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AN EVALUATION OF THE LOOKAHEAD PLANNING FUNCTION IN LAST PLANNER® SYSTEM

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ABSTRACT

Last Planner® System (LPS) has been lauded as a critical improvement methodology for project execution. Best results accrue when all functions are utilised. However, in practice, due to lack of knowledge and appreciation of the LPS cycle and complementary interactions required, teams are not achieving optimal outcomes. Effective Lookahead planning that reduces variation and 'making-do' are primary concepts for facilitating better construction task execution.

This study goes 'back to basics' and explores how improved Lookahead planning can enhance project delivery. It utilised a mixed-methods approach with case study design, encompassing interviews, project documentation, and existing research data. The case project utilised Visual Management, Takt concepts, Scrum, and Flow Walks to engage site supervisors proactively and collaboratively in diligent Lookahead planning.

Findings demonstrate involvement of the trades persons in task breakdown and design of the operation ensured better activity and trade flow resulting in improved task execution. Proactive and diligent constraint screening and flow walks resulted in increased constraint identification and better on-time resolution, while also developing a workable backlog. Conducting a First-Run Study resulted in immediate productivity improvement.

The basics of production planning and control are an essential component of Lean Project Delivery. The research highlights the value in practitioners exploring original literature in more depth to gain better knowledge and skills of the Lookahead planning function.

KEYWORDS

Lean construction, Last Planner® System, Lookahead, takt, visual management.

INTRODUCTION & LITERATURE REVIEW

Progressing execution of construction activities is mostly dependent on the completion of other tasks in addition to the timely presence of critical inputs, referred to as the eight flows (Koskela, 2004; Pasquire, 2012). The challenge of coordinating and managing these inputs contribute to issues that frustrate the timely execution of construction projects. Last Planner® System (LPS) is a dedicated tool of Lean Construction (LC) and offers an integrated suite of techniques for planning and monitoring task execution on construction projects (Hamzeh et al., 2016).

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Numerous case studies illustrate performance improvements but there are still implementations that are incomplete or fail to meet objectives, primarily due to difficulties with interpretation of LPS (Ebbs and Pasquire, 2018) allied to its ineffective implementation (Bellaver et al., 2022). Several studies (Daniel et al., 2017; Power and Taylor, 2019) argue LPS implementation varies, and its interpretation is inconsistent. Ballard and Tommelein (2021) sought to address such variation, emphasising the importance of using all functions to ensure planning and execution of tasks are linked to project milestones (Hamzeh *et al.* 2009; Ballard and Tommelein, 2016). A consistent and standard approach is essential as LPS is a series of interconnected functions and best results accrue when all functions are utilised. However, there is a paucity of literature that shows practitioners 'how to do' Lookahead planning and this served as a principal motivation for this research.

This study examines Lookahead planning and shows how the function was enhanced by introducing aspects of Takt planning, Scrum, and Visual Management. Literature and practice gaps suggest there is a need to improve trade involvement in assisting more rigorous and consistent Lookahead planning implementation. Two research questions are posed: 1) How consistent is Lookahead planning implemented in the case company's projects, and 2) What are the effects of the improvement measures implemented on the case company's projects?

The components of LPS include master / milestone schedule, phase / pull planning, Lookahead and make-ready process, commitment / weekly work planning, daily huddles / coordination, and learning and action (Ebbs and Pasquire, 2019). Lookahead planning has been highlighted as an essential step in shielding crews from undertaking tasks that are deficient in inputs, thereby ensuring crews only work on activities that are ready to be executed (Koskela, 2004). Lookahead planning is a first step in production control and links front-end planning with production by connecting the phase / pull planning function with weekly and daily planning by screening all committed tasks and effectively 'making work ready' to be completed (Hamzeh et al., 2012; Bellaver et al., 2022). Ballard (2003) posits Lookahead planning: (1) shapes the sequence and rate of workflow, (2) links master and phase schedules to weekly work plans, (3) shields downstream tasks from uncertainty in upstream tasks, (4) sizes workflow to match capacity and constraints, and (5) produces a backlog of workable activities by screening and pulling. Production is 'made ready' and is given the best opportunity of uninterrupted flow by removing constraints, sizing capacity to workflow, producing a backlog of workable activities, and designing how operations are performed (Ballard et al., 2007). These objectives are accomplished through three main steps (Hamzeh et al., 2008):

- Breaking down tasks into the level of processes then to the level of operations.
- Identifying and removing constraints to make tasks ready for execution.
- Designing operations through First Run Studies.

