Effect of Scheduling Practices on Project Success

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I. Presentation Objectives

A. Provide data that you can use to help justify the investment in project scheduling

How?

B. Present the results of an Independent Project Analysis, Inc. research study

1. Demonstrates a measurable link between scheduling practices and project outcome success
2. Based on data from actual projects

METHODOLOGY

II. Independent Project Analysis, Inc.

A. Project management research and consulting company based in Ashburn, Virginia

B. Capital project benchmarking

1. Project system benchmarking
2. Individual project evaluations
3. Project system monitoring

C. IPA approach is based on extensive, detailed, and robust databases

III. Characteristics of the IPA Process Plants Database

A. Over 7,000 capital projects from a wide range of industries

B. Over 200 companies worldwide

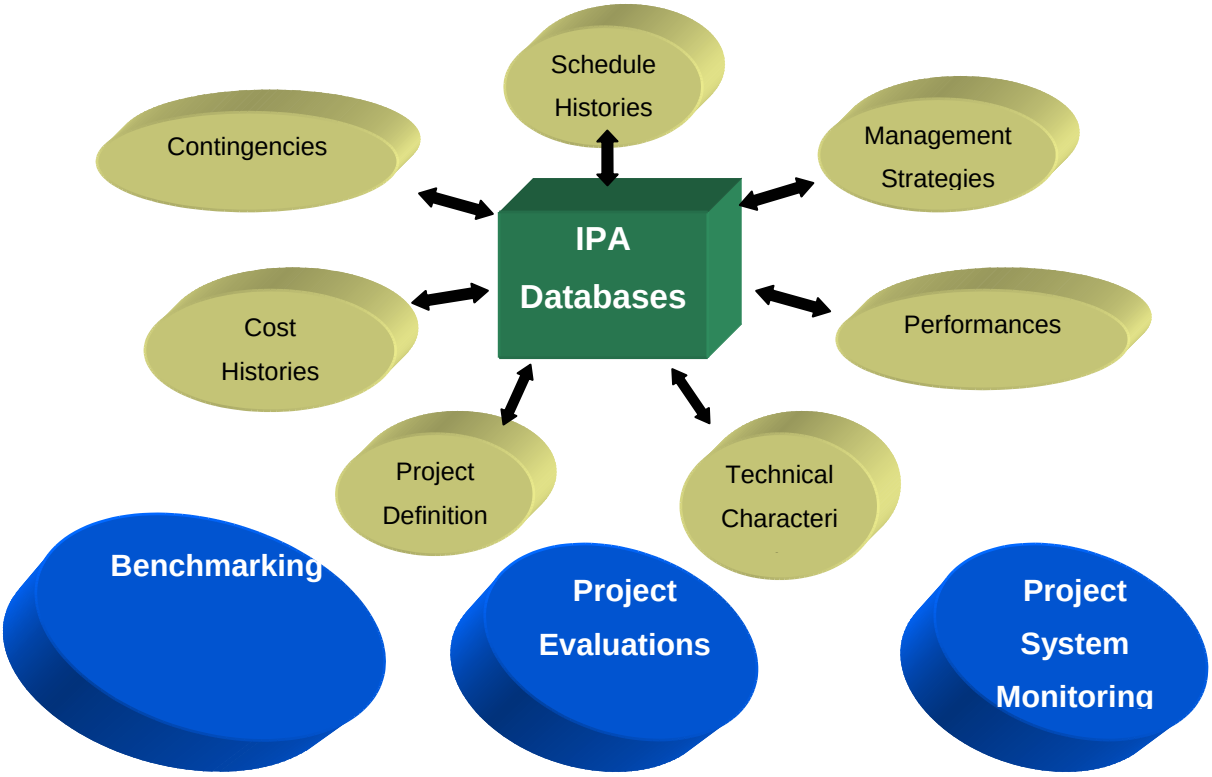
C. Quite detailed: up to 2,000 factors per project

