Overview of WPM

Introduction

Work Performance Management (WPM) is designed to calculate the current status, and predicted completion date for any project in a consistent, repeatable, and defensible way. It is primarily intended for use in projects, applying Agile or Lean Construction management approaches, but WPM can also be applied effectively to any project where Earned Value Management[1] is not being used.

WPM calculations are based on the concepts used in Earned Schedule, but are run in a simple spreadsheet[2], based on project metrics that are already being used for other control purposes within the project.

WPM is not intended as a replacement for either CPM or EVM in large or complex projects.

WPM is the core component of Project Controls 3.0 (PC-3.0). While WPM can be used on its own as an effective project controls tool, it overall effectiveness is enhanced through the implementation of the PC-3.0 paradigm. PC-3.0 shifts the focus of project management and controls towards delivering success, rather than measuring what has happened.

For more on PC-3.0 see: https://mosaicprojects.com.au/PC-3-00-Overview.php#PC-3-Overview

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The theoretical basis of WPM

WPM has been designed to fill an identified gap in current project controls systems. There is no simple process for calculating the current status (time variance) and predicting the expected completion date for projects that do not have a functioning CPM schedule[3], including those applying Lean and/or Agile management approaches.

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1 Projects using Earned Value Management (EVM) can apply Earned Schedule (ES) to the EVM data to obtain similar results to WPM. For more on ***Earned Schedule*** see: https://mosaicprojects.com.au/PMKI-SCH-040.php#Process2

2 For access to the ***WPM Spreadsheet***, see: https://mosaicprojects.com.au/shop-easy-WPM_WS.php

3 Critical Path schedules rely on the work of the project being undertaken in a predictable, predetermined way which can be modelled in the CPM network. Various Agile and adaptive approaches to working are based on the premise the best sequence of working should be decided at regular intervals through the course of the project creating a fundamental incompatibility, see: https://mosaicprojects.com.au/PMKI-SCH-041.php#WPM-A+D

Existing approaches that have been shown to accurately predict project completion without a CPM schedule include Earned Schedule (as an extension to Earned Value Management) and Earned Duration (ED)[4]. Both use a process that:

- Identifies the quantum of work achieved to a point in time
- The point in time when this amount of work was planned to be achieved
- Calculate the difference between these two points to assess the current status (variance)
- Calculates the ratio between the time needed, and the time planned, to complete the quantum of work
- Then apply this ratio to the overall project duration to calculate an expected project completion date.

The results from ES and ED have been shown to be more reliable than CPM updates[5], they are also repeatable, and defensible. However, the systems require a significant effort to implement and use. Both systems are based on metrics that represent the work being accomplished by the project's resources:

- The metric used in ED is the number of activity days derived from a bar chart or CPM schedule. The system sums the number of activities in progress on each day, and produces a cumulative graph of the total number of days work planned for the project. The number of days work achieved at a point in time is compared to this baseline.
- The metric used in ES is typically money (but other metrics can be used). Based on the EVM performance management baseline a cumulative planed value can be plotted showing the total planed value of work over time needed to complete the project. The value of work achieved at a point in time is compared to this baseline.

Experience derived from EVM, ES, and Earned Duration (ED) show that the metric does not have to be identical in every case for the system to provide valuable information. EVM and ES assume the amount of effort required to deliver $1000 of value in one work package is the same in every other work package. ED assumes the amount of effort needed to accomplish one days' worth of progress on one activity is the same as the amount of effort required on every other activity to achieve a day's progress.

Neither of these assumptions are true. Compared to the average, some elements of work will be more difficult and need more effort to complete, others will be much easier. But the systems produce useful information because on average the amount of work needed to earn $1000, or complete a day's work against an activity bar, will balance out. The easier elements of work compensate for the more difficult.

WPM is based on the same premise and appears to achieve a similar level of reliability by comparing the amount of work planned to be accomplished to the amount of work actually achieved in the period through to the data date (Time Now). However, unlike ES and ED, WPM focuses on the core elements of the with the metric used being derived directly from the project's primary deliverables.

The design of WPM is based on ES, the major differences being:

- EVM is designed to measure cost performance and then this data is adapted by ES to predict time performance. Consequently, all of the project's costs matter and therefor, have to be included in the Performance Management Baseline (PMB)
- WPM is focused on schedule performance only, therefore, peripheral and support elements in the project can usually be ignored. This makes applying WPM much simpler, and any failings in the

[4] For more on ***Earned Duration*** see: https://mosaicprojects.com.au/PMKI-SCH-025.php#ED

[5] For more on ***using WPM to augment the information from a well-maintained CPM schedule*** see: https://mosaicprojects.com.au/PMKI-SCH-041.php#WPM-CPM

peripheral areas (eg, procurement) inevitably manifest in delays in performing the core elements of the work either immediately, or with a short lag.

