Develop and Analyse Project Schedules for Realism:

Part 2 – Assessing schedules for realism

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This is the second part of a 2-part series of articles covering the development and control of robust, but realistic, project schedules. The focus of the articles is as follows:

- Part 1 – A composite scheduling process (published November 2016); and
- Part 2 – Assessing schedules for realism.

This second part is an overview of schedule assessment metrics that can be used to ensure that project schedules are realistic.

Introduction

It is a common management phrase which states that "if you want to manage it, then measure it". To this end, various metrics have been developed and used by various organisations to assess the quality of schedules to improve project performance. Some of the more well-known are:

- The Defense Contract Management Agency (DCMA), which has developed criteria for performing an objective and thorough analysis of a schedule;
- The National Defense Industrial Association (NDIA), in its Planning and Scheduling Excellence Guide (PASEG) (2016), describes, in addition to the DCMA criteria, a set of generally accepted scheduling principles (GASP); and
- The US Government Accountability Office (GAO) (2015) with its guide, the GAO Schedule Assessment Guide: Best Practices for Project Schedules.

While the guides mentioned above are all written with a focus on government projects, I have not found anything that is not applicable to projects in general. In fact, many times in the past it has been shown that the United States of America's Defense Force are at the leading edge of developing useful procedures, standards or other tools that become useful to industry in general. In this article, we'll consider each of these guides

in turn, and then try to identify areas of difference that can be considered useful in putting an enhanced or improved schedule quality assessment system in place.

Background

According to Winter (2011), the USA Under Secretary of Defense for Acquisition and Technology mandated the use of an Integrated Master Schedule (IMS) for contracts greater than US$20 million in March 2005. He also directed the DCMA to establish guidelines and procedures to monitor and evaluate these schedules. The DCMA then internally produced a programme in response to this requirement and released their 14-Point assessment checks as a framework for schedule quality control.

However, according to the National Defense Industrial Association (NDIA), the generally accepted scheduling principles (GASP) were originally developed as a governance mechanism for the Program Planning and Scheduling Subcommittee (PPSS). The PPSS is a subcommittee formed by the Industrial Committee on Program Management (ICPM) working group under the auspices of NDIA. The GASP was thus developed collaboratively with inputs from both Government and Industry.

I think that in the context of this article, the important issue is that there is a GASP, irrespective of who developed it. It is also essential to understand that GASP is intentionally broad and sets high expectations for excellent scheduling, yet do not specify methodologies. Therefore, avoid viewing the GASP as dogma; instead, continually strive to meet or exceed the GASP with creative and practical approaches that work for the size, value, risk, and complexity of the program and the skills and capabilities of the programme team.

The DCMA Generally Accepted Scheduling Practices

The Defense Contract Management Agency's schedule assessment system helps in determining schedule consistency, allows for constructive discussions based on the analysis, facilitates setting of realistic schedule baselines, is based on proven metrics and provides two tripwires for early detection of possible deviations against standard.

The generally accepted scheduling principles (GASP) are eight over-arching tenets for building, maintaining, and using schedules as effective management tools. The GASP is concise and easily understood, yet sets high expectations for programme or project management teams to develop and use schedules.

The first five GASP tenets describe the requisite qualities of a valid schedule; that is, one that provides complete, reasonable, and credible schedule information based on realistic logic, durations, and dates. The latter three GASP tenets reflect increased scheduling maturity that yields an effective schedule. An effective schedule provides timeous and reliable data, aligns time-phased resources, and is built and maintained using controlled and repeatable processes. Figure 1 below shows the groupings.