D. Includes all phases of the project life-cycle, from R&D through operations

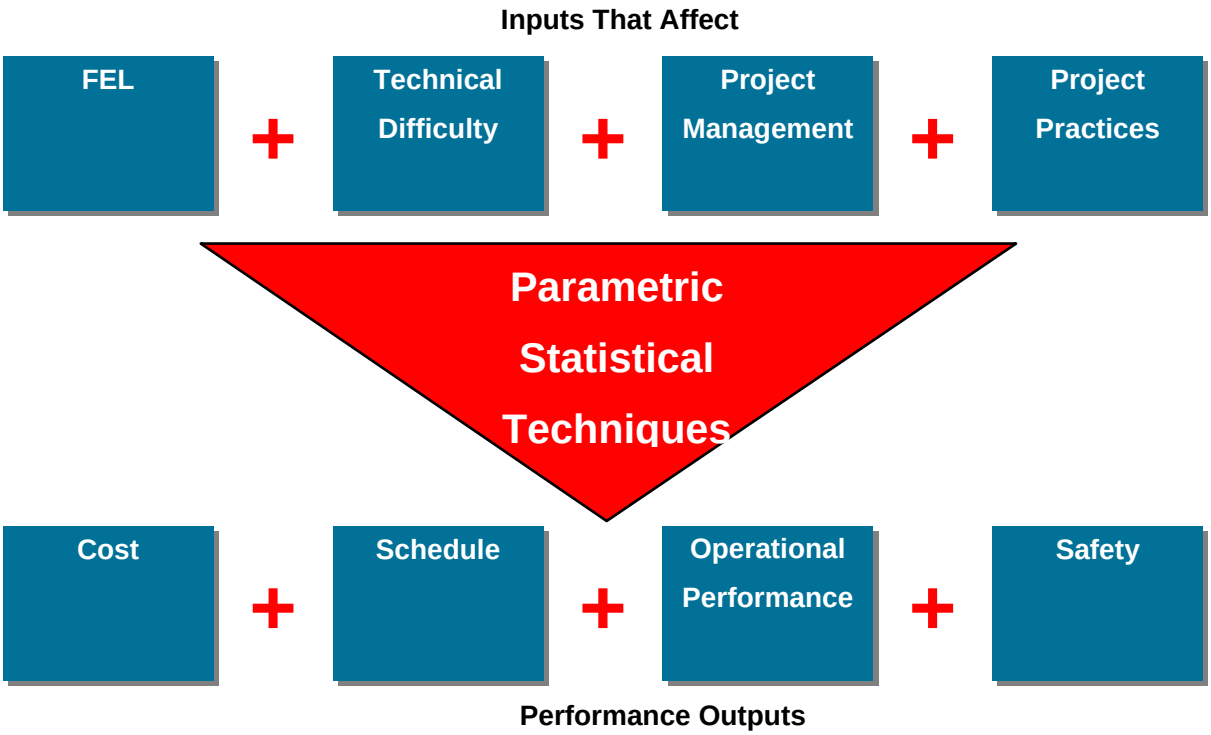
E. All project types covered: greenfield to revamp

F. New projects added constantly

IV. Application of the IPA Methodology



V. IPA Approach: Linking Inputs and Outputs



VI. Research Hypothesis

There is a positive and significant relationship between scheduling practices used early in the project life-cycle and the

ultimate success of the project.

VII. Scheduling Practices Data

A. Collected during every project interview

B. Measures characteristics of the project schedule

C. Anchored at the time of project authorization for all projects in the study

D. Validated with electronic schedule files and hard copy printouts

VIII. Project Outcome Performance Metrics

A. Measure relative performance for a wide range of outcome metrics - not just one success measure

B. Based on data collected after mechanical completion and startup

C. Derived using parametric statistical techniques

D. Normalized based on project characteristics, location, currency, escalation, etc.

E. Includes both predictability and absolute metrics

IX. Predictability vs. Absolute Metrics

Predictability Metric	Absolute Metric
Outcome performance relative to estimated performance	Outcome performance relative to industry average for comparable projects
Based on actual performance of project vs. the estimated performance	Based on performance vs. Industry average - derived using statistical models
Deviations are not normalized for project characteristics	Models normalize for project characteristics
Reported as a percent deviation from the estimated performance	Reported as an index with Industry average set to 1.0
Cost growth & schedule slip	Cost index & schedule index

X. Approach

A. Developed sample database

1. Project scheduling practices
2. Outcome performance metrics
3. Other project practices and characteristics

B. Applied statistical tests

C. Controlled for other project characteristics

D. Interpreted the results and formed conclusions

XI. Sample Characteristics

Characteristic	Study Sample
Number of Projects	494 completed projects
Number of companies represented	59 different owner organizations
Industries	All industries covered by IPA database
Project locations	Worldwide locations
Project types	All project types: Greenfield to revamp
Project sizes	Average estimated cost: $24MM ($100K to almost $1B)

