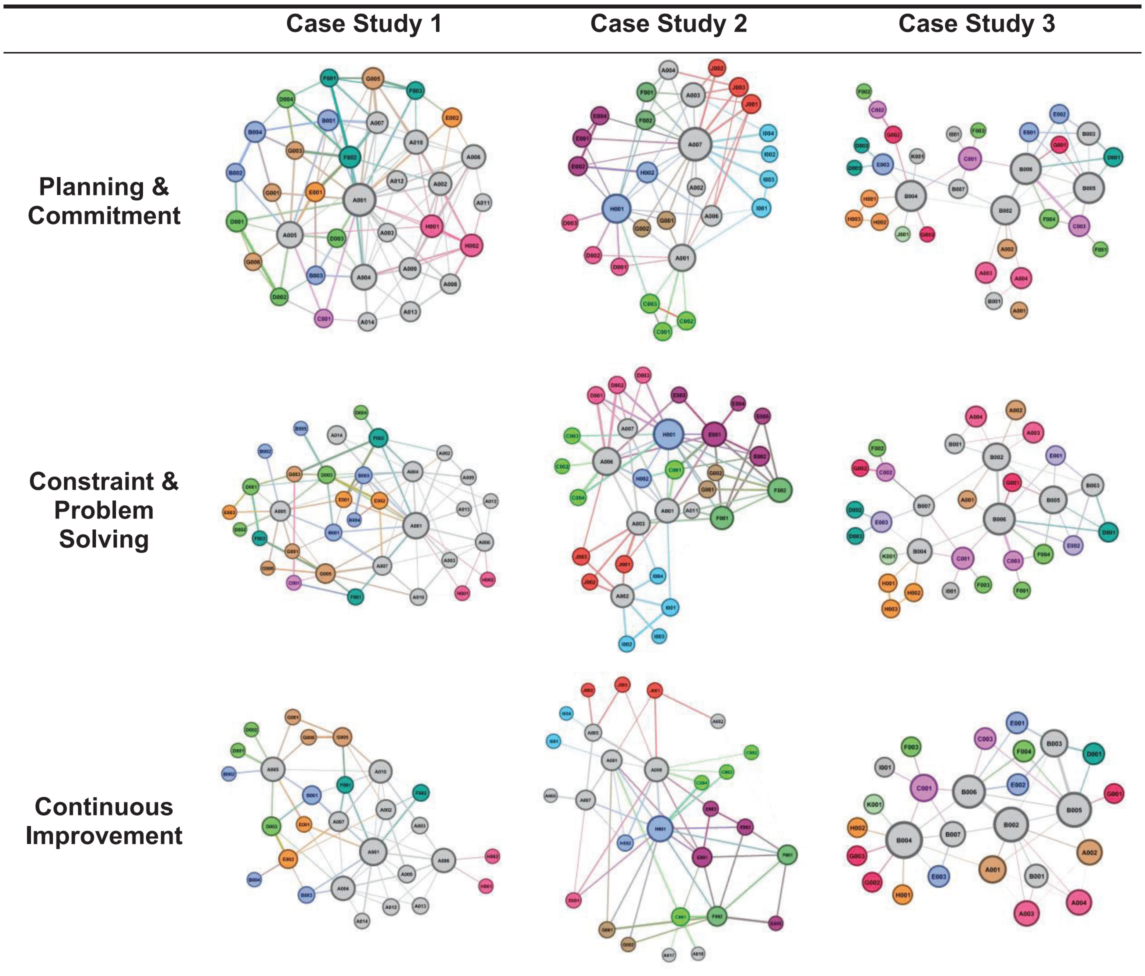

Figure 1: SNA Qualitative Comparison

The quantitative SNA used metrics like density, average degree, average path length and diameter. A single network map for each case study was prepared to perform this analysis to provide a comprehensive overview. Table presents a comparative analysis of all the network metrics. Network Density is the ratio of all the links present in the network to the total number of possible links. The unweighted density of Case Study 1 was 0.20 which signifies that 20% of the network was connected while for Case Studies 2 and 3 the values were 16% and 11% respectively. Since the number of nodes in all three networks was similar, higher network density could be correlated to higher cohesiveness and communication efficiency.

The Average Degree of all the nodes can be used to measure the structural cohesion of the network. The results for the same are in line with the average density as Case Study 1 had the highest average degree of 5.78 indicating a much more strongly connected network than the other two cases. Case Study 3 had the lowest average degree of 3.76. This can be understood by looking at the network map that has a higher number of isolates.

The Average Path Length is an indicator of communication efficiency. The path length was lowest for Case Study 2 and highest for Case Study 3. Since the members of Case Study 3 were connected only through the planning engineers and the project managers, any information would have to pass through them before it can be communicated to the entire network. The Diameter indicates the longest path for the information to reach all members. In Case Studies 1 and 2, any information had to pass through a maximum of 4 members to reach the entire network, while in Case Study 3, the diameter was 6.

