WORKING TO IMPROVE THE LOOKAHEAD PLAN

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ABSTRACT

The paper presents the journey of a general contractor to improve the lookahead planning process of a large healthcare facility in California. During the process managers, superintendents, designers, and owner's representatives all come together to identify task needs and spot potential constraints that need to be removed before tasks can happen. In a large and complex project such as a healthcare facility this is a daunting task that requires intense collaboration and clear flows of information and commitments, which must be tracked throughout time. The paper describes approaches used by the construction manager's team during the past year and a half to improve the make ready process, which is a fundamental part of the lookahead process. After trying multiple ways to improve the process the team is using a mix of on-site meetings and computer-based technologies to make constraints visible to all participants, improve the time to remove constraints, and give feedback to production crews. The process described is common to many contractors who work to keep track of commitments in projects of all sizes. The paper presents the journey the team in this project went through and some of the lessons they learned during the process.

KEY WORDS

Lookahead planning, make ready process, healthcare facilities.

INTRODUCTION

Delivering a healthcare facility can be considered a complex endeavor as the process mimics many characteristics found in complex systems, i.e., autonomous agents, coevolution, nonlinearity, non-uniformity, non-standard, unpredictability amongst others (Lucas 2003). In such system, leadership may emerge as the work progresses, and not necessarily as originally prescribed by job descriptions; managers and workers responsible for the project take the lead in coordinating with trades and making tasks ready for execution. Accordingly, the managerial system coevolves to adapt itself to the rules and conditions found in the environment.

In addition, the teams designing and building the project evolve in a nonlinear fashion as parts of the system interact with one another creating feedback loops, new channels of communication, and ways of doing work. Even though members of different organizations may be pulled together by similar contractual rules and regulations, they abide by their own organizations' norms and rules and respond to requests from the general construction manager in a non-uniform way. Ultimately,

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these characteristics combine to result in a system that may be viewed as largely unpredictable.

The needs of those procuring, designing, and building healthcare facilities in California has been addressed from different angles, e.g., special form of contracts have been developed (Lichtig 2005), target-value design has been used to deliver projects that better match owners needs (Rybkowski 2009). Feng and Tommelein (2009) presented a structured analysis of rework in the permitting and design phases of healthcare facilities in California based on a mapping exercise developed by four hospital owners. Feng and Tommelein indicated that rework happens largely due to problems in the "design planning and scheduling" (51% of the problems identified), "planning, programming and budgeting" (28%), and "design review" (17%). Some of these problems originate in early stages of the project development and others happen because the design of the facility evolves as the project is being built. Construction managers in different levels and field workers deal on a daily basis with constraints related to design and permitting issues, which ultimately undermine a team's ability to build the project as expected.

This is the background in which the study presented in this paper was developed. The paper presents the journey of a Construction Manager (CM) to improve the lookahead planning process of a large healthcare facility in California. This paper initially addresses the process proposed by Ballard and Howell (1998) to shield production against variations and the stages of group development. Next, the case is presented. Finally, conclusions regarding the lessons learned are presented.

SHIELDING PRODUCTION AND THE LOOKAHEAD PROCESS

Ballard and Howell (1998) propose that the planning process should act as a shield to protect production crews from uncertainty and variations in the flow of inputs of a project. Tasks assigned to the weekly work plan should have been screened for constraints through the make ready process, which works to remove constraints (roadblocks) that may impede production.

The shield represents the separation of upstream processes which are working to make tasks that should be done, according to the master schedule, into assignments that can be done effectively because they have been properly screened for foreseeable needs (during the make ready process). The downstream process under the shield represents the release of assignments to production teams, i.e., tasks that one reasonably expects will be done. By the end of the week managers (superintendents, foremen, project managers) are expected to evaluate what workers actually completed as planned, i.e., what they did, and reasons for non-completion are recorded (Ballard 2000). Along these lines, Ballard (1997, p.1) points out that:

> *"Lookahead schedules are commonly used in the construction industry in order to focus management attention on what is supposed to happen at some time in the future and to encourage actions in the present that cause that desired future. However, lookahead schedules are rarely conceived as having the specific purpose of producing sound assignments, nor are procedures provided for lookahead processes."*

Constraints are usually identified using the master schedule, plans and specifications, and the project cash flow, but can also be identified in coordination meetings. It is not unusual to see participants of lookahead meetings taking informal notes in notebooks,

using the lookahead plan to write side notes, or simply memorizing the roadblocks that have to be removed before tasks can start. The lack of structure of the make ready process results in constraints not being identified or being forgotten as no one is assigned to keep track of how they will be addressed. Codinhoto et al. (2003) found in a project in Brazil that over 40% of the causes of non-completion of tasks in the weekly work plan were related to constraints that had not been removed before tasks were assigned to production crews. Whereas Kemmer et al. (2007) observed that not all problems that prevent tasks from being completed are identified during the make ready process; suggesting that there are problems that appear during production that had not been identified in a prior planning stage.