ANALYSIS

XII. Scheduling Practices That Drive Better Project Outcome Performance

A. Integration of all project phases into a single schedule

B. Application of CPM techniques

C. Resource-loading

D. Review by core project team

XIII. Integrated Schedules

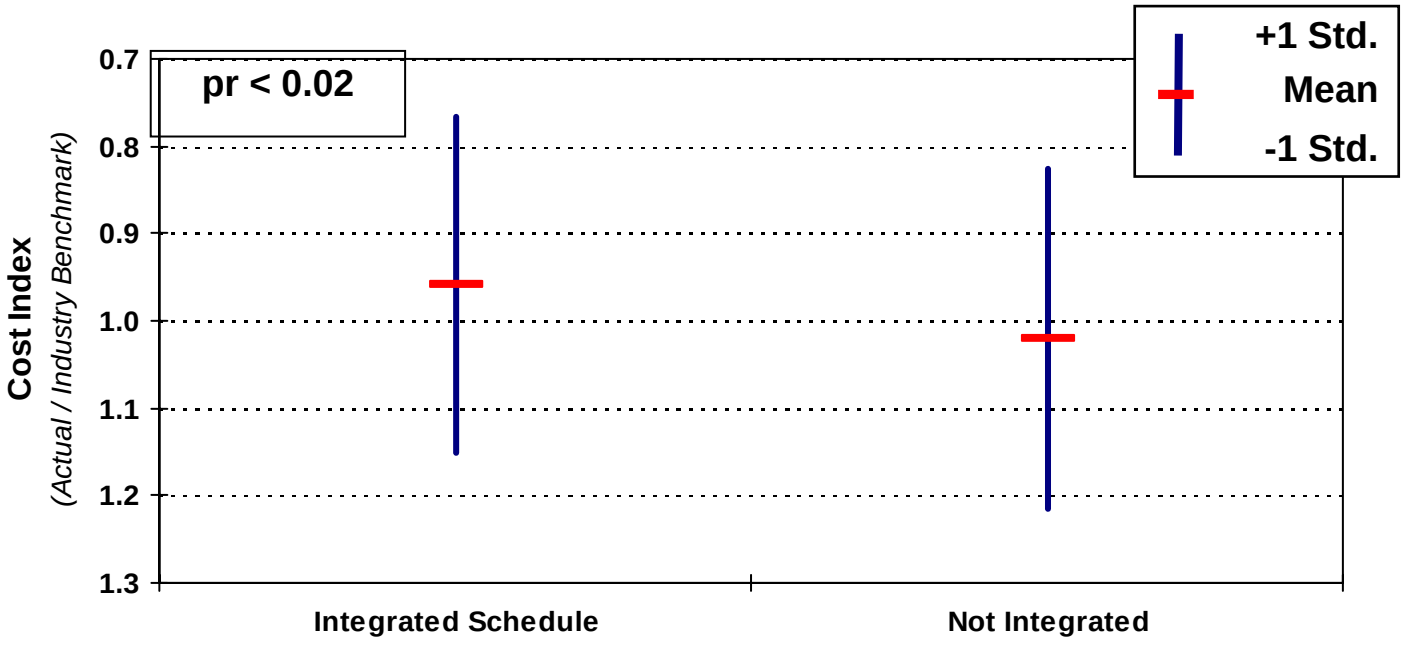
A. Integrates all project phases into a single master schedule

1. Definition, detailed engineering, procurement, construction, shutdown/turnaround, and commissioning and startup

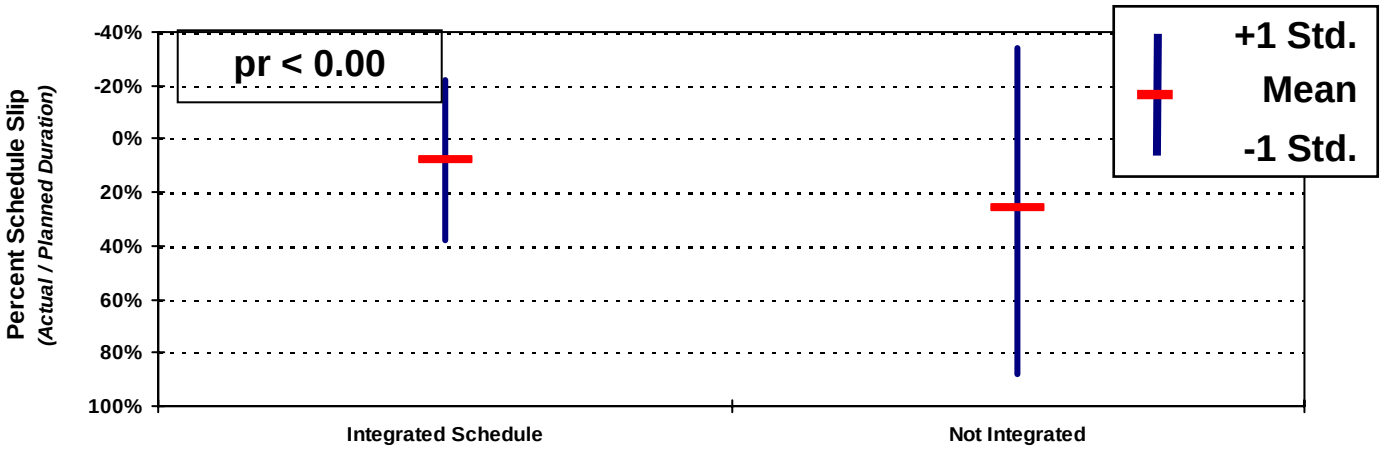
B. Only 33% include all applicable project phases