WORK STRUCTURING

A key element of Lookahead planning is the concept of work structuring, which concentrates on both designing and executing the construction production system. Work structuring can be defined as developing product design (the facility) in parallel with process design (schedules, delivery methodology), organising supply chains, allocating resources, and designing offsite preassemblies to produce reliable workflow and maximise value to both customer and site crews (Ballard et al., 2001; Tsao et al., 2004). This process should span across all project development phases, from definition through design, supply, and assembly (Ballard et al., 2009).

In a construction project, Bertelsen et al. (2007) asserted production flow is optimised when all flows required to complete a task are present at the right time and in the correct amounts for efficient task execution. In addition, Garcia-Lopez et al. (2019) suggest there are two work structuring methodologies: LPS, which has been advanced by other Lean construction researchers (Ballard et al., 2001; Hamzeh et al., 2008), and Takt planning (Frandson et al., 2013; Tommelein, 2017). According to Tsao et al. (2004), LPS work structuring methodology focuses on activity definition, sequencing, and assignment:

- breaking down work into units that can be assigned to specialists (activity definition).
- sequencing activities.
- understanding how work will be handed off between specialists.
- understanding whether work will be executed continuously between locations.
- placing and sizing decoupling buffers.
- scheduling activities (Tsao et al., 2004).

Activity breakdown occurs in conjunction with defining operations, optimising sequencing, coordination of tasks among project stakeholders, resource loading operations, sizing tasks to match available capacity, and analysing tasks for soundness so that all prerequisite inputs are in place (Hamzeh et al., 2008).

CONSTRAINTS

Identification and removal of constraints is the core process for producing dependable workplans and is conducted within a 4-to-12-week planning window (Hammerski, 2021). Constraints should be identified as early as possible in the project (Ebbs and Pasquire, 2018) and can be resolved as late as when tasks are being committed to the weekly work plan. As Hammerski et al. (2021) noted, constraint removal can become a prolonged process as removing a primary constraint can then expose other upstream constraints. Therefore, having a backlog of constraint-free activities is an essential element of Lookahead planning and provides work for crews which can restrict improvisation or 'making-do' (Koskela, 2004).

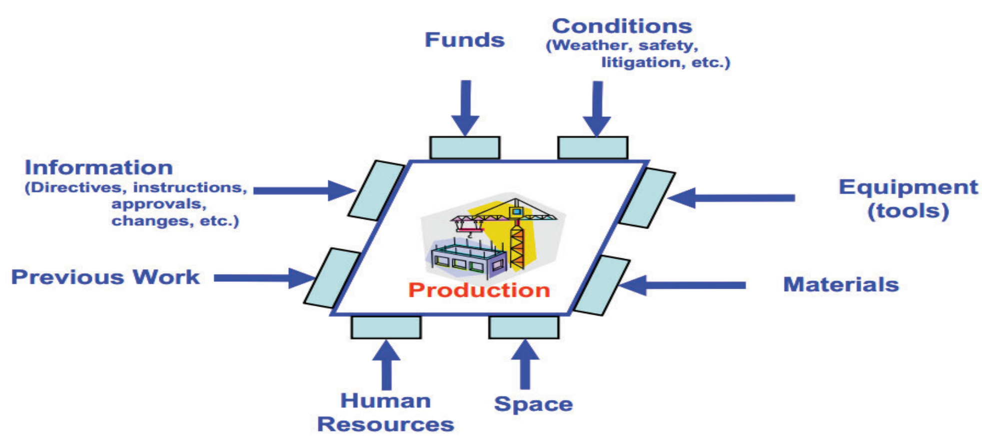


Figure 1: Shielding production from the effects of uncertainty in inputs (Hamzeh et al., 2008).

When an activity starts without having all its prerequisites ready (an incomplete kit), a 'making-do' waste is generated leading to reduced crew productivity (Ronen, 1992; Koskela, 2004). Therefore, a key role of Lookahead planning is to shield production from the adverse effects of uncertainty in inputs as illustrated in figure 1.

