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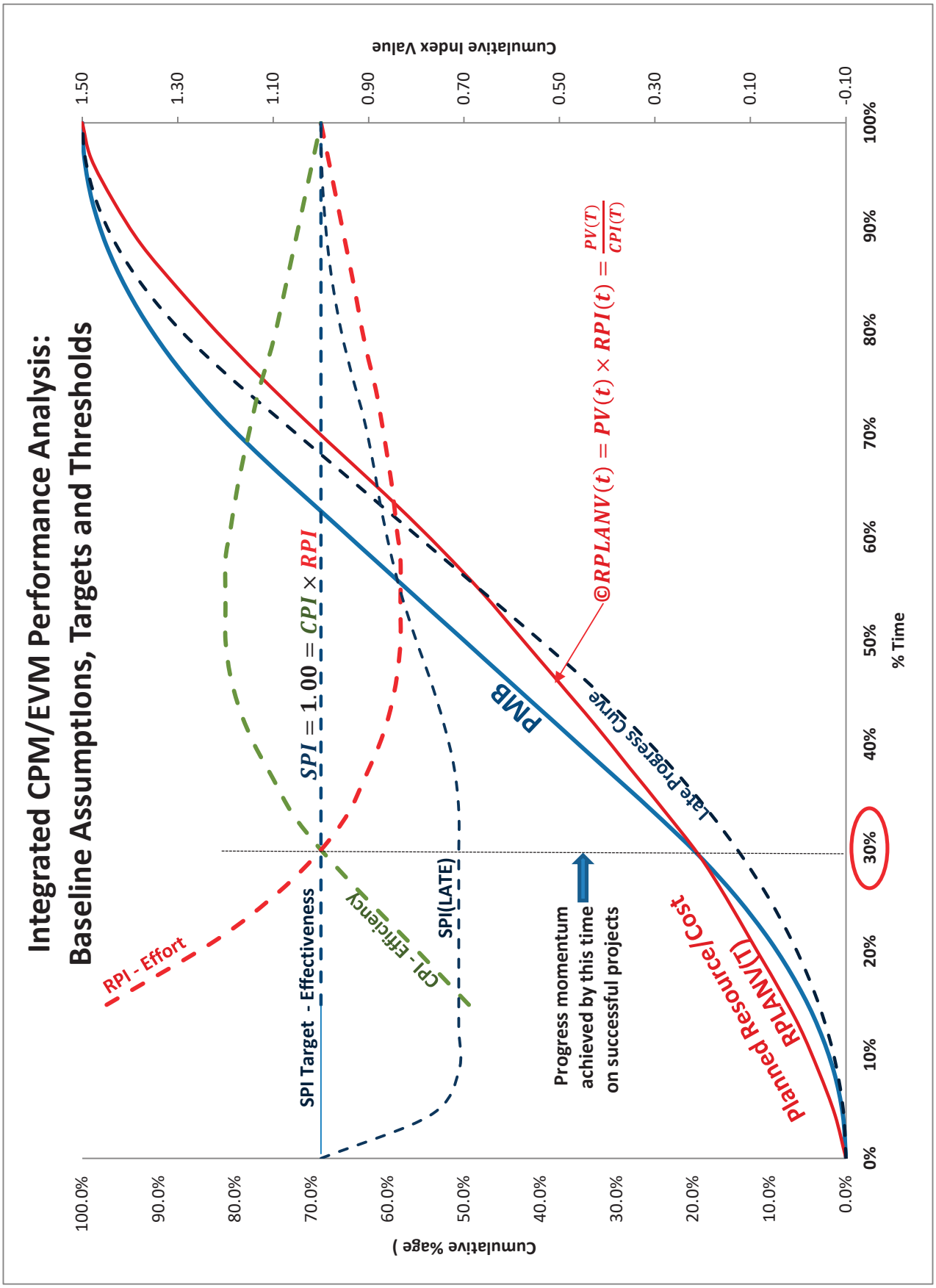
Integrated CPM/EVM Performance Analysis:
Baseline Assumptions, Targets and Thresholds
Cumulative %age)
Cumulative Index Value
% Time
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
1.50
1.30
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0%
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40%
50%
60%
70%
80%
90%
100%
PMB
Planned Resource/Cost
RdPLANV(T)
Later Progress Curve
©RPLANV(t) = PV(t) × RPI(t) = PV(T)/CPI(T)
SPI = 1.00 = CPI × RPI
SPI Target - Effectiveness
SPI(LATE)
CPI - Efficiency
RPI - Effort
Progress momentum
achieved by this time
on successful projects

FIGURE 32

Preface

The headline in the Economist Magazine read: "Construction the least efficient industry". The story of low productivity and poor performance it went on to tell has been told before. Over the past four decades, productivity in the construction industry has stagnated while other industries have steadily improved. Moreover, projects that get the green light to proceed "come in late and over budget". As the Economist observed, this is no "trifling matter" because the building trade is worth 13 percent of world output. If construction productivity matched the improvement in manufacturing productivity over the past 20 years, the $1.6 trillion savings would eliminate the $1 trillion worldwide shortfall in infrastructure, with some left over to improve the quality of all our lives.