1. Many missing FEL, shutdown/turnaround, and/or commissioning and startup

XIV. Integrated Schedules - Correlated With Better Cost Performance



XV. Integrated Schedules - Also Correlated With Less Schedule Slip



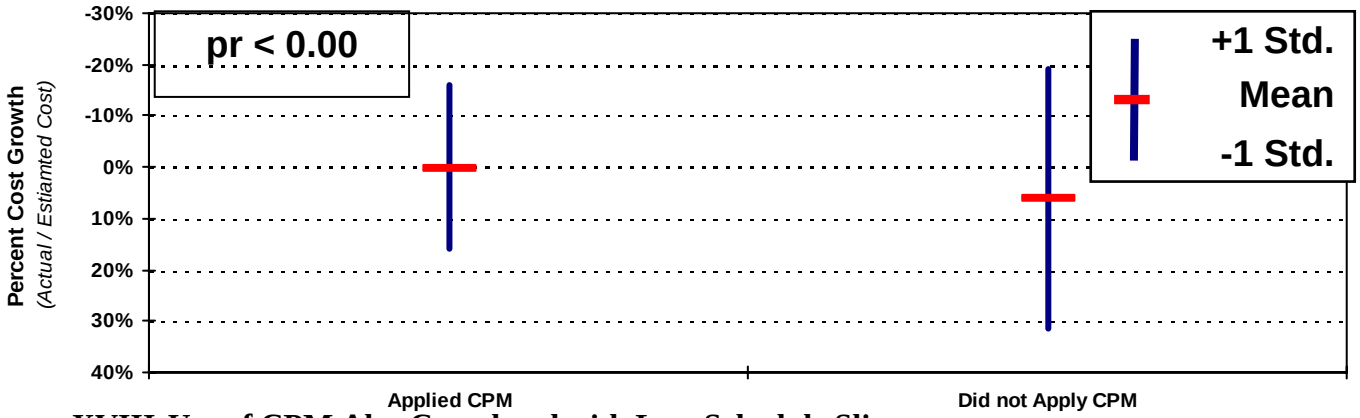
XVI. Based on CPM

A. Is the project schedule based on the Critical Path Method (CPM)?

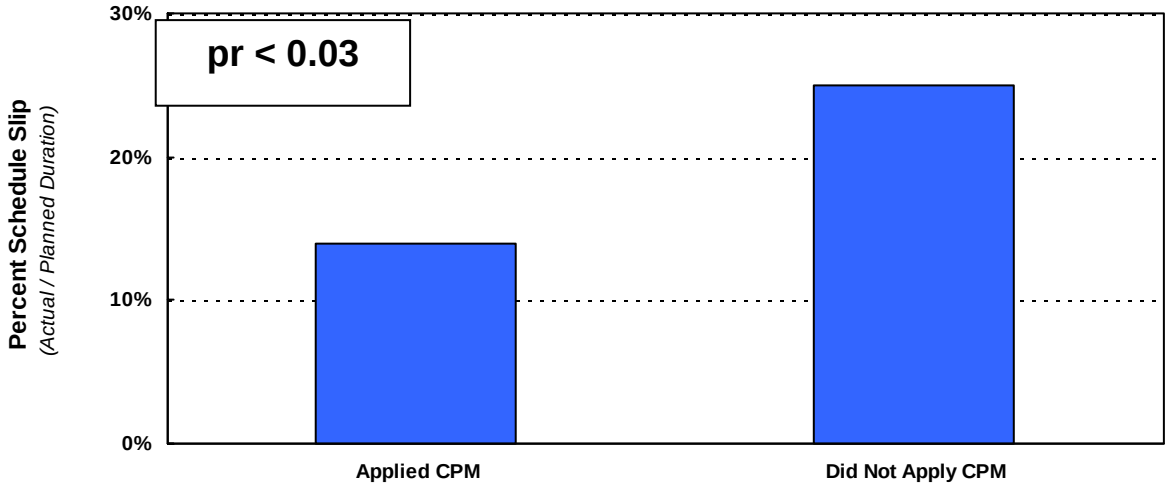
1. Activities networked together
2. Activity start and finish dates based on network calculations
3. Critical path and activity float defined

