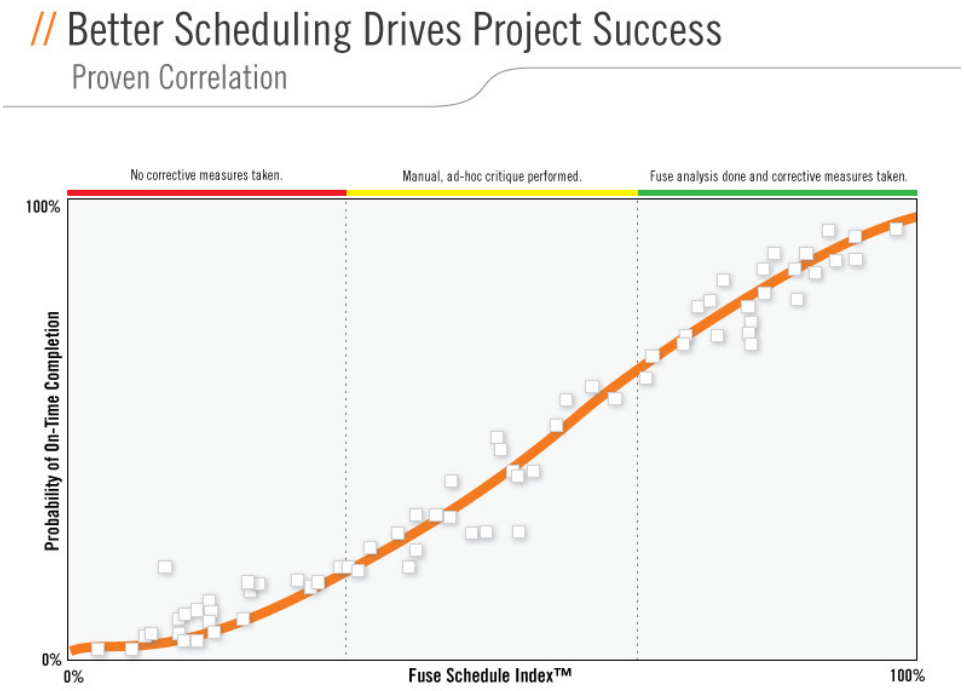
# DCMA 14-Point Assessment Metrics

The integrity of a CPM schedule is one of the critical factors in improving a project's likelihood of success[1]! There is a well-established correlation between the quality, or soundness, of a project schedule and the resulting execution performance.




However, defining a 'better schedule' is not straightforward. The USA Defense Contract Management Agency (DCMA) has developed a set of standards that (when met) indicate a well-built plan. These checks were developed to identify potential problem areas within a schedule. However, conforming to the checks does not of itself indicate the schedule is sensible, realistic, and achievable; correlation is not the same a causation – the analyst still needs to look at the schedule from a common-sense perspective[2].

The DCMA metrics are designed to provide the analyst with a framework for asking educated questions and performing follow-up research. The identification of a metric that does not conform to the requirements is not in and of itself synonymous with failure but rather an indicator to dig deeper in the analysis for understanding of the reason for the situation.

The implementation of the DCMA 14-Point Assessment in the various software tools is not certified by the DCMA or any other body and varies between the tools! The biggest issue is around counting of the number of tasks to be considered. The 2012 version stated that the Total Tasks should **exclude**: Completed tasks,

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1 See ***Proof of the blindingly obvious***: https://mosaicprojects.wordpress.com/2011/11/11/proof-of-the-blindingly-obvious/

2 The last published version of the DCMA 14 Point Checklist is in section 4 of the ***Earned Value Management System (EVMS) Program Analysis Pamphlet (PAP), DCMA-EA PAM 200.1 published October*** 2012. Download DCMA-EA PAM 200.1: https://mosaicprojects.com.au/PDF-Gen/DCMA-PAM-200-1.pdf

LOE tasks, Subprojects (called Summary tasks in MS Project), and Milestones (Zero Duration Tasks). This differs from the 2009 update, and the 2009 update changed from earlier versions.