Apart from the differences outlined above, the basis of calculation used in WPM is the same as in ES, and therefore, a similar level of usefulness and accuracy is expected from WPM[6].

To facilitate ease of use, the measure of 'work' used by WPM is flexible, the only requirement is that the measure can be applied consistently across the core work of the project and ideally, the measure is already being used within the project. The various ways of measuring work are discussed in more detail later.

WPM units of work

The core element in developing an effective WPM system is defining a robust measure of the work involved in the project. This needs to be a unit that can be applied uniformly across the core work of the project[7]. The measure does not need to include everything. Cost items such as procurement, the overall management of the project, and the disposal of hazardous materials do not need to be captured in the metric. However, problems in any of these areas are likely to have an immediate impact on the progress of the team delivering the core measure, or in the case of the waste disposal are unlikely to be critical.

Some of the options for effective measures of work include:

- Direct measures where the project's output can be counted are useful for many straightforward projects:
    - Telstra pits installed
    - Computers replaced
    - Interviews conducted
- Measures that describe the amount of effort applied to accomplish each component of the work. The estimate of the amount of effort involved in each unit of measure needs to be consistently applied across the project (eg, every story point involves the same amount of work). Some options include:
    - Function points
    - Stories and story points
    - Hrs of effort[8]
- When a detailed CPM schedule is available, the 'activity days' taken from the schedule can be used[9]
- Monetary values ($), this metric is particularly useful for commercial projects where a planned cashflow is established, and then monthly claims submitted to the client based on a schedule of rates for the work completed – care is needed to make sure the WP and WA remain aligned.

The key to obtaining valuable information from a WPM analysis is selecting a robust metric, ideally one that is used in other aspects of the project.

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[6] For more on ***how to apply WPM to a project*** see: https://mosaicprojects.com.au/PMKI-SCH-041.php#WPM-Works

[7] **Note**: While the selected measure of work does not need to cover peripheral and support activities, if the metric selected (eg, money) includes everything in the project WPM still functions effectively.

[8] **Note:** If using ***hours of effort***, this measure the WA is based on the planned hours per component completed, not the timesheet record of hours actually worked. The EVM equivalents are PV and EV (not AC).

[9] For more on ***using WPM to augment CPM*** (and overcome the CPM optimistic bias) see: https://mosaicprojects.com.au/PMKI-SCH-041.php#WPM-CPM

Care is needed to avoid confusing activity with work! For example, in software development the output from a sprint is variable, a sprint is timeboxed, and the team may produce nothing (everything goes back into the backlog) or complete a lot of work, it depends on circumstances. Whereas, function points, or story points both describe an amount of work that is embedded in the product. A story that has 6 story points is expected to take twice as much effort to deliver as a story with only 3 story points. When a story is delivered at the end of a sprint, the work involved in accomplishing its story points has been completed.

Scheduling the units of work

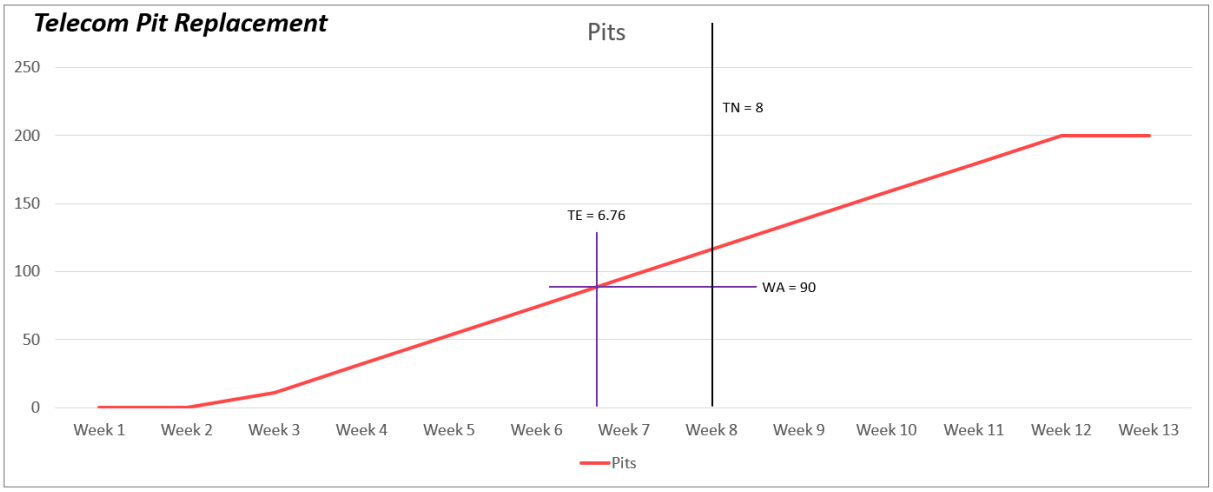
Scheduling the work should be as realistic as possible, but in many situations a straightforward pragmatic approach will suffice. To facilitate setting up the performance measurement baseline (PMB), there needs to be an overarching plan for the work, but the detailed scheduling of the work is assumed to use other processes, or be undertaken by the project team.