B. Less than 50% of schedules in the sample were based on CPM

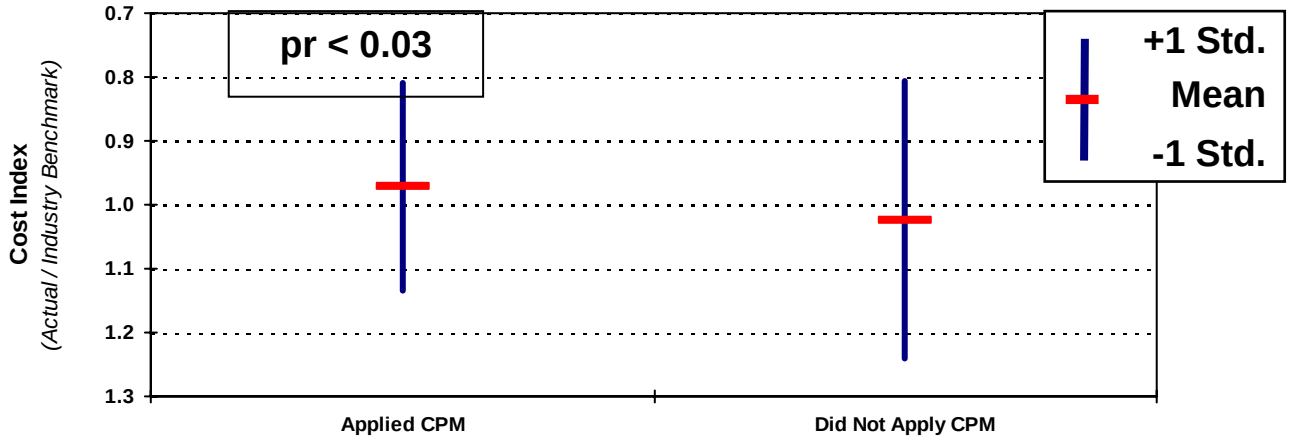
XVII. Use of CPM Correlated with Less Cost Growth