Each of the checks included in the latest DCMA 14 Point Assessment are detailed below.

### 1. Logic

**Description:** The number of incomplete activities that are missing a predecessor, a successor or both should not exceed 5% of the activities within the schedule.

**Notes:** Each activity should have at least one predecessor (connected to its start) and one successor (connected to its finish) associated with it. Failure to do so will impact the quality of results derived from a time analysis as well as risk analysis[3]. This includes checking for 'Dangling Activities' that have only a start predecessor relationship or only a finish predecessor relationship and not both. Activities that do not have a logic to initiate the start or a logical dependency after completion are poor candidates for being able to display the results of unplanned delays. This condition is more often found in MS Project schedules, as the tool does not allow for relationships pairs such as Start-to-start and Finish-to-finish to exist between the same two activities in the way P6, Micro Planner and Open Plan do.

### 2. Leads

**Description:** This check identifies any incomplete (in progress or not started) activities that are carrying a lead (also known as a negative lag). The DCMA require no leads (0%)

**Notes:** Leads or negative lags are often used to advance the successor start or end date relative to the logic link applied. Doing so can result in the successor starting before the start of the predecessor. **Note**: the banning of the use of negative lags is not based upon any universal scheduling principle; negative lags may just indicate the overlap of discrete work while a positive lag can be used to represent actual work, which is against CPM principals.

### 3. Lags

**Description:** Total number of activities with lags in its predecessor logic should not exceed 5% of the activities within the schedule.

**Notes:** Lags are positive durations or delays associated with logic links to delay the start of the successor activity. Lags tend to hide detail in schedules and cannot be statused like normal activities. Lags should typically be replaced with activities.

### 4. FS Relations

**Description:** Total number of activities with Finish to Start (FS) logic links >90%. Non-typical tasks limited to <10 % of total tasks.

**Notes:** Finish to Start (FS) links provide a logical path through the project and should be at least 90% of the logic within the schedule. Other link type should be less than 5%, mainly Start-to-Start (SS) and Finish-to-Finish (FF). Start to Finish relationships are used to portray a sequential series of work where the successor cannot finish until the predecessor starts. SF links should be used very rarely and with detailed justification.

### 5. Hard Constraint

**Description:** Number of activities with hard or two-way constraints should not exceed 5%.

[3] See ***Dynamic Scheduling***: https://www.mosaicprojects.com.au/PDF-Gen/dynamic_scheduling.pdf

**Notes:** Hard or two-way constraints such as *Must Start On* or *Must Finish On, Start No Later Than, Finish No Earlier Than,* should be avoided as they can result in a misleading schedule forecast. Consider using soft constraints if absolutely necessary, eg, *Start No Earlier Than*.

### 6. High Float

**Description:** Number of activities with total float greater than 2 months (44 working days) should not exceed 5%.

**Notes:** Schedule paths with high amounts of float typically arise due to artificially constrained activities (see check # 5). Paths with finish float of more than two months should be considered for acceleration and schedule optimization. This check applies to all normal activities, milestones, summaries, and level of effort (hammocks) that are planned, in-progress, or complete.

### 7. Negative Float

**Description:** No activities that are incomplete should have total float that is less than 0 working days. Tasks with negative float should have an explanation and a corrective action plan to mitigate the negative float.

**Notes:** Negative float is a result of an artificially accelerated or constrained schedule. Negative float indicates that the schedule is not possible based on the current completion dates. Compare this to activities with Hard Constraints to determine which activities (with negative float) are being impacted by constraints. Ideally, there should not be any negative float in the schedule.

### 8. High Duration

**Description:** The total number of activities that have a duration longer than 2 months (44 working days) and have a baseline start date within the detail planning period are included in this metric, and should not exceed 5%.