PHASES OF TEAM DEVELOPMENT

The study described in this paper, to a great extent, mimics an important piece of the literature related to the development of small groups. Tuckman (1965) defined the "developmental sequence in small groups" as the stages team members go through before the group is able to perform. He defined four stages of group development namely: forming, storming, norming, and performing. Later Tuckman and Jensen (1977) would add one more stage to Tuckman's original categorization: adjourning.

The *forming* stage is characterized by team members looking for answers that define how they fit to the group, what rules they have to obey, and what work they have to perform. Relationships and dependencies start being developed at this stage as group members get to know each other and test the limits of their relationships and their tasks. During the *storming* stage group members confront each other regarding the norms of the group versus their own norms or the organizational norms of their organizations. People get frustrated and become emotional as they try to work with one another and try to make different rules converge to what they see as beneficial to performing their tasks.

The *norming* stage is characterized by the team defining their own way of working in a cohesive way and defining new roles and responsibilities to carry out the tasks. In this stage team members share their personal opinions with the group, exchange relevant information to complete tasks, and are able to collectively define solutions. The *performing* stage is marked by group members being able to focus on completing the tasks, and taking advantage of flexible roles within the team. The goal is to get the job done. This is followed by the *adjourning* phase in which team members face the separation of the group and the self-evaluation task that may occur after the group work (Tuckman and Jensen 1977).

IMPROVING THE LOOKAHEAD PLAN IN A HEALTHCARE PROJECT

The observation of the process described in this paper and the discussion presented herein are based on observations made by one of the authors working for the Construction Management (CM) company at this project and a researcher who attended meetings as an observer and visited the site in different points in time (in 15 months starting from Phase 2 described later). The researcher recorded her observations on field notes. After meetings and site walks the researcher would discuss with the project personnel her observations about the planning process.

CASE DESCRIPTION

The sheer size and scale of a large healthcare facility provides additional levels of complexity when implementing the lookahead planning and the make ready processes. The project described in this paper is a $940 million dollar healthcare facility (790,000 BGSF and 360-bed), using a multi-prime contract (80 separate contracts), which began in July 2007 and will be completed in the spring of 2012. The main contractors in this project have incentive-based contracts. Over 800 craftsmen and 150 professionals across 75 different companies were on site during the time this paper was written. As of January 31, 2011, over 2.3 million man hours had contributed to the construction of the facility; 4,500 RFI's have been processed; and over 1,500 submittals had been distributed. In addition to the challenges of building a mega project, dealing with OSHPD requirements for inspections and approvals added to the lead times of this project. These factors created a strong need for collaboration, careful management of meetings, and clear flows of information. Given the magnitude of this project, and the existence of multiple "subprojects", the case described reflects the "building interiors" work only.

PHASES OF THE GROUP DEVELOPMENT – IMPROVING THE LOOKAHEAD PROCESS

Phase 1 – Forming

Phase 1 (2008) represents a moment of transition in this project. The CM was brought on board when the project was already running and during this phase the CM had to build relationships and form teams involved with planning and building the project.

A single Last Planner (LP) meeting was held every week with 10-15 attendees, who were General Superintendents at the project (Structural Steel, Metal Decker, Concrete/Rebar and MEP). The tools used to support the meetings were MS Excel spreadsheets, Primavera P6 (schedule), boards placed on the walls of the conference rooms and stacking charts. The boards were used to represent sequences of tasks and commitments related to different areas of the project. Stacking charts represented a summary of ongoing tasks and their performance.

When the project started, the general superintendents were the ones attending the meetings and this approach worked because the superintendents were the ones directly responsible for the trades. At this stage the team knew that the one meeting they had with the structural team was adequate for that point in time but this format would be difficult to scale and sustain as more trades would start working at the site. For the CM it was important to let project participants to know where they were at in any given time (actual and planned progress). Meetings and stacking charts with indicators showing the progress of each trade were used to give participants situation awareness about their work in this project.