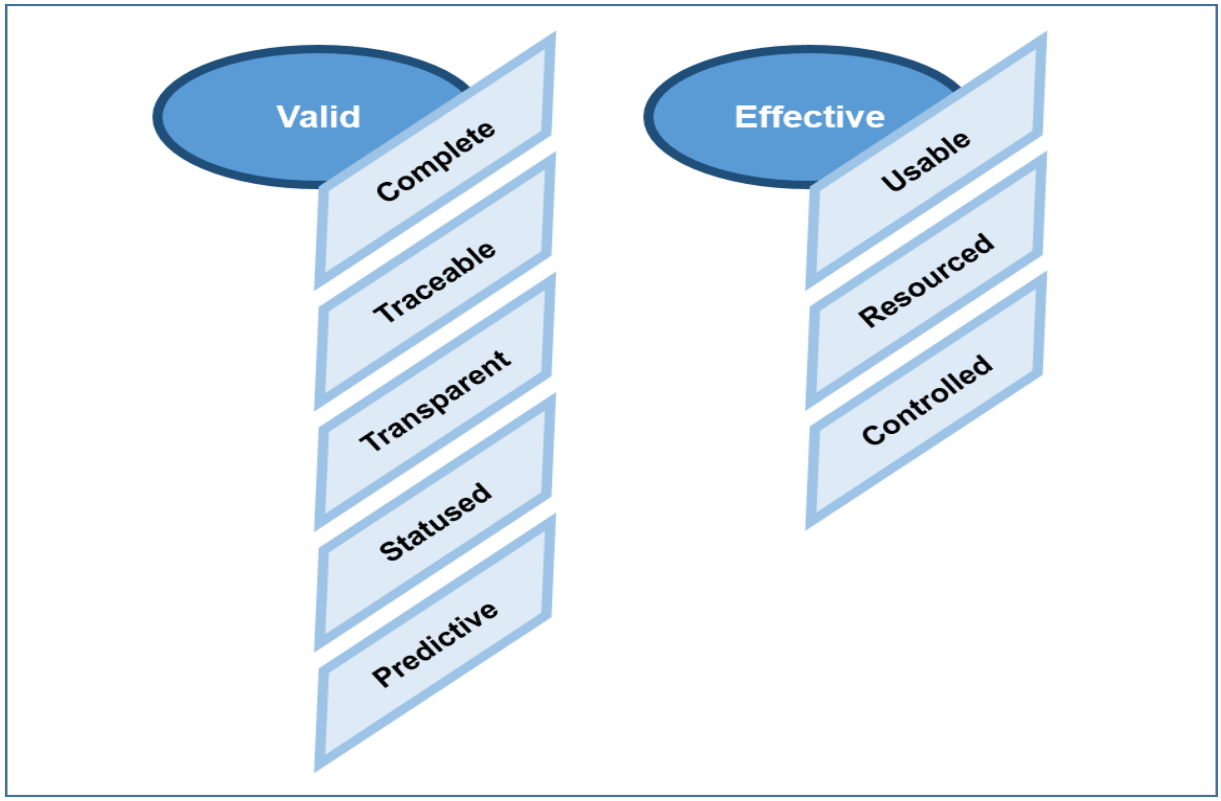

Figure 1: The GASP tenet groupings

The GASP tenets serve several purposes, including that:

- They provide high level targets for sound scheduling;
- They also serve as a validation tool for the programme team or organisation to assess the schedule maturity or areas needing improvement;
- They can be used as a governance tool to assess new or different scheduling approaches with objectivity and detachment; and
- They can be used as a compliance standard in contracts for the accepted schedule.

Achieving a GASP-compliant schedule indicates it is not merely healthy, but fit. A healthy schedule is functional and meets minimum management purposes, but a fit schedule is robust and dynamic.

Let us now consider each of the 8 tenets and where the 14-point assessment checks fit in, starting with the "Valid" group of tenets:

- **Tenet 1 - Complete:** Schedules must represent authorised discrete effort for the entire contract.
    - Assessment Point 1: High Duration – A high proportion of activities with this condition indicates a distinct lack of sufficiently detailed plans.

- **Tenet 2 - Traceable:** Schedules reflect realistic and meaningful network logic that horizontally and vertically integrates the likely sequence for project execution. Coding plays a large part in this principle.

    - Assessment Point 2: Missing Logic – This metric is used to test the "completeness" of the schedule and see how well the activities in the schedule are linked together.

    - Assessment Point 3: Relationship Types - The use of Finish to Start should be the most widely used, Start to Start and Finish to Finish used sparingly and Start to Finish used by exception.

- **Tenet 3 - Transparent:** Schedules provide full disclosure of project status and forecast and include documented ground rules, assumptions, schedule building and maintaining methods, approach to analysing critical paths, etc.

    - Assessment Point 4: Activities with Leads – The use of leads (negative lags) normally indicates that the schedule is not detailed enough or the scheduler is trying to "fix" activity dates. This makes it harder to analyse the critical path, distorts the total float in the schedule and may cause resource conflicts.

    - Assessment Point 5: Activities with Lags - The use of excessive lags complicates the schedule to the point of not being maintainable and ineffective in forecasting future dates. This makes it harder to analyse the critical path.