**Notes:** High duration activities are generally an indication that a plan is too high level for adequate planning and controls. Consider further developing the schedule adding more detailed activities. There is an exemption for 'Rolling Wave' schedules. To be counted as a High Duration task, the activity must also have a baseline start within the detail planning period or rolling wave period. This allows for place holders for future work that has not been adequately defined. Rolling Wave[4] schedules reduce the accuracy of CPM calculations and increases the risk that you will improperly identify the critical path but are essential if detailed information is not available.

### 9. Invalid Dates

**Description:** There should not be any invalid dates in the schedule defined as activities with planned work in the past or actual work completed in the future indicated by all actual dates being prior to the data date and all forecast dates being on or later than this date.

**Notes:** Invalid dates are a reflection of 'loose' scheduling engines not correctly enforcing standard schedule logic. It is impossible to have planned activities prior to the time now/data date and similarly, activities cannot be statused showing work completed in the future. This is a key schedule quality check that pinpoints activities that could have a major erroneous outcome on the dates in the schedule.

[4] For more on ***Rolling Wave*** see: https://www.mosaicprojects.com.au/WhitePapers/WP1060_Rolling_Wave.pdf

### 10. Resources

**Description:** All incomplete tasks should have resources (hours/$) assigned. This check verifies that all tasks with durations of 1 or more days have $ or resources assigned[5].

**Notes:** Useful for determining whether a schedule has been resource loaded in its entirety or not.

### 11. Missed Activities

**Description:** Number of activities that have slipped from their baseline dates should not exceed 5%. Identifies tasks that are supposed to have been completed (prior to the status date) with actual or forecast finishes after the baseline date, OR have a finish variance greater than zero

**Notes:** The number of activities that have been completed behind the baseline completion date is a good indication of execution performance and how well (or poorly) the schedule is meeting the baseline plan.

### 12. Critical Path Test

**Description:** This check evaluates the project's network logic, particularly for the critical path and is a 'what-if' test performed directly on the schedule. Its intent is to identify a current critical path activity, to grossly extend its remaining duration, and note if a corresponding extension occurs to the project completion date.

**Notes:** Performed as a test to identify broken logic or where the project completion date is NOT affected by delays in directly proportion to the amount of delay applied. This test ensures that a schedule has been built using CPM and meets the other 13 DCMA requirements.

### 13. CPLI

**Description:** Calculation of the Critical Path Length Index (CPLI) verifies that the critical path makes sense and that the critical path is "believable" Ratio of critical path length + total float to the critical path length should = 1 (>1 favourable; <1 unfavourable)

**Notes:** The Critical Path Length Index (CPLI) is a measure of the relative efficiency required to complete a milestone on time, or how close a critical path is to the project target completion date. A project with an aggressive or conservative completion date may not carry the same overall duration as that of the critical path through the network. CPLI of greater than 1 indicates that a schedule is conservative with a very high chance of early completion. A CPLI of less than 1 is very aggressive with a very high chance that completion will overrun beyond the target project completion date[6].

### 14. BEI

**Description:** Calculation of the Baseline Execution Index (BEI). BEI is the ratio of the number of tasks completed to the number that should have been completed by the status date. BEI should be > .95 (>1 favourable; <1 unfavourable)

**Notes:** An indication of the efficiency with which actual work has been accomplished when measured against the baseline. The more activities that are completed either on time or ahead of the baseline schedule will reflect a BEI of 1 or more. Conversely, a BEI of less than 1 reflects less than forecasted schedule execution. This check applies to all normal activities, milestones, summaries, and level of effort

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[5] **Note:** The GAO ***Schedule Assessment Guide*** now require all schedules to be both resourced and risked, see: https://www.mosaicprojects.com.au/PMKI-SCH-010.php

[6] For a detailed description of the CPLI see clause 3.1.2.3 in DCMA-EA PAM 200.1: https://mosaicprojects.com.au/PDF-Gen/DCMA-PAM-200-1.pdf

(hammocks) that are planned, in-progress, or complete. Studies have indicated that the BEI provides an earlier, early warning indicator for schedules in danger of missing their deadline than many other tools[7].