FIRST RUN STUDIES

Design and testing of operations should be advanced during Lookahead planning and at least three weeks ahead of execution, according to Hamzeh (2009). A first run study (FRS) is primarily a trial or test run of an operation to evaluate and improve the techniques and methodologies necessary to execute that operation. Potential processes requiring a FRS are those that are new, critical, or repetitive (Hamzeh et al., 2008). Ideally, a FRS should become a standardised element of planning, conducted three to six weeks in advance of a new set of tasks to be executed. A FRS requires the operation to be executed as it normally would by the crew; observations or recordings will seek to improve the process and ensure it interacts effectively with other processes (Howell et al., 1993). By agreeing an effective way to do the work and by setting an achievable standard, a measurement system is then in place on which to assess performance. Standards are an essential part of any process which allows learning and improvement as any movement from the agreed standard can be assessed and examined (Ballard et al., 2007).

PURPOSES OF VISUAL MANAGEMENT

Greif (1991) describes Visual Management (VM) as the use of visual information to enable those that are undertaking work to immediately transfer that information to assist execute the task. The principal objective of VM is to allow production systems learning and improvement while enhancing communication across teams and organisations by increasing process visibility and transparency (Tezel et al. 2016). VM also contributes to the reduction of variability and the elimination of non-value-adding activities (Koskela et al., 2018), as well as to continuous improvement, and incorporates foundational Lean principles. Koskela et al. (2018) suggest VM facilitates faster and more consistent and reliable communication; this contributes to shorter cycle time and less variability. Collaborative planning boards and pull planning exercises facilitate development of a common understanding of different trades inputs, helping to better structure the project planning process. When effectively implemented, VM practices break down complexity by sharing relevant information on-time and by removing information barriers in the work environment (Valente et al. 2019). Systematic and standardised implementation of VM establishes a visual workplace where different objectives of VM can be communicated (Tezel et al., 2016).

Grönvall et al. (2021) suggest the positive effects of takt control and continuous improvement can be enhanced with the adoption of VM tools. Continuous production flow, enabled by increased use and understanding of VM, results from benefits in transparency, discipline, management by facts, simplification and unification, and the creation of shared ownership (Tezel et al., 2016). VM tools are a critical aspect of takt production communication as takt production plans themselves are visually more understandable than traditional schedules.

TAKT PLANNING

In construction, Takt time is a design parameter for labour-paced flow of work (Frandson et al., 2013). A key aspect of takt time planning is to bring more stability to the production process by pro-actively designing continuous workflow for trade activities wherever possible. LPS then provides the control mechanism and stability of the production system. Construction can utilise Takt time as a work structuring methodology to align the production rates of trades by pacing work sequentially through planned zones creating continuous workflow, reliable handoffs, and an opportunity to continuously improve the production system (Frandson et al., 2013). Takt time regards ‘space’ as a resource to be considered when planning construction projects and designing production operations. Another critical consideration is, in construction workers move around the work as opposed to the work moving to the worker, for example, through an assembly line. Frandson et al. (2013) suggests the difference between Takt time planning and other location-based planning methods is the balance between ‘work waiting on workers’ and ‘workers waiting on work.’

SCRUM

Scrum is a flexible, adaptable, empirical, productive, and iterative method that uses the ideas of industrial process control theory for the development of software systems (Sanchez and Nagi, 2001). Its theory is founded on empiricism and Lean thinking (Engineer-Manriquez, 2021) and is built on three pillars of transparency, inspection, and adaptation. A key characteristic is the autonomous team which is empowered to make relevant decisions to achieve its goals. Work is carried out in time-boxed 'sprints' that empower teams to examine progress and adjust if required, thus minimising risk of miscommunication or over-processing of tasks. In the context of design and construction, Scrum is a framework applicable to project work planning through to deliverable completion. The deliverable could be a calculation, a design, a drawing, an element of a physical task, or a component of a structure.

FLOW WALK

Ebbs and Pasquire (2018, p.736) proposed a 'Flow Walk' to '…firstly identify project constraints at milestone level planning and secondly, to provide the context for desirable action to remove constraints within the framework of the Last Planner® System at Milestone, Phase and Make Ready Planning'. The 'Flow Walk' was used as a structured approach to collaboratively identify constraints and incorporate them into the risk registers and Make Ready Planning. The 'Flow Walk' effectively validates the assignment screening process and replicates Pull Planning conversations at the point of work execution. A common and shared understanding of 'done' and required conditions of satisfaction are direct benefits of the approach (Ebbs and Pasquire, 2018).