Phase 2 – Storming

By October 2009, the CM was using pull planning as the main technique to get multiple trades together to develop the lookahead planning. At that time, the managers in the CM team indicated that many contractors had not participated in pull planning sessions before and were not used to actively participating in the planning process. These meetings could at times be very large and could involve as many as 50 people

making it difficult to those involved to be an efficient participant in the planning process.

In order to address the project planning with a more manageable group, the large meeting was broken down into major special areas of the project (e.g., interiors, exteriors, central plant, and site). The smaller planning meetings consisted of approximately 20 people – most of which were still the general superintendents for the trades. The same tools used in Phase 1 were used in Phase 2. As a result of the meetings happening separately, the sharing of information amongst participants in different meetings became a challenge. Decisions made in one meeting might not reach all the people involved quick enough before the next meetings they would have to attend (silo effect) and impact the make ready process (identification and removal of constraints before tasks were scheduled).

As the project grew bigger, the work started being managed separately by different foremen and trade superintendents by floor. It became a challenge for some of the trades to send a foreman to all the meetings since they were not fully staffed yet. Because of this, the general superintendents for the trades were attending all the planning meetings but quickly learned it was too much information and too many meetings to attend. The superintendents started sending the foremen to the meetings, which was ideal since the foremen (the 'true' last planners) had the best knowledge of the planning area. However, some of them had not been on the project long enough to be a true decision maker for their scope or have the project historical knowledge of key ongoing constraints. Additional last planner meetings were added and with that, the continuation of the struggles of having the right person in the room to effectively commit to work and communicate roadblocks.

Phase 3 – Norming

Five months later (March 2010), the pull planning meetings appeared to be in full swing. The CM had previously organized a large room with boards on the walls and a large number of "stickies" were placed all over the boards representing a production commitment (or roadblock) for a specific physical area of the building in a given week (e.g., central plant, tower east, tower west). This "board room" was the setting for the meetings between the different trades in charge of specific physical areas of the project. The boards seemed to be a good idea to share information for this project earlier on. However, once the project reached a point of 'full capacity', other challenges arose that impeded the effectiveness of the lookahead planning process. As mentioned earlier, the challenge of having the right person in the room was prevalent as was the ability to visualize the flow of work due to the large quantity of roadblocks that were still a struggle to efficiently resolve. In addition, tracking the information became a challenge due to the number of resources needed to capture the information that ultimately led to data inconsistencies.

In the interest of time, most of the meeting was dedicated to communicating what had to be done immediately and defining what was necessary to get the tasks done rather than going through a detailed screening process that could potentially last for hours. Tasks would be discussed and every participant was supposed to take notes regarding the constraints related to their tasks, and to identify what was necessary to get these constraints removed. To assist with the roadblock visualization and tracking, one wall in the "board room" was dedicated to roadblocks related to everyone's work

and this planning board was used by the owner, architect, and engineers to commit to resolving the roadblocks.

No single person or integrated system had all the information about the constraints at this stage. This also became a challenge as at times those directly interested in having the constraints removed would not properly document the constraints identified during the meetings and work to have them removed before tasks were assigned to production trades. Another challenge was to make clear to all involved about how critical certain constraints were. Milestones were indicated on the board but at times the expectations related to certain deliverables might not have been completely understood or communicated to participants.

The discussions at this stage were very rich as those representing the trades had specific knowledge about the work areas being planned. People voiced their concerns and made promises to the team. The group seemed to be gaining a good grasp of how the lookahead process should be carried out and were becoming more active in the planning process. Documentation was happening for production commitments on the boards and in the tracking tools for production commitments but not specifically for constraints related to the work of all trades (e.g., RFIs, approvals from OSHPD). Later in this phase, projectors started being used during the meetings to convey information about specific areas of the project.

Parallel to the development of meetings with the trade General Superintendents, a whole new set of meetings was happening at the field. With the objective of getting to the 'right' person to commit to work and communicate information needed, the CM area Superintendents were meeting with groups of 15-20 Trade Foremen at the building under construction and using boards located in different floors of the building to track commitments. These six meetings had a basic structure in that the General Foreman of a specific floor would get close to the board and add and/or change tasks indicated throughout a week based on discussions with those in attendance and from discussions that occurred in the planning sessions in the "board room". Participants would share their concerns about different issues, e.g., sequencing of tasks, materials stored at the working areas, requests for information. At this stage, foremen were actively involved in the process, and the last planners were providing real-time information. Nonetheless, these meetings seemed to lack a uniform process to carry out the conversations given that each major area had a different General Foreman. Each meeting had its own characteristics and some General Foremen were better in communicating priorities and negotiating important issues with the Trade Foremen than others. Some Foremen would lead the meetings whereas others would give room to Trade Foremen to be more vocal and dominate the conversations and set their trade's priorities. Since the meetings were held inside of the building, close to workers performing tasks, noise was a constant and conversations were made difficult in places where the boards were located next to the trades working.