### Summary[8]

Before the 14-Point Checks can be considered, the protocol requires the total number of activities and relationships that are to be considered, to be defined and counted. For most checks, the limits are defined as ratios of 'faults' compared to these numbers. The 'count' should exclude: Completed tasks, LOE tasks, Subprojects (called Summary tasks in MS Project), and Milestones.

When using the DCMA checks, many of the terms used such as 'Total Task' are not an industry term and can cause confusion similarly some of the checks (such as the prohibition of 'Leads') are not necessarily valid in all situations. Fortunately, these problems are easily solved.

At least three validation tools can import a project file from most of the standard scheduling tools, do the 'counting' and apply both the DCMA checks and a range of other checks to assess the technical correctness of the schedule. This automation of the checking of schedules for compliance with the DCMA 14 point assessment (or selected checks from within the 14 points) and other desirable checks with some of the basic checks being free should drive improvements in planning practice and make specifying the quality of a schedule required from a contractor very simple.

## Additional Checks

As well as the 14 Points, there are many other potential checks. Some include:

- **Redundant relationships**: unnecessary logic in the network (also 'link-density' the average number of links per task)
- **Out-of-sequence progress**: correction needed to logic
- **Resources on summary tasks**: this may, or may not be appropriate depending on the resource.
- **Relationships on summary tasks**: Should not be allowed.

## Core Traits of a Reliable Schedule[9]

Less prescriptive than the '14 Points', the *Core Traits of a Reliable Schedule* is aimed at codifying schedule best practices. The Authors have endeavoured to codify the essential elements of a reliable schedule into a comprehensive protocol. It organises established and emerging best practices for CPM and GPM schedules into 20 core traits.

- 'A' Traits correspond to comprehensive schedules,
- 'B' Traits correspond to credible schedules,
- 'C' Traits correspond to well-constructed schedules, and
- 'D' Traits correspond to controlled schedules.

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7 For a detailed description of the BEI see clause 3.1.2.4 in DCMA-EA PAM 200.1: https://mosaicprojects.com.au/PDF-Gen/DCMA-PAM-200-1.pdf

8 Undertaking a schedule assessment on its own is unlikely to be adequate – for more on the need for overall project surveillance and the full range of topics to check and validate in a project 'health check' see; ***Proactive Project Surveillance***: https://www.mosaicprojects.com.au/WhitePapers/WP1080_Project_Reviews.pdf

9 A useful free synopsis can be downloaded from: https://pmaconsultants.com/services/innovation/core-traits-of-a-reliable-schedule/

The 20 best practices are:

**A1 Aligned** - The schedule portrays a viable plan that aligns with the planning basis, subcontractors' schedules, and the procurement approach.

**A2 Complete** - The entire work, including specified responsibilities of the owner and third parties, is captured by activities, logic ties, and events.

**A3 Conforming** - The schedule complies with contract dates, sequences, & other conditions; the initial schedule data date = contract start date.

**A4 Formulaic** - Physical work activity durations are largely formulaic, or are endorsed by activity owners, and align with the schedule level.

**A5 Resourced** - The schedule reflects the resources needed, their availability to support the rate of progress, and known availability limits.

**B1 Predictive** - The schedule establishes valid critical and near-critical paths; in the initial schedule, the critical path has total-float ≥0.

**B2 Risked** - Using risk assessment, the schedule is established with schedule margin sufficient to support the targeted probability threshold.

**B3 Weather-Fit** - The schedule correctly integrates normal adverse weather according to the controlling specifications and best practices.

**B4 Resource-Flowing** - Resource-flow logic ties portray crew movements, equipment logistics/reuse work-flow, and material reuse work-flow.