In some circumstances, a 'straight line' is adequate. For example, the Agile approach to working is to let the team decide what is best to do next, they choose the stories to work on in each sprint. All WPM does is measure if they are producing enough finished work to complete the overall project on time.

In other types of projects, there may be an overall roadmap, or a detailed schedule, of some other form of planning that identifies when the work should be done. If these tools are available, they should be used to set the planned work curve.

Assessing progress using WPM

Once this basic rate of production has been determined for the project WPM assesses the progress in a project by comparing the amount of work achieved at a point in time with the amount of work planned to have been achieved at the same point in time. The project team needs to measure the actual work delivered (WA) and enter the information into the model. Then based on this data, WPM shows the time variance at Time Now (TN) and uses this information to calculate a predicted Expected Completion (EC) date.



WPM terminology

The terminology used for the data points in WPM is:

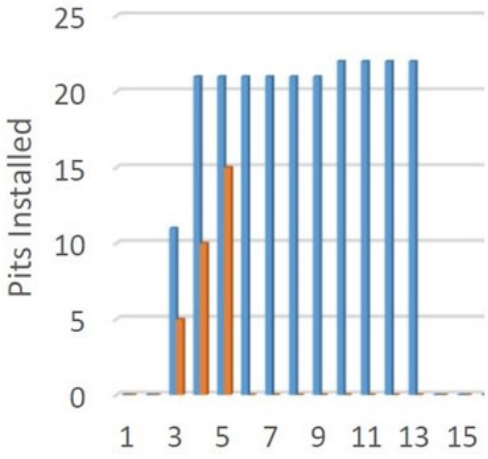
- **WP** = Work Planned measured in an appropriate unit – cumulative over time
- **WA** = Work Accomplished measured on the same basis as WP
- **PC** = Planned Completion project duration in time units (working days, weeks, months)
- **TN** = Time Now the number of PC time units to the date of assessment
- **TE** = Time Earned the number of PC time units to the point where WA = WP

From this information, the work performance measures are calculated as follows:

- **WPV** = Work Performed Variance **TE - TN**, negative values show the schedule slip in PC time units
- **WPI** = Work Performed Index **TE/TN**, values less than 1.0 show less work has been accomplished than planned
- **EC** = Expected Completion the expected project duration in PC time units: **PC/WPI = EC**

An example of the output from the ***Easy WPM Workbook*** showing the current variance and the expected completion is:

WPM Update Report



Work per Time Unit

Implementing WPM

The fundamental concepts embedded in WPM can be adapted for use on most projects and built into a range of tools. Alternatively, the ***Easy WPM*** spreadsheet is a simple straightforward option we have developed that allows:

- Users to set the time units to be used (working days, weeks, months)
- The metric used in their project to measure work
- Create the project's PMB, this can be up to 60-time units overall
- Set Time Now (TN) and record progress
- The calculations are performed as at TN, there is no need to update the spreadsheet every time unit
- The spreadsheet calculates the TE, WPV, WPI and EC for the project.

For more details on how the ***Easy WPM Workbook*** is set up, download the instructions for its use from: https://mosaicprojects.com.au/PDF-Gen/WPM_Instructions.pdf

The commercial spreadsheet, free sample spreadsheets, and instructions for their use can be downloaded from: https://mosaicprojects.com.au/shop-easy-WPM_WS.php

Key reference documents

The following papers outline the development of the WPM concept:

Scheduling Challenges in Agile & Distributed Projects. The focus of this paper is to define the challenge of controlling work efficiently in a wide range of projects where the CPM paradigm does not apply. Then to outline practical options for managing projects using various agile and lean approaches, other soft projects, and distributed projects. The paper:

- Briefly defines the management assumptions that support the use of CPM scheduling, its origins, and limitations
- Develops a classification framework of project characteristics to help define the potential usefulness of CPM scheduling across different project types
- Briefly describes some of the management approaches currently used in non-CPM projects including agile and lean, their benefits and limitations
- Considers the application of the framework discussed above applied to a typical wind farm project, and
- Develops general recommendations for the management of non-CPM projects focused on optimizing the efficient use of resources in agile (soft) projects and distributed projects.