- **Tenet 4 - Statused:** Schedule reflects consistent and regular updates of completed work, interim progress, achievable remaining durations relative to status date and accurately maintained logic relationships.

    - Assessment Point 6: Invalid Dates – Activities that have not started should not have projected start or finish dates before the status date. Activities should also not have actual start or finish dates after the status date.

    - Assessment Point 7: Missed Activities – This metric checks for the number of activities that have missed their baseline finish dates and are therefore not meeting the baseline plan.

    - Assessment Point 8: Baseline Execution Index (BLI) – Measures the percentage of activities completed as a percentage of the activities that should have been completed.

- **Tenet 5 - Predictive:** Schedules accurately forecast the likely completion dates and impacts to the project baseline plan through valid network logic and achievable task durations from the status date to project completion.

    - Assessment Point 9: High Float – Excessive amounts of positive float may indicate incomplete schedule logic or an unstable network. Large negative float values may indicate a scheduler capturing the date incorrectly.

- Assessment Point 10: Negative Float – Float less than 0 working days is considered negative float. This indicates that the project is overrunning its stated completion date and re-planning needs to take place to correct the situation.
- Assessment Point 11: Critical Path Test – This test must be run manually. It is used to check the integrity of the critical path by ensuring that a delay introduced into the path has the appropriate impact on the end date.
- Assessment Point 12: Critical Path Length Index (CPLI) – This is an indicator of the likelihood of completing the schedule on time and measures the relative efficiency required to complete the schedule on time.

The three tenets for the "Effective" group are:

- **Tenet 6 - Usable:** Schedules provide meaningful metrics for timely and effective communication, tracking and improving performance, mitigating issues and risks as well as capturing opportunities.
  - Assessment Point 13: Hard constraints – The overuse of date constraints is considered one of the most common abuses of a schedule. Overuse leads to a "hardening" of the schedule and limits the forecasting capability of the schedule.
- **Tenet 7 - Resourced:** Resources align with the schedule baseline and forecast to enable stakeholders to view and assess the time-phased labour and other costs required to achieve project baseline and forecast targets.
  - Assessment Point 14: No Assigned Resources – Without resources assigned it is extremely difficult to determine if there is a fighting chance of completing the activity / project. Resource profiles indicate resourcing needs and show if progress is being achieved / maintained at the rate planned for.
- **Tenet 8 - Controlled:** Schedules are baselined and maintained using a rigorous, stable and repeatable process. Schedule additions, deletions and updates conform to this process.

The United States Government Accountability Office (GAO) Schedule Assessment Guide

GAO's research tells us that the four characteristics of a high-quality, reliable schedule are that it is comprehensive, well-constructed, credible, and controlled.

A **comprehensive** schedule includes all activities for both the government (owner) and its contractors necessary to accomplish a program's objectives as defined in the program's WBS. The schedule includes the labour, materials, travel, facilities, equipment, and the like needed to do the work and depicts when those resources are needed and when they will be available. It realistically reflects how long each activity will take and allows for discrete progress measurement.

A schedule is **well-constructed** if all its activities are logically sequenced with the most straightforward logic possible. Unusual or complicated logic techniques are used judiciously and justified in the schedule documentation. The schedule's critical path represents a true model of the activities that drive the program's earliest completion date, and total float accurately depicts schedule flexibility.

A schedule is **credible** if it is horizontally traceable—that is, it reflects the order of events necessary to achieve aggregated products or outcomes. It is also vertically traceable: activities in varying levels of the schedule map to one another and key dates presented to management in periodic briefings are in sync with the schedule. Data about risks are used to predict a level of confidence in meeting the program's completion date. Necessary schedule contingency and high-priority risks are identified by conducting a robust schedule risk analysis.

Finally, a schedule is **controlled** if trained schedulers update it regularly using actual progress and logic, based on information provided by activity owners, to realistically forecast dates for programme activities. Updates to the schedule are accompanied by a schedule narrative that describes salient changes to the network. The current schedule is compared against a designated baseline schedule to measure, monitor, and report the program's progress. The baseline schedule is accompanied by a basis document that explains the overall approach to the program, defines ground rules and assumptions, and describes the unique features of the schedule. The baseline schedule and current schedule are subjected to configuration management control.

The GOA also indicate that there are 10 scheduling best practices required to achieve the four characteristics of a high quality, reliable schedule. They are self-explanatory and I will not delve into any of them here; suffice to say they are mostly represented and described in the DCMA literature discussed earlier. Table 1 shows how the 10 scheduling best practices are mapped to these four characteristics.