The CM's efforts to lead connected conversations between superintendents and foremen resulted in more people being involved in the planning process, and with that more roadblocks were being identified. However, a challenge at this stage was that the foremen were losing the ability to look ahead effectively due to the number of roadblocks impacting their work flow and their limited knowledge of the existing roadblocks that were discussed in detail in other meetings which the General Superintendents attended. These challenges ultimately led to the demise of the

planning board systems in the field, but as a result, the Trades understood the need for the foremen to attend and actively participate in the lookahead planning sessions in the "board room". This illustrates a challenge related to making the LPS™ scalable and making information integrated and available in different levels of detail to those involved in a mega project such as this.

Finally, at this stage an integrated tracking tool started being used to capture all roadblocks that were being discussed in the various planning sessions. The CM was having separate working sessions with major trades (e.g., mechanical, electrical, framing, plumbing) with the intention of resolving the roadblocks that were identified in the planning sessions. Since the participants in the planning sessions were not always in attendance in the working sessions, the ability to effectively communicate the criticality of a roadblock and its impacts were lost. Because of this, roadblocks fell into a weekly 'to-do' list and lost its urgency. To help communicate the appropriate priorities and urgency of roadblocks, one person was designated to participate in all planning meetings and the working sessions as a sort of "constraint expediter". This person's task consisted of, amongst other things, elevating critical constraints that affected production to the right work group, ensuring they were committed to, and following up to make sure they got resolved. It became very clear that getting the right information to the right people at the right time was key to effectively resolving roadblocks in the most efficient manner. That was the moment when the CM decided that all meetings – planning meetings and working sessions – had to enter their roadblocks and pertinent supporting information such as detailed action items, needed by person, date needed and status updates into a single system so that all participants would be aware of tasks that needed resolution before tasks started.

Phase 4 – Performing

On Phase 4 the long road to proactively identify and remove roadblocks reached a different stage: the CM started using the integrated tracking tool as the primary tool to communicate roadblocks in all planning meetings and working sessions. At this stage, there were twelve different planning meetings (weekly) with 10-30 last planners communicating roadblocks relating to major physical areas of the project. In addition, there were seven working sessions (primary related to key scopes of work) to resolve the roadblocks. Due to the volume of information being processed through these meetings, the effectiveness of the meetings – particularly the meetings dedicated to resolving roadblocks – became plagued with what could be considered "non-value added conversations" regarding the location of the item, who identified the item, when the resolution was needed etc. To reduce the non-value added conversations and help with location awareness of an issue, the team repurposed a punch list tracking tool (the software uses 2D plan views as it primary data entry point and tracks user and location info with one click) to a tool that helped the team to collaboratively manage constraints identified in different meetings.

At this stage, the planning meetings and the working sessions were held in the "board room" and were using a blend of commitment boards, Primavera P6, the integrated tracking tool (Figure 1), and dual projectors to share visual details about the areas being discussed during the meetings. With the use of the integrated tool and filters within the system, the planning teams were able to communicate the most urgent priorities to the owner and design teams. The owner representatives became more involved with the planning process and the building teams would indicate to the

owner the deliverables that were needed to proceed with the work at the project site according to defined milestones.

The team decided that in order to get information to the field faster they needed to gather the right people around the issues at the location of impact in the field as identified in the planning meetings and displayed in the integrated tool (Figure 1). For the Interiors buildout of the project, the team set up 3 additional meetings with representatives of the Owner, Architect, Engineers, CM and Trade Foreman who would collectively agree on the best resolution and, if possible, make a decision on the spot. In addition to identifying roadblocks in planning meetings, participants could now go to the field, walk inside the building and use a tablet PC and the tracking system (Figure 1) to identify which constraints were still pending in different areas of the building (stars indicate constraints waiting to be addressed in Figure 1). At this stage they had participants in the field looking at the real problems being discussed and understanding the issues on the spot, which is very much along the lines of the "go and see" principle (Go to *gemba*) (LEI 2008).