XVIII. Use of CPM Also Correlated with Less Schedule Slip



XIX. Use of CPM Also Correlated With Better Cost Performance



XX. Resource-Loaded

A. Critical project resources loaded into the schedule using appropriate units of measure

B. Only 24% were resource-loaded

C. Mix of resource categories for projects with resource-loading

D. Construction labor 73%

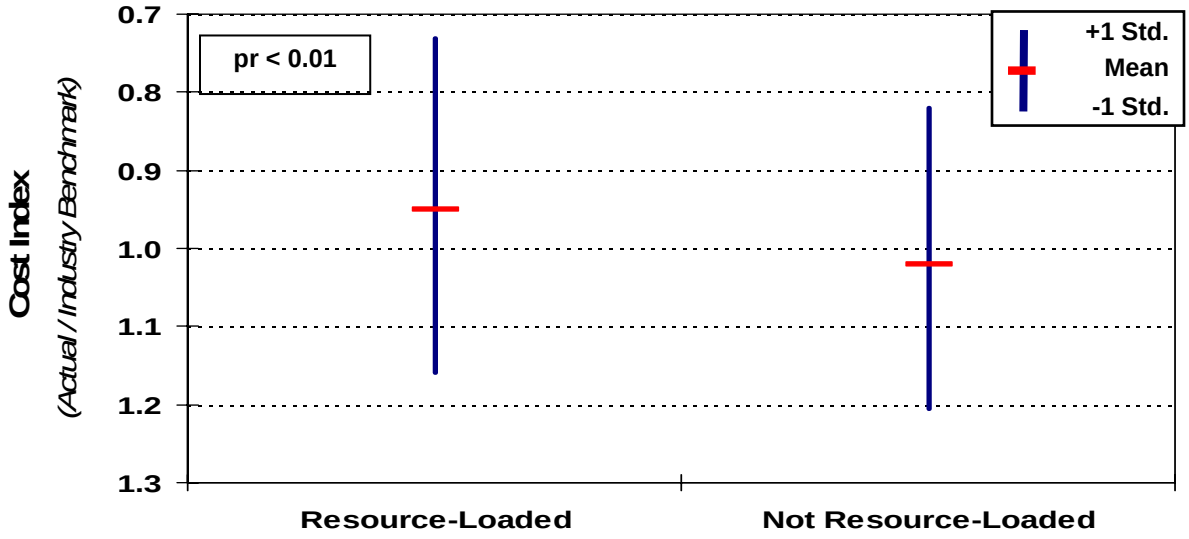
E. Engineering labor 58%

F. Construction Equip. 24%

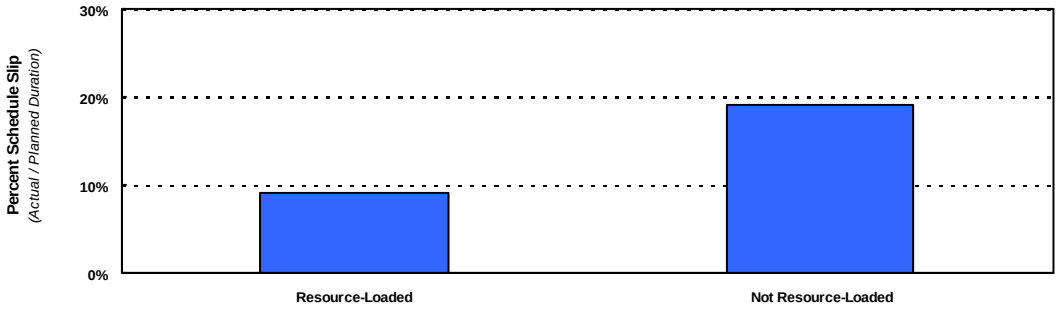
G. Estimated cost 21%

H. Other 10%

XXI. Resource-Loading Correlated with Better Cost Performance



XXII. Resource-Loading Also Correlated with Less Schedule Slip



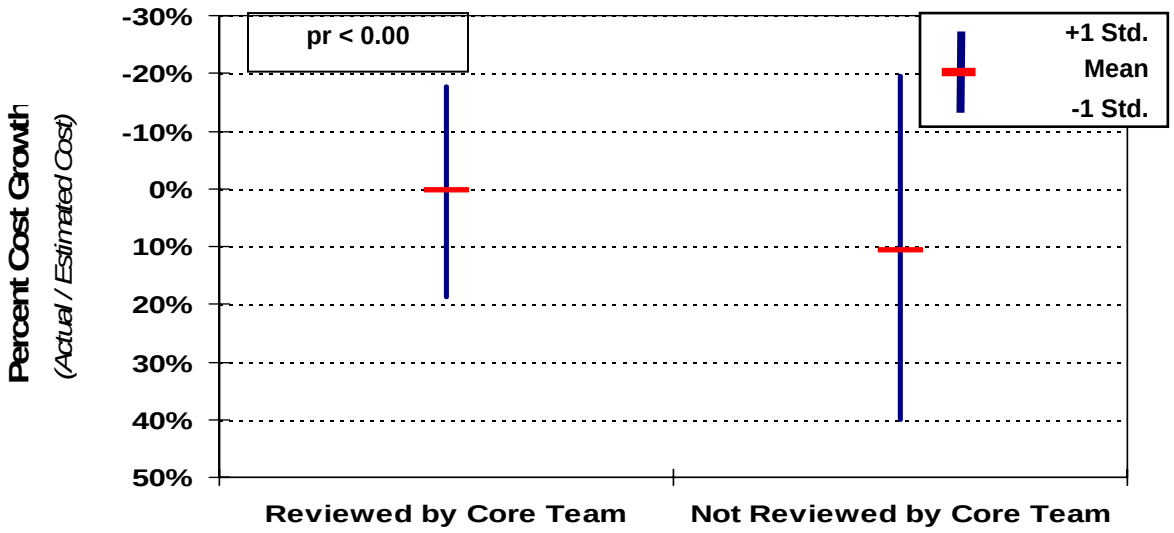
XXIII. Project Team Review

A. Review by the core project team

1. Supports buy-in to plan