RESEARCH DESIGN

The paper reports on an in-depth case study of an EPCMV consultancy implementing LPS and specifically examines the Lookahead planning function. The case project is in Ireland and involved the decommissioning of a pharmaceutical facility and the site's return to an environmentally protected zone to be used as the local community's public space. The critical phases of the project are Clean to Shell, Demolition, Site Remediation, and Groundwater treatment and monitoring. Power et al. (2021) presented an LPS Implementation Health Check (IHC) to highlight the critical components of the functions of LPS and allow project teams to check whether each is being utilised effectively. This study builds on the initial primary research from the IHC paper and then utilises 18 months of new IHC data to specifically examine inconsistencies in Lookahead planning implementation within the case company. This qualitative study utilises a mixed methods approach with case study design (Yin, 2009). Unique sources were purposely sought to increase validity and to provide a wider research perspective, as advocated by Yin (2009) and Stake (1995). The interviews were transcribed and then analysed using a thematic analysis approach, as suggested by Braun and Clarke (2006).

The data was organised into different themes (Braun and Clarke 2006); inferences drawn from the emerging themes were checked by triangulation against the literature review findings and against other sources to check their reliability and integrity. One of the authors was embedded as a Last Planner Facilitator / Lean Mentor on the case project. An action research approach (Eden and Huxham, 1996) was taken on the implementation so the effectiveness of any interventions could be clearly monitored and measured.

Primary data from Power et al. (2021) was examined which investigated 12 projects that utilised LPS to assess effectiveness of implementation of all LPS functions. The projects were measured for compliance with the five core functions of LPS: Milestone Scheduling, Phase Planning, Lookahead Planning, Commitment Planning, and Learning (Ballard and Tommelein, 2016). The implementations were scored on a range from 0 to 5 with: 0 = 'no existence of the function', 3 = 'Partial existence of the function', and 5 = 'Full existence of the function'. Table 1 presents the sources for this paper's research.

Table 1: Research Sequence and Source

Source	Project and Participants
Power et al. (2021) primary research.	12 case company LPS project data from 2017 – 2020. Assessed & analysed implementation of all LPS functions across 12 projects. (n=12)
IHC Data; Case project LPS data.	86 Implementation Health Checks from 6 projects; PPC, reasons for non-completion of tasks, & constraints data from the single case project.
Purposeful Interviews	Interviews with 1 X Client Project Manager, 2 X Construction Manager, 2 X Contractor Site Manager, & 1 X Last Planner Facilitator. All from different projects. (n=6)

For this study, 86 IHC from six projects from June 2021 to December 2022 were examined for alignment with the Lookahead planning function of LPS. LPS data from the single case project was also examined with specific focus on the constraints analysis and resolution data. Semi-structured purposeful interviews were conducted with six interviewees across six projects which implemented the IHC to elicit views on Lookahead Planning. Table 2 presents the interviewees profile.

Table 2: Interviewees profile.

Interviewee	Role	Experience in construction & with LPS
1	Client Project Manager	28 years; 2 years.
2	Construction Manager 'A'	16 years; 6 years.
3	Construction Manager 'B'	9 years; 2 years.
4	Civils Contractor Site Manager	22 years; 2 years.
5	Electrical Contractor Site Manager	11 years; 1 year.
6	Last Planner Facilitator	17 years; 11 years.

Findings were collated and countermeasures proposed which were then piloted on a single case project. Mason (2002) suggests a major challenge for interpretive approaches revolves around how researchers can be sure that they are not inventing data or misrepresenting perspectives. As with any research, this study has limitations pertaining to the small survey size within a single organisation, lack of generalisability, and minimisation and elimination of bias during data collection and analysis stages. Limitations exist due to the research being conducted within a single organisation. Generalisability is not the main concern of this study and Yin (1993) argued that the relative size of the sample "…whether 2, 10, or 100 cases are used, does not transform a multiple case into a macroscopic study", thus, asserting a single case is considered acceptable once it meets research objectives. Bias was mitigated by two researchers being distanced from the project and unconnected with the case company.

FINDINGS AND DISCUSSION

RESEARCH QUESTION 1: HOW CONSISTENT IS LOOKAHEAD PLANNING IMPLEMENTED IN THE CASE COMPANY'S PROJECTS?

Power et al. (2021, p.690) found haphazard and inconsistent LPS implementation across the case company's projects. That study was examining consistent use of all functions and by extension, this study seeks consistency of approach towards implementing Lookahead planning. The summarised findings from 12 selected projects that implemented LPS from 2017 to 2020 were evaluated by Power et al. (2021) and results are presented in table 3.