There may be a high level 'road map' outlining the desired route to completion and/or specific constraints on parts of the work in both soft and distributed projects, but there remains a lot of flexibility in the way the work is accomplished. And, in many cases there is a deliberate management intent not to follow a predetermined sequence of activities defined in a CPM schedule!
https://mosaicprojects.com.au/PDF_Papers/P208_Scheduling_Challenges_in_Agile_+_Distributed_Projects.pdf

Predicting Completion in Agile & Distributed Projects. The focus of this paper is to offer a practical solution to the challenge of assessing progress and the likely completion date in agile and distributed projects where the traditional concept of a 'critical path' simply does not exist.

The paper describes the current application of EVM and ES to this type of project. It then introduces the concept of Work Performance Management (WPM) as a robust and practical alternative for determining the current status and predicted completion date for projects that are not using EVM, and are not suited to the CPM paradigm. The theoretical underpinnings of WPM are identified together with the concept of 'work units' and the basis of the WPM calculations.
https://mosaicprojects.com.au/PDF_Papers/P214_Predicting_Completion_In_Agile_+_Distributed_Projects.pdf

Assessing Delays in Agile & Distributed Projects. The internationally recognized approaches to assessing delay and disruption are based on the premise there is a well-developed critical path schedule that defines the way the work of the project will be accomplished. Critical path theory assumes there is one best sequence of activities, that have to be completed in a predefined order to deliver a project successfully. Therefore, events that delay or disrupt

activities in the schedule can be modeled, their effect assessed, and responsibility for the assessed delay assigned to the appropriate party. The focus of this paper is to offer a practical solution to the challenge of assessing delay and disruption in agile and distributed projects where the traditional concept of a 'critical path' simply does not exist and the effect of intervening events has to be considered in terms of loss of resource efficiency.
https://mosaicprojects.com.au/PDF_Papers/P215_Assessing_Delays_In_Agile_+_Distributed_Projects.pdf

Conclusions

WPM is designed to be a simple robust performance measurement system that will provide an accurate assessment of the project's status from a time management perspective. It can assess how far ahead or behind plan the work currently is, and based on this information, the likely project completion date assuming work will continue at the current rate. Recording the status and expected completion at each update provides reliable trend information.

The types of projects where WPM can provide an effective controls tool include:

- Relatively small projects requiring a straightforward controls system
- Large projects with a single primary deliverable that is easy to measure
- Large projects using CPM where there is a need to overcome the CPM optimism bias[10]
- All project applying Agile[11] and Lean Construction approaches where the project team determine the sequence of working
- Distributed projects[12] where CPM is inappropriate, and management has chosen not to use the ES extension to EVM.

The two requirements to implement WPM are:

- A consistent metric to measure the work planned and accomplished, and
- A simple but robust assessment of when the work was planned to be done.

In summary, the introduction of WPM means there is no longer any excuse for a project team, senior management and/or the organisation's governing body 'not to know' how the work of each project is progressing.

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[10] For more on ***WPM and the CPM optimism bias*** see:
https://mosaicprojects.com.au/PMKI-SCH-041.php#WPM-CPM

[11] For more on ***applying WPM to Agile and Lean projects*** see:
https://mosaicprojects.com.au/PMKI-SCH-041.php#WPM-Agile

[12] For more on ***applying WPM to distributed projects*** (and a definition of distributed projects) see:
https://mosaicprojects.com.au/PMKI-SCH-041.php#WPM-Dist

Try WPM on your projects:

The ***Easy WPM Workbook***, is a practical spreadsheet that performs the calculations needed to implement Work Performance Management (WPM) to accurately calculate the status and projected completion of your projects.

Download the free sample files, or buy the ***WPM Workbook*** and instructions for use for **$20** (plus GST for Australian purchasers only), from:
https://mosaicprojects.com.au/shop-easy-WPM_WS.php

Other papers in this series:

1. **How WPM Works**: https://mosaicprojects.com.au/Mag_Articles/AA038_-_How_WPM_Works.pdf
2. **WPM solves CPM optimism**: https://mosaicprojects.com.au/Mag_Articles/AA039_-_WPM_solves_CPM_optimism.pdf
3. **WPM for Agile Projects**: https://mosaicprojects.com.au/Mag_Articles/AA040_-_WPM_for_Agile_Projects.pdf
4. **WPM for Lean & Distributed Projects**: https://mosaicprojects.com.au/Mag_Articles/AA041_-_WPM_for_Lean_+_Distributed_Projects.pdf
5. ***Easy WPM Workbook*** instructions for its use: https://mosaicprojects.com.au/PDF-Gen/WPM_Instructions.pdf

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