2. Provides a check for accuracy and feasibility

B. 76% of the project schedules were reviewed by the team

XXIV. Team Review Correlated with Less Cost Growth



Conclusions and Recommendations

XXV. Single Schedule Definition Rating

A. Definitive - Resource-loaded CPM schedule that covers all major project phases

B. Preliminary - CPM schedule that covers all major project phases, but not resource-loaded

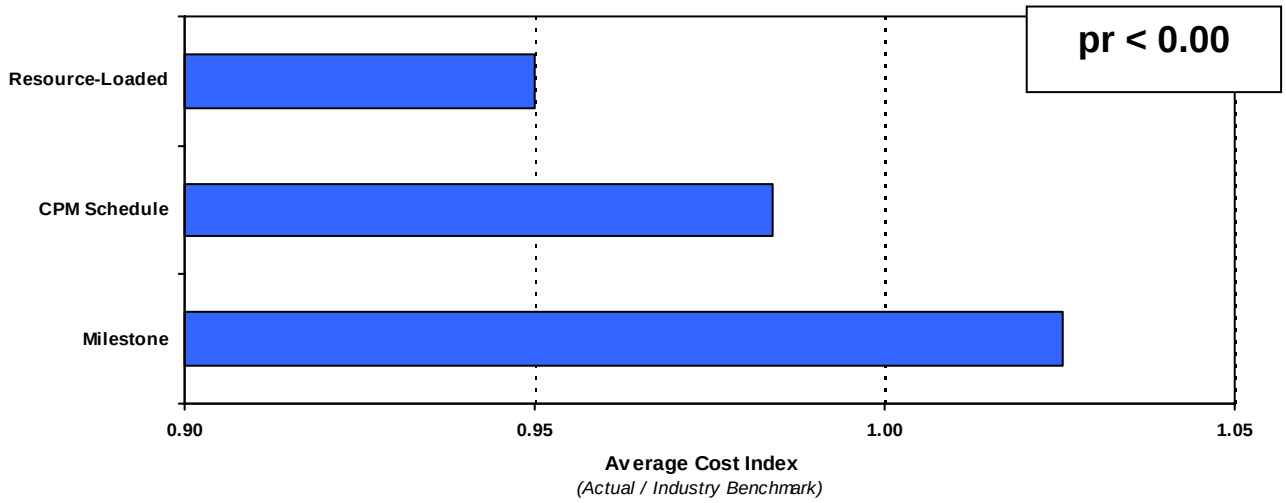
C. Factored - Milestone schedule showing the timing required for major project milestones and phases

D. No Schedule - No project schedule developed other than possibly a target completion date

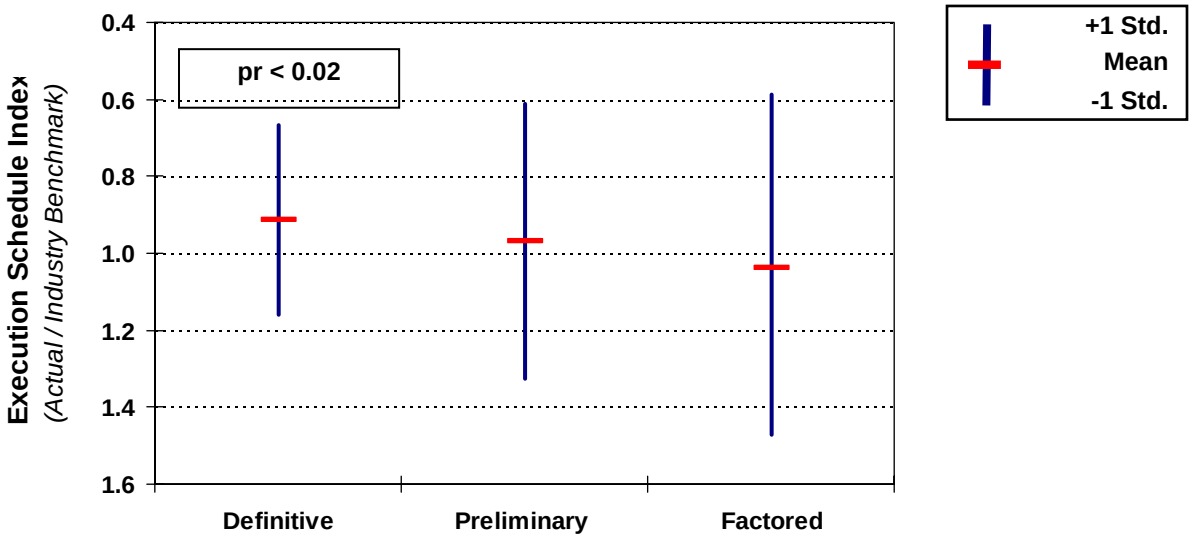
XXVI. Sample Distribution

Definition Rating	Percent of Sample
Definitive	13%
Preliminary	29%
Factored	55%
No Schedule	3%