Table 3 indicates difficulties with understanding the importance of consistent implementation of all functions of LPS. While the Learning and Phase planning functions were poorest used functions, Milestone and Commitment planning were most used. Lookahead planning, considered so critical in the literature, scored 55%; this pointed to inconsistent use of the complementary functions of LPS. Following from this Power et al. (2021) finding, the next step was to examine how the Lookahead planning function implementation could be improved.

Table 3: Status of LPS implementation on twelve projects (Power et al. 2021).

Survey Findings Score from 0-5 (0=no, 5=full)	Milestone Planning	Phase Planning	Lookahead Planning	Commitment Planning	Learning
Mean Values	3.7	2.1	2.8	3.7	2.2
Median Values	3.5	2	2.5	4	2
Lowest Values	2	0	2	3	0
% Implementation	73%	42%	55%	73%	43%

The IHC was introduced on projects using LPS in June 2021. By December 2022, 86 IHC are available for examination from six different projects. As the IHC is a system compliance and process improvement tool, its purpose is to reduce non-compliance with the agreed LPS implementation standard. An audit of 86 IHC showed high levels of non-compliance with the Work Structuring and Constraint Management requirements of the Lookahead planning function of LPS. At the time, First Run Studies (FRS) was not incorporated into the IHC. The next step was to conduct interviews with persons knowledgeable on LPS to seek further detail on the Lookahead planning process. Table 4 presents interviewees collated opinions on the Lookahead planning process.

Table 4: Interviewees opinion on Lookahead planning process.

Opinions on Lookahead planning process
"Looking 4 to 6 weeks ahead is too far and is unnecessary as there are more urgent issues to address."
"LPS is taking too much time and Constraint Walks take supervisors away from direct supervision."
"Design should be completed, and it isn't our job to screen their deliverable."
"It shouldn't be the contractor's job to identify what inputs are missing."
"Constraints identification is not taken seriously enough."
"It is difficult to plan off PDFs of Master Schedules."
"Being pushed to start new tasks on a specific date when ongoing tasks are incomplete leads to frustration, especially when the ongoing task has extra scope added."
"Let us finish what we are at before we move onto a different location."
"Being able to 'see' what needs to be done where, and who is doing it would be helpful."
"Incumbent client contractors need to understand that external contractors have work priced through competitive tenders and therefore the incumbents should get their own tasks complete when they say they will."
"Constraints removal process needs accountability and management."
"Several contractors working in the work area can sometimes slow each other down and lead to safety issues."

Analysis of the comments confirms a distinct lack of awareness and understanding of the LC and LPS ways of working and how that differs from traditional push methodologies. LPS implementation needs to be more than just a tool-focused approach and must bring cultural, and mindset change along the journey as well. Some comments in table 4 point to frustration with the constraints process and indicate any next steps should be holistic in approach and include all stakeholders' interests.

Research Question 2: What are the effects of the improvement measures implemented on the case company's projects?

Literature asserts the importance of the Lookahead planning function and the IHC examination findings indicated poor focus and application of the constraints process across the six surveyed projects. Table 4 confirmed this and added further detail. In addition to the constraints process, improved work structuring was required and there was an absence of FRS. The case company has a 'Lean Team' that supports project teams implement process improvements. The Project Director was favourable towards experimentation to improve the Lookahead planning function. This leadership support was a critical first step in implementing changes to the existing processes. Firstly, the team needed to agree on what constituted 'good' Lookahead planning. From the literature it was agreed to focus on Work Structuring, Constraints Management, and First Run Studies. These were further broken down into actionable activities as shown in table 5.

Table 5: Actionable activities to implement Lookahead Planning

Work Structuring	Constraints Management	First Run Studies (FRS)
Break work into defined activities that can be assigned to specialists. Sequence activities by logic and flow. Make explicit how work will be handed off between specialists by involving the 'next-customer.' Visualise the Pull / Phase Plan to understand continuous workflow. Position, size, and make visible decoupling buffers. Schedule activities to prioritise release of value-adding work to progress the project. Introduce Takt concepts to structure task, trade, & inputs flow.	Seek to identify constraints at every opportunity. Ensure primary constraints are broken down to permit recursive examination of sub-constraints. Establish clear ownership and accountability. Make the 8-flows visible to all. Keep building a constraint-free backlog that is available for all crews. Visualise location-based constraints. Introduce Scrum framework to ensure daily focus on constraints removal.	Introduce the concept of FRS to encourage studying an activity with the objective of standardising the work and removing any non-value adding steps. Video record where possible to review several cycles of an activity to seek improvements. Create an environment where new ideas can easily surface and be tested. Focus on enhancing persons jobs, welfare, and working conditions through improving safety, quality, and logistics. Adopt a quality focus on handoffs to ensure no defects are passed on.