Table 1: The GOA Schedule Characteristics and Best Practices

Schedule characteristic	Best practice
Comprehensive	1. Capturing all activities 3. Assigning resources to all activities 4. Establishing the durations of all activities
Well-constructed	2. Sequencing all activities 6. Confirming that the critical path is valid 7. Ensuring reasonable total float
Credible	5. Verifying that the schedule can be traced horizontally and vertically 8. Conducting a schedule risk analysis
Controlled	9. Updating the schedule using actual progress and logic 10. Maintaining a baseline schedule

The United States National Defense Industrial Association (NDIA)

The NDIA Planning & Scheduling Excellence Guide (PASEG) published this guide in March 2016 to provide the programme management team, including new and experienced master planners/schedulers, with practical approaches for building, using, and maintaining an Integrated Master Schedule (IMS). It also identifies knowledge, awareness, and processes that enable the user to achieve reasonable consistency and a standardized approach to project planning, scheduling and analysis.

Sound schedules merge cost and technical data to influence programme management decisions and actions. Realistic schedules help stakeholders make key go-ahead decisions, track and assess past performance, and predict future performance and costs. Industry and Government agree that improving IMS integrity has a multiplier effect on improved programme management.

The three sections in the document that are of real interest to me are listed in Table 2. This NDIA PASEG (available on the internet), can also serve as a useful guide for relatively new planners.

Table 2: Three important sections of the NDIA PASEG

PASEG Major Section	Description
GASP	The Generally Accepted Scheduling Principles (GASP) are eight over-arching tenets for building, maintaining, and using schedules as effective management tools.
Leadership, Buy-In, and Commitment	Includes managing using the IMS, integration of management tools, and roles and responsibilities of programme personnel.
Schedule Analysis	Covers schedule health assessments, critical and driving path analysis, schedule risk assessment (SRA), set-up and execution and SRA Analysis. Addresses schedule execution metrics, including critical path length index (CPLI), baseline execution index (BEI), schedule performance index (SPI), % complete, schedule rate chart, and current execution index (CEI).

Key Observations

In both guides the GASP features prominently. If we then adopt the GASP as the minimum schedule quality standard and do a comparative analysis with the GAO Schedule Assessment Guide and the NDIA Planning & Scheduling Excellence guide, the following can be observed:

Firstly, regarding the GAO Schedule Assessment Guide:

- In this guide the GASP, by and large, is described with the same or similar words.
- The guide seems to emphasise the planning process, rather than interrogating the schedule and analysing it with measurable results.
- What I did like, and which will be included in the minimum standard, is best practice 1 “Capturing All Activities”. If one looks at the description, then it is very clear that the work breakdown structure (WBS) is central to this, as in theory “all activities need to link to a WBS element and all WBS elements need to link to an activity”. This clearly then would need to be incorporated into tenet 1.

Secondly, regarding the NDIA Planning & Scheduling Excellence Guide:

- This is an excellent and rather comprehensive guide to planning and scheduling. Certainly, value will be obtained by using this guide as a reference.
- I love the fact that this guide focuses on the Integrated Master Schedule as its point of centrality for schedules. This is critical for large or complex projects or programmes. I would suggest that a measure to be added to GASP is whether all schedules linking to the Master Schedule have a minimum GASP quality measurement rating.
- Another like is the “Leadership, Buy in and Commitment” section. This is an area that generally is very problematic. Do approved roles and responsibilities for all parties involved in the schedule development and maintenance exist and how to measure these? I also support introducing the Current Execution Index (CEI), which measures the team’s ability to accurately forecast ahead.
- This guide also emphasis Earned Value analysis and one can then add Schedule Performance to the mix. Cost Performance would be reported elsewhere as the GASP is purely schedule related.

Concluding remarks

This has been a fascinating exercise spurred on by Jurie Steyn, the editor of these articles, challenging me to expand and improve on the generic minimum standard GASP discussed at the start of this article. By identifying additional value adding schedule measures, the quality of programme / project schedules improves, and hence the success of ventures improves.

In summary, four new measures will be added to the minimum standard GASP used within OTC. This is by no means an all-inclusive list and we will continue searching for ways to improve on this to the benefit off all. If you have any suggestions after reading this article, please pass them on and let us get the mindset entrenched in the industry that quality schedules are the new norm and the preferred standard.

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