**B5 Flexible** - Level 3 schedule[10] -flexibility right of the data date is adequate for mitigating delay/floating and for resource leveling.

**C1 Hierarchical** - The baseline is developed as a level 2 schedule that serves as the basis for, and remains traceable to, the level 3 schedule.

**C2 Phased** - Construction phases from site work to closeout align with the planning basis; construction phase durations are benchmarked.

**C3 Logical** - FS logic is favored; constraints, FS lags, FS leads, and zero-lag SS & FF logic are used judiciously and, when used, are justified.

**C4 Connected** - Every activity has at least one FS or SS predecessor and one FS or FF successor; paired SS/FF logic is used judiciously.

**C5. Calendar-Fit** - Calendars used to calculate the schedule reflect the planning basis, the working schedule, and other limiting factors.

**D1 Statused** - The schedule is accurately statused using reliable, documented protocols; imminent level 3 schedule activities are resource leveled.

**D2 Weathered** - The schedule is used to evaluate weather delay and/or gain originating from actual weather conditions in the prior month.

**D4 Forensic** - In a statused or revised GPM schedule, the critical path is identified left of the data date (from the project start event to the data date).

**D5 Trended** - Activity rate of completion is sufficient so the scope of remaining activities is congruent with an achievable rate of progress

For information on the indicators used to assess these practices and the consequences of failing to apply them download the free from: https://pmaconsultants.com/services/innovation/core-traits-of-a-reliable-schedule/

[10] For more on schedule levels see: https://www.mosaicprojects.com.au/PDF-Gen/Schedule_Levels.pdf

## Validation Tools

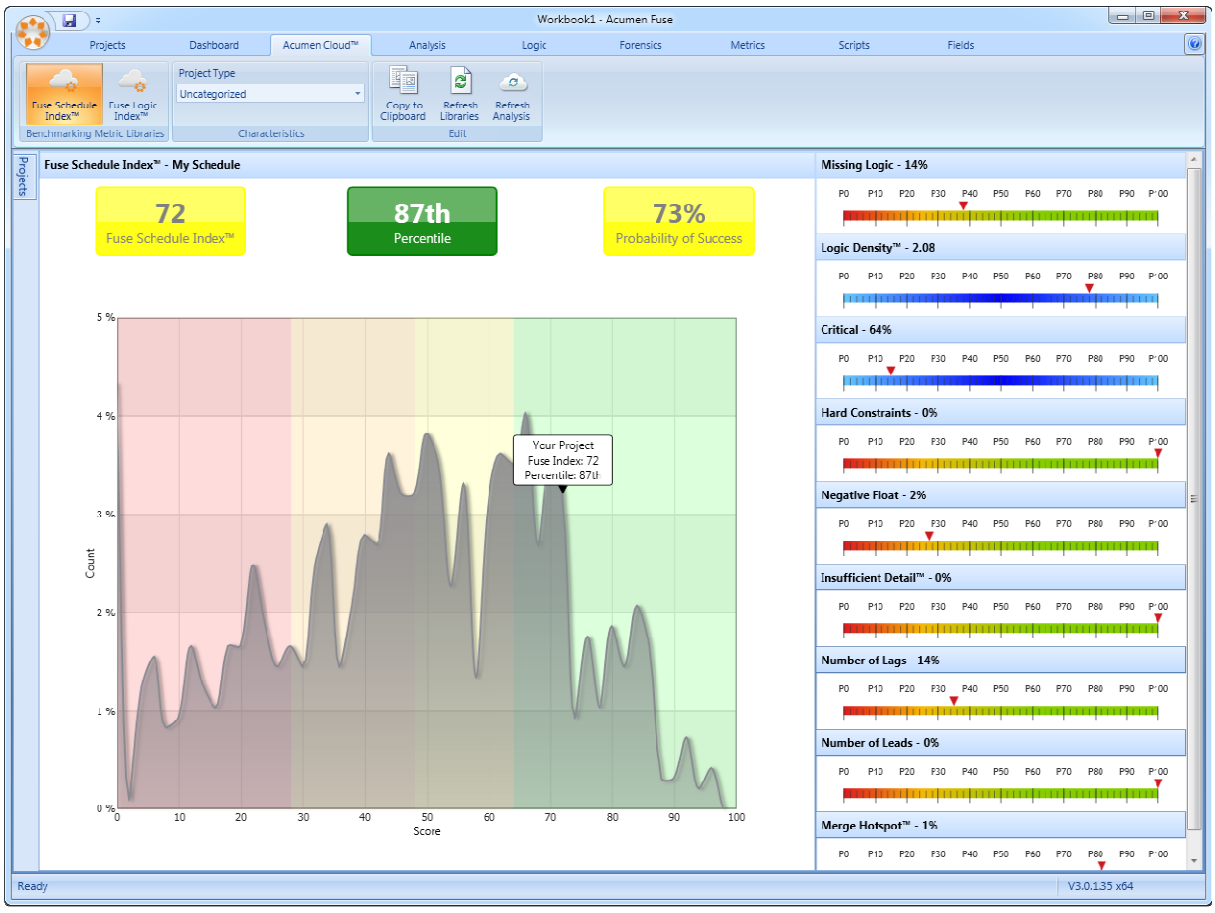
**Acumen Fuse:** https://www.deltek.com/en/products/project-and-portfolio-management/acumen/acumen-fuse