Table 3: SNA Metrics Comparison across Case Studies

	CASE STUDY 1	CASE STUDY 2	CASE STUDY 3
Nodes	36	39	33
Edges	104	113	62
Density	0.20	0.16	0.11
Average Degree	5.78	4.36	3.76
Average Path Length	2.19	2.17	2.71
Diameter	4	4	6

The cross-case analysis helps establish the relationship between the New Tasks that emerged and the different planning behaviours observed at the site. To compare the New Tasks between the three case studies, a percentage measure was created. The percentages of New Tasks in the three case studies were 17.3%, 22.6% and 32.3% for Case Studies 1, 2 and 3 respectively.

A correlation between the percentage of New Tasks observed in each project with the density of the network helps to establish a cause-and-effect relationship between the communication efficiency in a network and the number of New Tasks that arise. Average Density was used for the correlation as it is independent of the number of members in each network. All other network metrics are absolute and depend upon the total number of project participants. As observed in Figure , the percentage of New Tasks was inversely proportional to the network density. The networks with higher density had fewer New Tasks and vice versa. This is related to the communication efficiency in the three networks. The emergence of New Tasks in each case was due to a lack of communication and collaboration between the project participants.

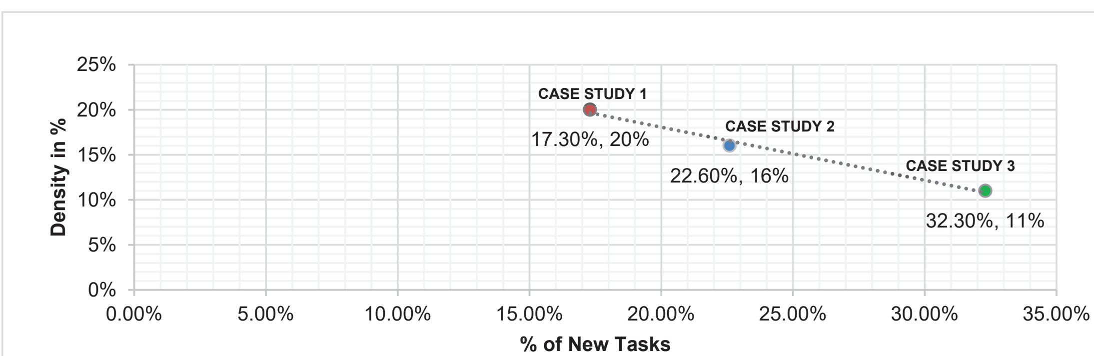

Figure 2: Correlation between Network Density and New Tasks

CONCLUSIONS

It was seen from the literature survey that the implementation of the Last Planner System in an organization engenders a social network among the members that enhances coordination. Three different organizations with varying degrees of LPS implementation were studied to evaluate the New Tasks that emerged during execution. SNA metrics like density, diameter, average path length and average degree were used to analyse the different case studies based on the planning behaviours they exhibit. The comparison of SNA results showed a relationship between the number of New Tasks that emerged during the six-week study period and the total number of planned tasks in each project. The following interpretations can be made from the research:

The inverse relationship between the percentage of New Tasks and the network density in the case studies highlights the importance of effective communication and collaboration among project participants. A higher network density, indicating better communication and efficient flow of information, is associated with fewer New Tasks.

The case studies presented highlight instances where unplanned and ad hoc tasks were added to existing tasks, leading to disruptions in the planned project schedule and impacting the project performance. It is important to acknowledge that the observed ad hoc reactionary behaviours were a result of the lack in systematic implementation of LPS, hence, there is a need for a robust LPS process to mitigate such issues.

Look-Ahead Planning is key in this regard as it enables collaboration between all the stakeholders in pull planning of the Tasks to be planned. The constraints are identified and resolved at this stage and the tasks are made ready for implementation. This reduces planning errors due to communication inefficiencies to a great extent.

This paper proposes a gradual increase in the authority and capability of subcontractors and foremen to participate in planning processes, with a focus on Look-Ahead Planning. The Last Planner, typically the foreman, has the ability to ensure a consistent and predictable flow of work downstream. However, cultural and language barrier can be a challenge in implementing LPS. Foremen and other workers who are not fluent in the language used in meetings may have difficulty understanding instructions and expressing their ideas. This can lead to misunderstandings, delays, and errors in the planning process. To overcome these barriers, it is important to provide training and education to all participants in LPS, including foremen and workers who may be less familiar with the planning process.

The findings from the case study research cannot be generalised for the entire construction industry as only specific planning behaviours are compared, not the overall projects. The research mentions the reasons for the New Tasks but does not provide insight into their impact on the time or cost of the project. Only the New Tasks that emerge due to deficiencies in the planning system have been included in the comprehensive list prepared. Those occurring due to uncertainties like weather changes or equipment breakdown have not been considered for the research. While performing Social Network Analysis, it has been assumed that the network graphs prepared at one point of time in the research are representative of the social interaction patterns for the six weeks of study. There is significant potential for future research to examine the impact of new tasks in weekly plans and their relationship with weekly PPC trends. Additionally, the application of Social Network Analysis could be expanded to the organizational level to investigate interaction patterns surrounding the emergence of New Tasks.

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