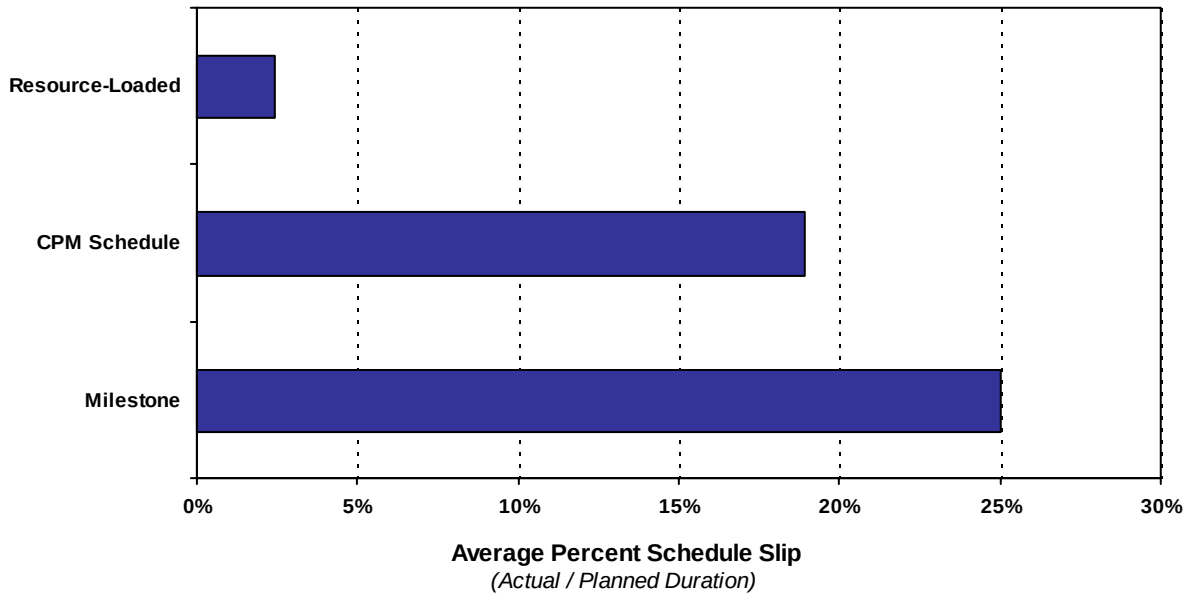
XXVII. Schedule Definition Drives Better Cost Performance



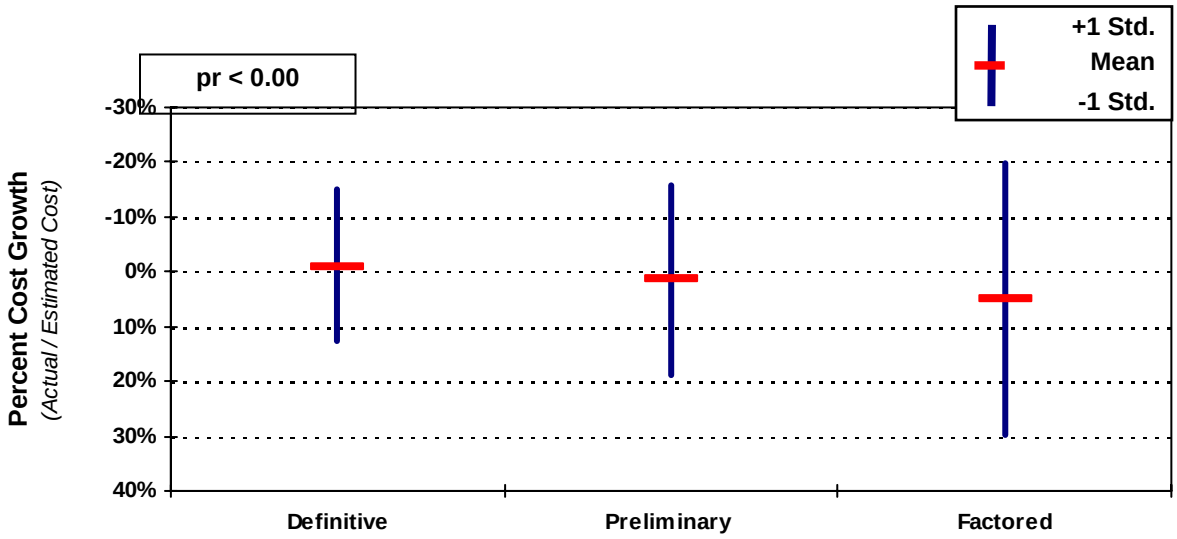
XXVIII. Schedule Definition Also Correlated with Better Schedule Performance



XXIX. Schedule Definition Also Drives Lower Schedule Slip



XXX. Schedule Definition Also Correlated with Less Cost Growth



XXXI. Conclusions

A. Sound scheduling practices drive better project outcomes

B. Significant benefits of good scheduling practices

1. 7% better cost
2. 12% better schedule
3. 6% less cost growth
4. 23% less schedule slip

XXXII. Transferability of Findings

A. Sample is limited to capital projects in the heavy industrial sector

B. Measure of scheduling practices anchored at the time of project authorization - not at the start of construction

However

C. Relationship between practices and outcomes is consistent across project types and industries

D. General findings are applicable to all project types

XXXIII. Recommendations

A. Use the results of this study to help justify the investment in sound scheduling practices

B. Benchmark schedule development

1. Design an applicable metric for schedule definition
2. Systematically measure schedule definition at authorization for all projects
3. Measure trends and strive to improve

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