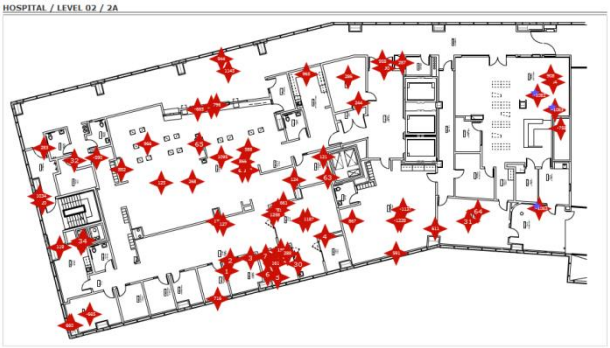

Figure 1: Screenshot of the system to keep track of constraints

The CM did not develop the Building Information Model (BIM) for this project. They inherited it when they started working on this project, and participants had modelled important elements for their trades. The BIM was used for design coordination but was not an integral part of the short interval planning process. The sheer size of the model and the need to have a BIM specialist to attend multiple planning meetings did not prove feasible for the model to be frequently used in planning meetings. Noteworthy, the project got an AIA award for excellence in BIM implementation and the model was used extensively for prefabrication, deck pours, seismic coordination (an extremely important factor for healthcare projects in California), and wall layout to name a few areas in which the model was successfully used.

The field meetings were even more important as some details that were not present in the BIM could be observed in the field. The team could also use filters to separate the RFIs that required the entire team's attention vs. simpler ones that could be resolved outside of the meetings held in the field. The CM worked to sort through issues that could be approved by OSHPD inspectors through field reviews and be sent to production faster in a few days vs. issues that need to be immediately submitted to the OSHPD office in Los Angeles, which might take months to be resolved.

With the help of PC tablets, the tracking tool, and printed plans from the tracking tool brought to the field participants of these meetings could work on roadblocks by comparing and contrasting the plans and the actual elements in the building. The CM would head to the field with a list of roadblocks identified in the meetings and the

documentation related to each roadblock organized using the integrated tracking tool. The roadblocks would be pulled from the inventory available in the PC tablet, a discussion would take place where the problem was happening, and the conversations and action items were recorded in real time. This contributed to speeding up the process to resolve roadblocks as the need to prepare and wait for time-consuming RFIs could be eliminated in many cases.

Phase 5 – Adjourning

The project was under construction during the time this paper was written. Therefore, no comments were made regarding this phase. The CM is working to document lessons learned in this project and how they will be used in future projects.

CONCLUSIONS

The paper focused on the improvement of the lookahead process and the challenges facing the project team. The CM used its in-house resources and one of its partners to repurpose a tool originally used to keep track of punch list items to develop an integrated tracking tool adapted to its needs and the size of the project. A few lessons learned were gained from this journey: there were challenges related to the scalability of the LPS™ which required adaptation of existing tools to fit this project's needs; the CM had to create a culture that promoted certain practices the industry at large has yet to get used to; and persistence and commitment to continuous improvement are daily exercises for the team involved in this project.

It was a challenge to implement the LPS™ as originally conceived in a project of this size. Tracking thousands of work packages and roadblocks from the master schedule all the way down to the field became a challenge for this project. As the project developed, multiple trades and managers joined the planning process, and more meetings had to be held and documents had to be used to plan production tasks and disseminate information.

The CM tried different approaches to engage people in multiple levels of the project and to help them develop situation awareness of all the work going on in the project. Involving designers and the owner during the make ready process is crucial in complex healthcare projects. The owner needs to understand how their decisions impact field work and designers can help to expedite solutions if they can visualize the problems as they happen in the field. Accordingly, the CM persistently worked to promote a culture and develop managerial processes to support their efforts to continuously improve the reliability of the plans and keep people accountable for their tasks during the make ready process.

The use of a system (software + tablet PC) to document constraints and make them available in real time to all involved proved to be crucial in this project. The system allows notes to be recorded and information can be pulled while designers and builders meet inside the project. The authors understand that there are other tools in the market to support the LPS™ implementation; however the CM decided to use their own expertise and work with a vendor to adapt existing tools to their own needs. Additionally, the BIM was used extensively for design coordination but not for planning the work flow for the reasons discussed elsewhere in the paper. Furthermore, many elements of the project were being designed as the project progressed and required inspection and approval from OSHPD. This resulted in constraints that could

not be anticipated until trades started working and required a very dynamic management system to address their needs.

Finally, not all teams were in the same stage of group development at any given time. Some teams were in the norming and performing stages because they had started earlier in the project, whereas newcomers would be in the storming phase trying to make sense of the work and the team members. Hence, the authors cannot say that there were precise moments that define each one of the four phases presented; rather one can find a group of characteristics that fits one of the four phases over time.

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