The Economist article, and the international study to which it referred, offered some helpful ideas on how to change this state of affairs but, after over 40 years in the construction industry, first as a builder, and then as a consultant helping owners and contractors on multi-billion dollar projects to improve their time and cost outcomes, and as an expert in analyzing the causes and effects of project failure and, most importantly, as one dedicated to solving problems on construction projects, I was frustrated. Most of all, I was frustrated because I knew, after many years of experience, what works, and I knew that many of my peers knew many of the the same things I do, but the tried-and-true solutions were being given short shrift as the industry sought alternative panaceas, perhaps hoping to avoid the hard work and lacking the true commitment to performance which is required for success. I was sufficiently frustrated that I wrote this book.

Given the obvious and essential connection between productivity and time and cost performance, how is it that on most construction projects, planned and actual productivity is rarely known, or even asked about? Heads should be shaking in disbelief, but in fact, even requiring this information in contracts is considered by many to be controversial. Of course, even if productivity data is available, reliable analytics are required to reveal how productivity factors into time and cost performance. Unfortunately, performance analytics which effectively combine Critical Path Method schedules with Earned Value metrics that reflect the connection between input and output have not, until now, been available. To fill this knowledge gap, I have developed new, field tested, formulas and metrics for Earned Value analysis on construction projects, and explain how the new EV analytics should be integrated with Critical Path Method schedules to provide a unified performance analysis that improves the chances of on-time and on-budget completion.

Finally, I knew, based on hard experience, that reliable analysis is *necessary* in a performance-based system, but it is not sufficient. To achieve the time and cost objectives, a performance-based system must be defined, and fully committed to, by all parties to the construction contract, and then led and enforced by the buyer of construction. There is, in other words, the challenge of convincing human beings (whether owners, contractors or designers), who are not always astute in judging their own best interests, to truly collaborate in pursuit of peak performance. This is the implementation

challenge: there can be great systems, and sound analysis, but it is all for naught without successful implementation, which is the subject of Part 3.

J. Gerard Boyle, B.A., CFCC, GSC

HOW TO READ THIS BOOK

This book is intended to be read by anyone who cares about achieving peak performance on construction projects. The interests of both the specialist and the generalist are served. The advice offered is based on the author's lifetime of practical experience in successfully delivering projects on time and on budget. Its three parts are described below:

Part 1: EXISTING EARNED VALUE ANALYTICAL PRACTICE

This part provides an exhaustive description and critical review of existing Earned Value Management and analytical practice. These are required in order to fully understand the current problems with EVM as it pertains to the construction industry, and what is needed to correct them. Numerous worked examples of the various EV formulas and thresholds are provided. By the end of Part 1, you will have been given an exhaustive basis for the argument that current EVM requires a complete rethinking.

Part 2: NEW EARNED VALUE ANALYTICS & MANAGEMENT EMPHASIS FOR CONSTRUCTION PROJECTS

Part 2 provides a solution to the problems identified in Part 1. It presents a new EV analytical approach, which is fully integrated with resource-loaded Critical Path Method schedules. Performance formulas and variance metrics are introduced, which connect output (accomplishment) to the inputs (productivity and resources) that determine it. A fully integrated schedule update analysis using the new performance analytics is presented. Finally, consideration of these performance interconnections leads to a radically changed understanding of root causation as it pertains to schedule delay.

Part 3: OVERCOMING IMPLEMENTATION CHALLENGES

The author has successfully implemented the EV project management and analytics presented in this book on small and large construction projects and programs of differing types, complexity, and under various contract delivery methods. The historical reasons for ubiquitous project failure are identified so that efforts are concentrated on their correction. Experience-based advice provides specific guidance in overcoming the significant implementation challenges commonly encountered. In this regard, proven approaches to obtaining meaningful construction schedules are offered. The existing failed approaches, which have been advanced by the construction industry, are replaced with an overarching, performance-based management philosophy based on *project* advocacy, instead of the individual advocacy mentality that has undermined performance. Strategizing to succeed includes the use of Game Theory concepts customized for construction. Step-by-step instructions on how to succeed are provided. Also discussed are the implications for related fields such as commercial dispute resolution, forensic claims analysis, probabilistic schedule analysis, contract delivery methods, and other areas that will benefit from, or should be influenced by, the rethinking of EVM theory and management methods.

This is an essential, groundbreaking book for public and private buyers of construction, contractors and sub-contractors, designers, project managers, lawyers, Earned Value specialists, forensic claims analysts, schedulers, dispute resolution experts, academics, and anyone interested in improving performance and productivity on construction projects.

Among the topics discussed are the following:

- Exhaustive critique of existing Earned Value analysis that compels changes to current theory and practice
- New Earned Value analytics for construction, integrated with resource-loaded CPM schedules represent a paradigm change
- Worked examples of resource-loaded CPM schedules using the new EV Performance analytics
- Identification of reliable performance thresholds for progress, productivity and resources
- Understanding the interconnection of progress and productivity and performance patterns over time
- How to create meaningful, resource-loaded, CPM schedules
- Analyzing schedule float in concert with the new analytics
- Why current cause and effect delay analysis is fundamentally flawed because it ignores root causes
- Why delay claim analysis must always account for productivity
- The problem common to all contract delivery methods and how to correct it
- Why construction projects fail
- Specific steps in creating a successful construction program
- Game theoretical & other approaches to implementing a performance-based system
- Using commercial dispute resolution to contemporaneously resolve claims and improve performance going forward
- The importance of probabilistic (Monte Carlo) schedule analysis & problems with current practice

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