A Look at LBS

Over the years, numerous construction tools and scheduling methods have emerged as a means to solve construction challenges. Location-based scheduling (LBS) is one of the latest methods that promise to increase efficiency. It is causing many to take a closer look at how projects and work move through time.

For Henry Ford, changing the way work moved through time was more than a promise. In 1913, he introduced the world to assembly line automation as part of the turn-of-the-century manufacturing boom in the United States. Ford's advancement dramatically increased production by keeping the crews stationary and moving the work along a linear path. This resulted in more cars built in less time.

Following Ford's success, engineers from many industries examined linear methods for accomplishing all kinds of tasks. Ford's concept underpinned new ideas related to overall process improvement. In construction, linear scheduling methods have also evolved as new techniques to improve the planning and control of projects.

The location-based scheduling method is designed to help plan and control the movement of work crews through a building. In contrast to the assembly line approach, the crews move through stationary work areas, or locations. With LBS, crews are coordinated and managed to ensure a smooth procession from area to area throughout a building with minimal conflicts and idle time for workers and equipment.

LBS vs. CPM

CPMI President Mike D’Onofrio has been exploring LBS for more than a year. At the December 2011 Construction Superconference in San Francisco, Mike participated in a panel moderated by Rick Lowe of Duane Morris. The panel, which included attorneys and location-based scheduling experts, explored how LBS compares with the critical path method (CPM), including the benefits and drawbacks of each method and their impacts on the planning and control of projects. The discussion topic was also formally accepted and presented as a paper to the American College of Construction Lawyers in early 2012.

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Olli Seppänen, author and expert on the LBS method, has considered the historical basis of LBS in great detail. As Seppänen describes in his 2010 book, “Location-Based Management for Construction,” the first documented use of location-based methods was for the Empire State Building in 1929. According to the author, the techniques were employed mainly by the builder as visual planning and controlling tools.

**How LBS Works**

LBS evolved as a combination of CPM and the linear scheduling method. It tracks the continuity of crews working on production tasks. Like CPM, LBS is based on a network of work activities; however, LBS clusters the work activities that can be performed by a single crew into tasks. A task is made up of work activities that “repeat” in multiple locations. The grouping allows the efficient planning and management of the crew’s workflow and production rates for the work activities within the task.

LBS uses logic relationships to define the sequence of activities (similar to CPM) and also to force continuity of activities within tasks. The activities within a task are scheduled in a continuous manner for efficiency, i.e., a crew will complete work at one location and then start work at the next location without interruption.

LBS is presented graphically in a flowline diagram—a graph that shows the movement of crews through locations over time. There is a striking difference in the graphical representation versus CPM. CPM focuses on managing time (Gantt chart form); LBS focuses on crew flow (flowline).

In LBS, the slope of the flowlines represents which trades are proceeding faster or slower. The LBS schedule can be optimized by changing the production rates so that the tasks are aligned as close to parallel as possible.

Schedulers who use CPM or LBS should attempt to accurately reflect the relationship between the activities with regard to the dependency, concurrency and flow of all work.

**Adoption of LBS**

The increasing use of building information modeling (BIM) in the construction industry is likely to benefit location-based methods. BIM makes available more information that can be accessed to set up quantities, locations and productivity targets. For example, BIM may provide drywall quantities for each floor of a building. With LBS, the material quantities at each location can be used to determine durations, resources and productivity.

Adoption is a major hurdle for LBS and any new scheduling method. According to several estimates, over 90 percent of the construction firms in the United States use the critical path method of scheduling to control and
On January 24, 2012, at the Construction CPM Conference in Orlando, Florida, CPMI’s Andy Roeser, P.E., PSP, answered that question in a presentation to industry professionals. Andy focused on the key causes of what he calls “schedule divergence”: when the actual sequence of construction activity deviates from the critical path method (CPM) schedule. When this occurs, it renders the schedule ineffective as a management tool.

Andy provided insight as to how management teams can avoid such pitfalls. He began by identifying the purpose of a CPM schedule, asking the audience for input. To them, a CPM schedule is designed to:

- Manage time
- Forecast the plan
- Measure progress
- Reflect impacts to the plan
- Manage risk
- Reflect the scope of all project stakeholders

Considering the variety of answers, the following quote serves as a good overall definition:

“The construction schedule is the primary means that the general contractor can use to communicate the construction plan to the general contractor’s own forces, subcontractors, and suppliers as well as owners and designers.”

AGC, Construction Planning & Schedule, 1994

Based on his 17 years of experience managing and scheduling construction projects, Andy cited the following primary reasons for schedule divergence:

- Overpopulating the CPM—too much data
- Using the CPM for change management or a claims tool
- Using the CPM as a payment tool
- Improper updating of the CPM—“voodoo logic”
- Failure to timely and accurately reflect changes in the plan
- Failure of the GC/CM to communicate the plan

Often, CPM schedules get overloaded with data from multiple sources in an attempt to provide management controls for every aspect of the project. Change orders, labor, equipment and material resources as well as cost data can all interfere with a good scheduling plan.

Andy used case studies of real projects in which many of the typical issues were encountered to explain steps to avoid or overcome divergence issues. Each case study provided a different perspective and lessons learned.

The presentation generated lively discussion.

For a copy of Andy Roeser’s presentation, please call 888-260-2626 or e-mail aroeser@cpmiteam.com.
manage their projects. LBS-driven vendors are promoting improved efficiency based on several large projects that have used LBS software as an addition to CPM.

New methods in construction scheduling such as LBS raise significant legal and practical implications for project stakeholders. While projects managed with LBS can clearly save production dollars for the trades, the legal implications are not well documented. CPM is still the gold standard for proving a delay claim. How the use of LBS affects the critical path delays on a project remains in question.

In the decade ahead, additional case studies will need to demonstrate how location-based scheduling can consistently provide project stakeholders with improved target outputs. As the number of BIM projects increases, construction managers will persist in exploring scheduling methods that allow professionals to efficiently manage greater project detail. Time will tell whether LBS can gain market share over CPM, or if it will continue to be marketed as a productivity enhancement to CPM scheduled projects.

**News & Events**

**News:**
For additional articles of interest, please see our online newsletter archive at www.cpmiteam.com/news.html. All previous editions, trade articles and white papers are available in PDF format.

**Upcoming Events:**
**ABA Forum on the Construction Industry Regional Meeting**
**November 9, 2012, Philadelphia, Pennsylvania**
CPMI and Cotton & Company co-sponsor the ABA Continuing Education program *Infrastructure: Civil Works Projects for Lawyers* at the Independence Visitor Center in historic Philadelphia. Visit the ABA Forum Web site for registration and meeting information.