Inaccurate schedules do not help to achieve success. Schedule analytics, help the project team to:

- Build a better schedule
- Improve project confidence; and
- Achieve successful-on-time and on-budget projects, again and again

Acumen Fuse allows project teams to not only calculate their score, but pinpoint the weaknesses driving that score and immediately correct them. It is a comprehensive project analysis, visualization and problem resolution platform that complements your existing scheduling tools to:

- help you build sound, realistically do-able schedules without manual critique;
- provide you with the schedule checks and execution tracking necessary for understanding your schedule quality, cost forecast accuracy, risk model realism, earned value and performance; and
- give you a repeatable way to pinpoint weaknesses and gauge the impact of schedule changes




**Overall benchmarking report from Acumen.**

The Schedule Index™ Calculator is a free web utility that provides planners and schedulers with a direct means of calculating their schedule quality and determining the likelihood of a successful on-time completion


Detail assessment from Acumen

**Schedule Analyzer:** http://scheduleanalyzer.com

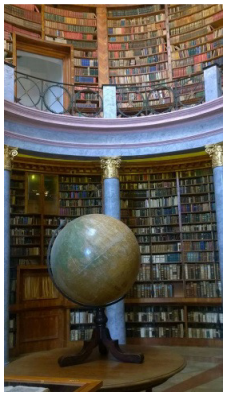
Schedule Analyzer™ is a complete set of tools to assist the professional Scheduler and Claims Analyst in performing their job better, quicker, and smarter. Review your Baseline Schedules or your Updates with speed and accuracy. For Primavera P3 or P6, detailed analysis and expert recommendations with a wide range of capabilities and reports for schedule maintenance add the eForensic package for forensic analysis.

**Schedule Inspector:** https://www.barbecana.com

Barbecana's Schedule Inspector does 28 different tests on your schedule, including all 14 points in the Defense Contract Management Agency's (DCMA's) assessment guide for Microsoft Project 2007 or 2010 schedules, plus many others including: redundant relationships, out-of-sequence progress, connectivity index (ratio of relationships to tasks), and resources or relationships on summary tasks

## Useful documents:

***GAO Schedule Assessment Guide*** http://www.gao.gov/products/gao-16-89g





For more information on scheduling and planning, visit Mosaic's scheduling home page at: https://mosaicprojects.com.au/PMKI-SCH.php