LAST PLANNER SYSTEM – THE NEED FOR NEW METRICS

Ghali El Samad[1], Farook R. Hamzeh[2], and Samir Emdanat[3]

1 INTRODUCTION

The Last Planner System (LPS) is widely used in construction projects to improve workflow and increase the reliability of construction planning. LPS acknowledges the shortcomings of forecasts and thus recommends planning in greater depth as the team gets closer to completing the work.

Many researchers and practitioners have developed metrics to measure the planning performance when applying the LPS. Some metrics measure the success of the lookahead stage at anticipating tasks and removing constraints to make activities ready for implementation. Others measure productivity and progress both at the project level and the weekly work plan level. Many of those metrics were either inconsistently used, showed no correlation with the overall project performance, or required data that was too difficult and time-consuming to collect.

This paper offers an overview of the various metrics in the literature and proposes new metrics to assess weekly work planning (WWP) performance and overall workflow. The suggested metrics complement Percent Planned Complete (PPC) which naturally assumes that all activities are of equal value and importance. The proposed WWP metrics take into consideration activities status (Required, Not Required, Backlog, and New). Required activities are critical activities in the traditional Critical Path Method understanding. Backlog activities are excess tasks that are ready but not necessary and which are to be executed in case of available capacity. New activities are tasks added to the WWP that were not foreseen in the lookahead process. The proposed workflow metrics considers the volume of the activity and the number and duration of its successor tasks.

2 WEEKLY WORK PLAN METRICS

Required Level (RL): RL measures the number of required/critical activities with respect to the number of activities on the weekly work plan. The purpose of RL is to help planners determine the criticality level of their activities and is thus calculated before the WWP starts. A high RL value means that many activities on the WWP are considered critical. Therefore, the team should attempt to complete all activities and obtain a high PPC as well.

$$RL = Required\ Will/Will$$

Completed Uncommitted (CU): CU is a metric that measures work performed that was not on the WWP with respect to the total activities completed. CU is proposed to address some PPC limitations. PPC does not distinguish between WWP, backlog, and new activities. Thus, an increase in CU can indicate problems in anticipating tasks and in the make ready process.

$$CU = \frac{Executed - Executed\ from\ Will}{Did + Backlog + New}$$

[1] Graduate Student, Civil and Environmental Engineering Department, American University of Beirut, Lebanon, ghe02@mail.aub.edu

[2] Assistant Professor, Civil and Environmental Engineering Department, American University of Beirut, Lebanon, +961350000 ext. 3616, fax: +961 1 744462, farook.hamzeh@aub.edu.lb

[3] Director of Management Services, Ghafari Associates, LLC, 17101 Michigan Avenue, Dearborn, Michigan 48126, semdanat@ghafari.com

3 Workflow Reliability Metrics

Labor Hours Reliability Index (LHRI): LHRI compares the percent of work completed in terms of labor hours with respect to the total amount of expected labor hours. PPC ignores the amount of labor hours an activity needs. This is misleading since not all tasks are of equal value. Accordingly, these metrics can be used together to show a more refined assessment.

$$LHRI = \frac{\%\ of\ Work\ Completed\ x\ Expected\ Labor\ hrs}{Total\ Expected\ Labor\ hrs}$$

Progress Priority (PP): Progress Priority is based on the time plus sum of sons priority rule. In general, the priority rule ranks any given schedule's activities based on the time required by the activity plus the time required for all activities that succeed it.

$$PP = \frac{\sum Time\ Plus\ Sum\ of\ Successors\ Completed}{\sum Time\ Plus\ Sum\ of\ Successors\ of\ WWP\ Should}$$

Two cases are shown below to explain the calculation of the PP metric. Calculations are based on the CPM Network shown in Figure 1. Activities shown in red represent activities that were placed on the WWP.

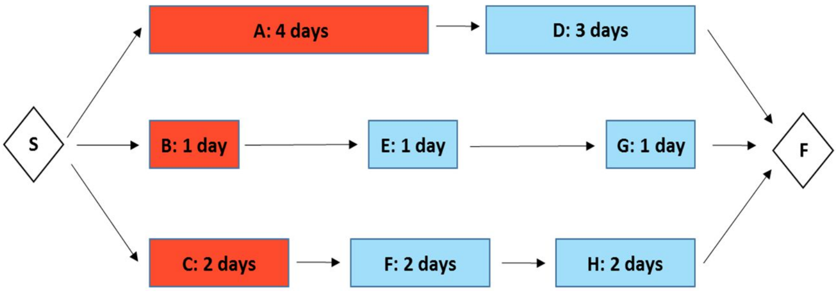

Figure 1. CPM Network

Case 1: Activities A and C were 100% completed. However, activity B was not fully completed by the end of the week.

$$PPC = \frac{2}{3} = 66.7\%, \qquad PP = \frac{7+6}{7+3+6} = \frac{13}{16} = 81.25\%$$

Case 2: Activities B and C were 100% completed. However, activity A was not fully completed by the end of the week.

$$PPC = \frac{2}{3} = 66.7\%, \qquad PP = \frac{3+6}{7+3+6} = \frac{9}{16} = 56.25\%$$

It can be inferred that PP can be different for the same value of PPC. PP can be used to maintain a smooth workflow alongside PPC.

4 Conclusion

This paper highlights the fact that many metrics are currently available and new metrics are being developed. However, there is little research that systematically applies those metrics to identify their predictive power in isolation or in combination. Research is difficult to conduct because of how teams document LPS. The advent of database-driven LPS tools provides an opportunity for the systematic analysis of the LPS metrics. Research can help advance how LPS tools are implemented and the resulting organized datasets can advance research by providing well-organized and structured datasets for further analysis. In this context, the authors are in the process of applying these metrics on actual projects to assess their utility and highlight major issues in production planning.