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ANALYZING NEAR-CRITICAL PATHS

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ANALYZING NEAR-CRITICAL PATHS

TCM Framework: 7.2 – Schedule Planning and Development
9.2 – Progress and Performance Measurement
10.1 – Project Performance Assessment

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Disclaimer: The opinions expressed by the authors and contributors to this recommended practice are their own and do not necessarily reflect those of their employers, unless otherwise stated.

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PURPOSE

This recommended practice (RP) is intended to provide a guideline on analyzing near-critical paths in project schedules. Delays or unexpected circumstances may adversely affect near-critical path activities to the extent that they become critical. A near-critical path consists of one or more near-critical activities that are susceptible to the risk of becoming critical and/or causing critical path delays.

This RP will discuss the term near-critical path and the significance of near-critical paths in projects; demonstrate how to determine near-critical paths and set forth a process for tracking, trending and analyzing near-critical paths. This RP is intended to serve as a guide and resource, not to establish a standard.

INTRODUCTION

The critical path of a schedule is defined as the longest sequence of project activities which establishes the minimum overall project duration [1]. Most project management attention is focused on the critical path. Although it is of utmost importance to ensure adequate attention is paid to critical path activities, it is unwise to solely focus on critical activities to ensure timely project completion. Status on a project is usually evaluated periodically. Uneven progress or delay events can affect non-critical path activities such that activities that were not on the critical path may surprise managers when they become critical in between status updates.

All too frequently insufficient attention is paid to near-critical (also known as subcritical) activities. This oversight may result in disrupting the project schedule or changing the critical path. Schedule analysts must be able to identify and analyze the near-critical path activities. AACE defines near-critical path as an activity or set of activities that are almost critical or are at risk of becoming critical if delayed past their expected completion times [1].

Project schedules with a high percentage of critical and near-critical activities are susceptible to greater risks of late completion due to higher chance that slight delays will produce potentially adverse effects on the project completion date, and higher chances for formation of merge points. Evaluating merge biases facilitates the process of identifying and assessing risks that are caused by parallel float paths at the merge points.[2] Project schedules with multiple near-critical paths tend to be riskier than those with fewer near-critical paths because the project

schedules with multiple near-critical paths are not only exposed to the risks associated with the critical path, but are also susceptible to the risks associated with overlooked or lightly assessed near-critical path(s). In addition, project delays are frequently caused by delays that originally arise on a near-critical path. It is important to identify near-critical paths, analyze them routinely, and alert project team members to potential changes to the project plan resulting from slippage of near-critical paths. Analyzing near-critical paths should be part of any network schedule analysis. Near-critical and critical path analyses are used to support effective project control.

The greater the level of uncertainty about the estimated durations or the interrelationships between work activities, the greater the number of near-critical activities that should be reviewed. This will help ensure that a more complete list of risk factors is taken into account when assessing near-criticality concerns.

During the schedule management phase, actual progress is tracked, critical and near-critical path activities are monitored, and variances or trends are analyzed and reported to the project participants [3]. Potential impacts to critical and near-critical activities should be assessed and reported.

RECOMMENDED PRACTICE

Considerations in Identifying Near-Critical Path

The concept of near-criticality is based on the CPM calculations that evaluate how close any activity in a logic network is to becoming a critical-path activity. A continuous sequence of activities within a network is called a path. The longest continuous sequence of activities which establishes the minimum overall project duration (may be more than one path) is called a critical path. A lesser critical sequence of activities might then be considered a near-critical path.

The concept of near-criticality is applicable to both a project activity and a network path; this recommended practice primarily focuses on near-critical paths. Near-criticality can be defined in different ways. Similar to critical paths, near-criticality is primarily based on closeness either to lowest float path or longest path. As such, near-critical paths may be identified using any of the following methods [4]:

Deterministic Methods

a. **Near-critical float**: If the float that is available to a near-critical path is consumed, the near-critical path also becomes critical in parallel with the existing critical path of the network, and if float consumption continues, the path that was near-critical becomes the new critical path from that point onwards. A near-critical path may or may not partially overlap with the existing critical path of a network.

   Some authors suggest establishing ranges (e.g., a total float value between 1 and 5 [5]) just above the critical path float to identify near-critical activities. These ranges are subject to expert judgment and may vary from one project to another. Most project planning and schedule software applications allow users to filter project activities that have total float values within certain ranges (e.g., less than a value, less than or equal to a value, or equal to a value). Schedulers should refrain from accepting the default settings when evaluating the criticality level of activities in an effort to seek justifiability and suitability of values chosen. No single, specific float value exists that correctly identifies near-critical path activities in all situations.

   The amount of float that is available to a near-critical path is mainly driven by the time required to take necessary corrective actions.[6] In some projects, one week might be more than enough time to take needed remedial actions. In this case, a network path with a total float value of less than a week but more than three days might be considered near-critical. In another project, a week might be inadequate to prevent near-critical