Work Structuring - The primary change implemented with work structuring was the involvement of the trades persons in breaking down the tasks into finer detail and then building the operation to ensure activity and trade flow through the buildings. A sticky-note example of a work structuring exercise was conducted with the work crew supervisors. Firstly, all tasks required to 'clean' a building were written on sticky notes (dedicated colour per trade) and put on the board. Next, each task was ordered in sequence to generate an Overall Process Analysis

(OPA). Durations were assigned to the OPA for a specific building, and this was then tested in the field. Once durations were validated the OPA could be extended into a visual that incorporated all areas in the selected Lookahead window. In addition to the OPA sticky note visual, a 6-week Lookahead was applied onto the site layout plan (figure 2); crew supervisors could then view which locations were coming into the near-term planning horizon.

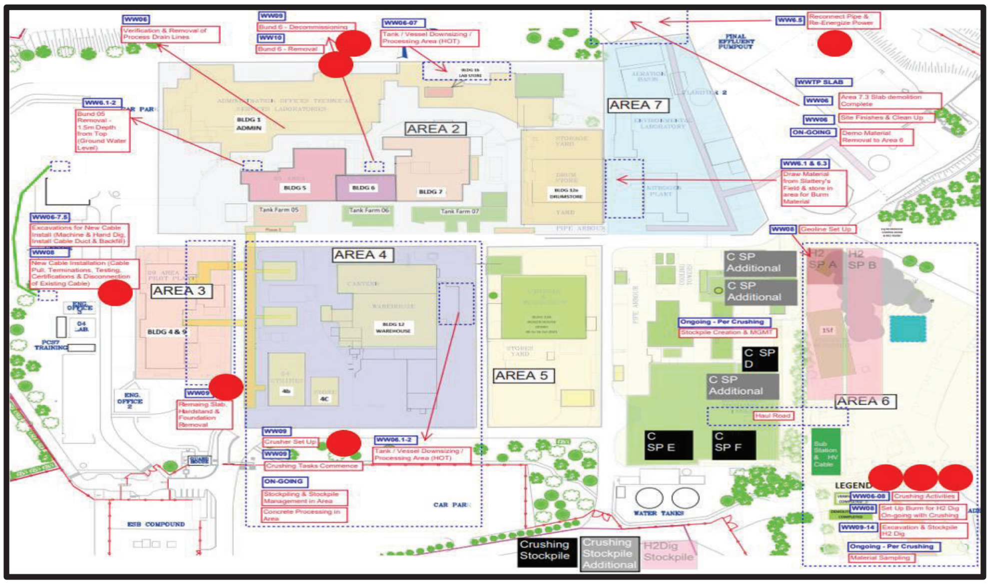
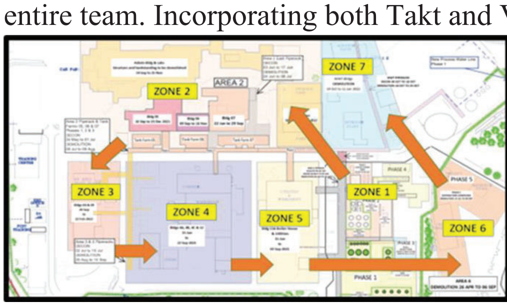


Figure 2: 6-week Lookahead / site layout plan.

Takt concepts of moving through zones in sequence, balancing work package sizing, and matching crew and plant capacity with planned work durations were implemented in the earthwork remediation phase. Visualisation of the planned progression through the zones (figure 3) and its positioning on the site information board shared the high-level plan with the entire team. Incorporating both Takt and VM concepts assisted planning work structuring.



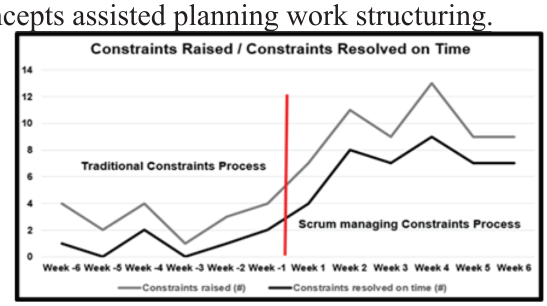


Figure 3: High-level work-flow visualization. Figure 4: Improved constraints process.

