

INTRODUCING NEW CAPACITY PLANNING METRICS IN PRODUCTION PLANNING

Lynn Rizk¹, Farook Hamzeh², and Samir Emdanat³

INTRODUCTION AND KNOWLEDGE GAP

Planning is an essential step in managing production flow on a project. But although it is very crucial at early project stages, ongoing planning during production which includes capacity planning is instrumental in shaping production; and thus worth studying.

A lot of research has gone into understanding the planning and the scheduling of tasks from a chronological point of view, but there is also the planning of how to assign the activities and tasks (the load) to the available labour, equipment, and resources (the available capacity). This is known as capacity planning.

Allocating adequate time and resources to planning is only one solution to the problem, but it cannot contribute to the success of the project if there is a mismatching problem between capacity and load. Therefore, it is important to understand the relationship between capacity and load and to have the adequate metrics to assess the status of resource allocation in an attempt to figure out how to strike a proper balance between the two.

METHODOLOGY

Before coming up with the metrics discussed in this paper, this study distinguishes between three types of activity clusters as shown in figure 1. Note that the green pebbles represent normal activities while the red pebbles represent required activities (i.e. critical activities).

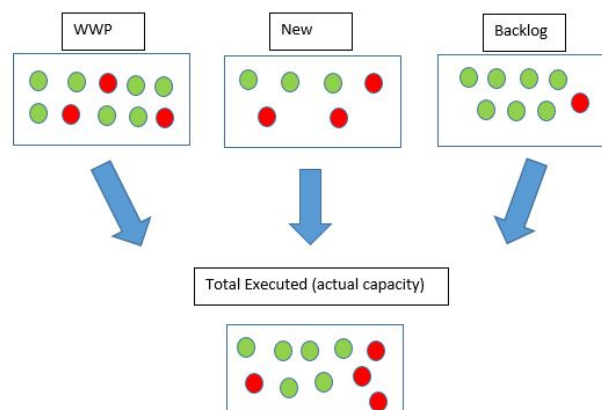


Figure 1 - Activity Clusters

- WWP (Weekly Work Plan) cluster: group of activities consists of all the tasks that have been committed to be completed that week.

¹ Graduate Student, Civil and Environmental Engineering Department, American University of Beirut, Beirut, Lebanon, lar07@mail.aub.edu

² Assistant Professor, Civil and Environmental Engineering Department, American University of Beirut, Beirut, Lebanon, + 961 1 350000 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



- New cluster: group of tasks that need to be executed during the week as pre-requisites or co-requisites to other tasks.
- Backlog cluster: the activities that are assigned when the team has completed the activities that they have committed to complete and they have extra resources to work more.
- Total Executed: actual activities that have been executed that week (i.e. the actual capacity).

RESULTS

Six metrics were created. Note that these metrics are to be used for measurement on a weekly basis when applying the LPS. Table 1 summarizes all the metrics with their respective equations and descriptions.

Table 1 - New Capacity Planning Metrics

Metric	Formula	Description
Capacity to Load Ratio	$\frac{\text{Total Executed}}{\text{WWP}}$	Number of executed activities vs. number of committed activities.
Capacity to Load Ratio man-hrs	$\frac{\text{Actual man - hours}}{\text{WWP man - hours Worked}}$	How many man hours have actually been expended vs. the hours required to complete the WWP.
Required Capacity Ratio	$\frac{\text{Required Executed}}{\text{Total Executed}}$	From the total executed tasks for that week, how many required.
Required Percent Complete	$\frac{\text{Required Executed}}{\text{Total Required}}$	Out of all required tasks for this week, how many have been executed.
Weekly Deviation	$\text{WWP} - \text{Total Executed}$	How far from the WWP we have deviated and in what direction.
Weekly Deviation Ratio	$\frac{\text{WWP} - \text{Total Executed}}{\text{WWP}}$	Normalized WD for comparison.

SUMMARY

The need for proper and reliable planning is essential for project success. Capacity planning has received good attention in the construction community but few metrics exist to assess its performance. The new metrics introduced in this paper will help in informing planners and last planners about the status of load vs. capacity, the matching between the two, and the reliability of capacity planning on a project.

Further research on this topic and the testing of these metrics to prove their reliability in attempting to visualize the problem of capacity planning, is required. The authors are in the process of applying these metrics on actual projects to assess their utility and highlight major issues in capacity planning.