Constraints Management - Constraint screening occurred at every opportunity and red dots as suggested by Ebbs and Pasquire (2018) were positioned at each location where an unresolved constraint existed (figure 2). Constraints were managed on a virtual board (Trello) using the Scrum framework. A key point was the presence of a dedicated Scrum Master who was managing the constraints resolution process with a committed 'Development Team'. The Construction Manager was the Product Owner, and the entire constraints process was proactively driven. Twice-weekly constraint / flow walks were mandatory on Tuesdays and Thursdays with the distinct objective of identifying any possible risk or concern that might cause delay to a task, a safety issue, or a quality defect. A critical finding was the increase in both constraints raised and constraints resolved on-time as indicated on figure 4. This was a direct result of the constraint / flow walks and the commitment to the Scrum process for resolving the constraints. A relentless focus was placed on creating a backlog of constraint-free tasks. These were available on each week's weekly work plan should any adverse event impact the planned tasks. A new area of focus was the concept of testing the resolved constraint for quality. Past experienced had shown that incomplete closure of the constraint only led to further delay and frustration as supervisors resorted to improvisation to allow the activity to proceed. It is important for the overall implementation that a quality focus is maintained at all steps in the design, construction, and close-out phases.

First Run Studies – A large stockpile of demolition material was ready to be crushed with the concrete and reinforcement steel to be separated and recycled. It was agreed the specialist contractor would commence the first run of the activity and allow video recording and observation to facilitate process examination and improvement. The activity involved excavator #1 sorting broken concrete from earth and creating a spoil heap for excavator #2 to feed the crusher. Crusher output from 1100hrs to 1400hrs was averaging 100 tonnes per hour. The activity was recorded and logged as per figure 5. The Process Observation noted excavator #2 was constantly waiting for material and often had to move around and commence segregating its own clean stockpile. Excavator #1 was on a separate location on the heap and was not communicating with excavator #2. This was discussed with the crew leader and the key point identified was the excavators were not working together as a team and coordinating their movements. The supervisor spoke with both drivers, and they then began to work together in more coordinated action as shown in figure 6. This change increased crusher output from previous average of 100 tonne per hour to 146.4 tonne per hour from 1500hrs to 1600hrs on that day. On subsequent days production was consistently more than 135 tonne per hour.

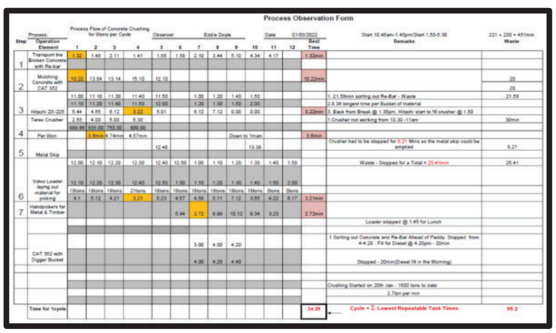


Figure 5: FRS Process Observation exercise.

Figure 6: Excavators working as a team.

CONCLUSION AND RECOMMENDATIONS

The research shows that the basics of production planning and control are an essential component of construction delivery and posit practitioners revisit original literature to gain better knowledge and skills of the Lookahead planning function. Improving input flows to reduce variation and 'making-do' are primary concepts for improving construction task execution. Consideration of the three primary aspects of Lookahead planning, namely Work Structuring, Constraints, and First Run Studies should be fundamental to LPS implementation.

Involving the wider management team and trades in the work structuring exercise creates a common and shared understanding of the challenges and peculiarities of the project. Diligence around screening of tasks, constraints identification, their prioritisation, and effective resolution contributes to smooth workflow as well as enhancing enthusiasm and engagement amongst the team. Creating an environment where First Run Studies are encouraged and financially supported leads to less disruption and increased productivity during the project.

Previous studies have shown how the Lookahead planning function can be advanced with metrics and digitisation. However, to ensure we do not digitise a poor process we must make certain Lookahead planning is structured in accordance with the basics of production planning and control. The effective use of Visual Management, Takt concepts, and the Scrum framework can complement Lookahead planning, task make ready, and ensure better project execution.

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