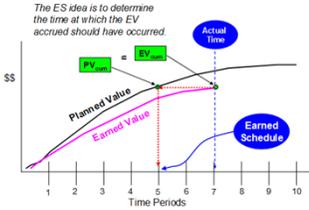




# Managing Out of Sequence Performance

Walt Lipke  
 PMI® - Oklahoma City  
 +1 405 364 1594  
 waltlipke@cox.net  
 www.earnedschedule.com



The ES idea is to determine the time at which the EV accrued should have occurred.

Australia PGCS 2018 Copyright © Lipke 2018 1

1



# Objectives

- What is Earned Schedule?
- How is ES computed?
- What is Schedule Adherence?
- How does ES enable the measure of SA?
- How is SA computed?
- How can SA help PMs with schedule performance control?

Australia PGCS 2018 Copyright © Lipke 2018 2

2



# Introduction to Earned Schedule

Australia PGCS 2018

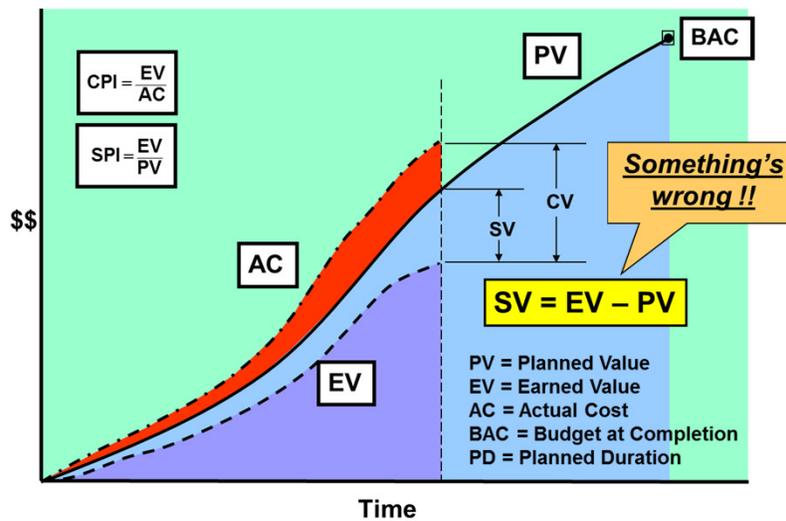
Copyright © Lipke 2018

3

3



## EVM Schedule Indicators

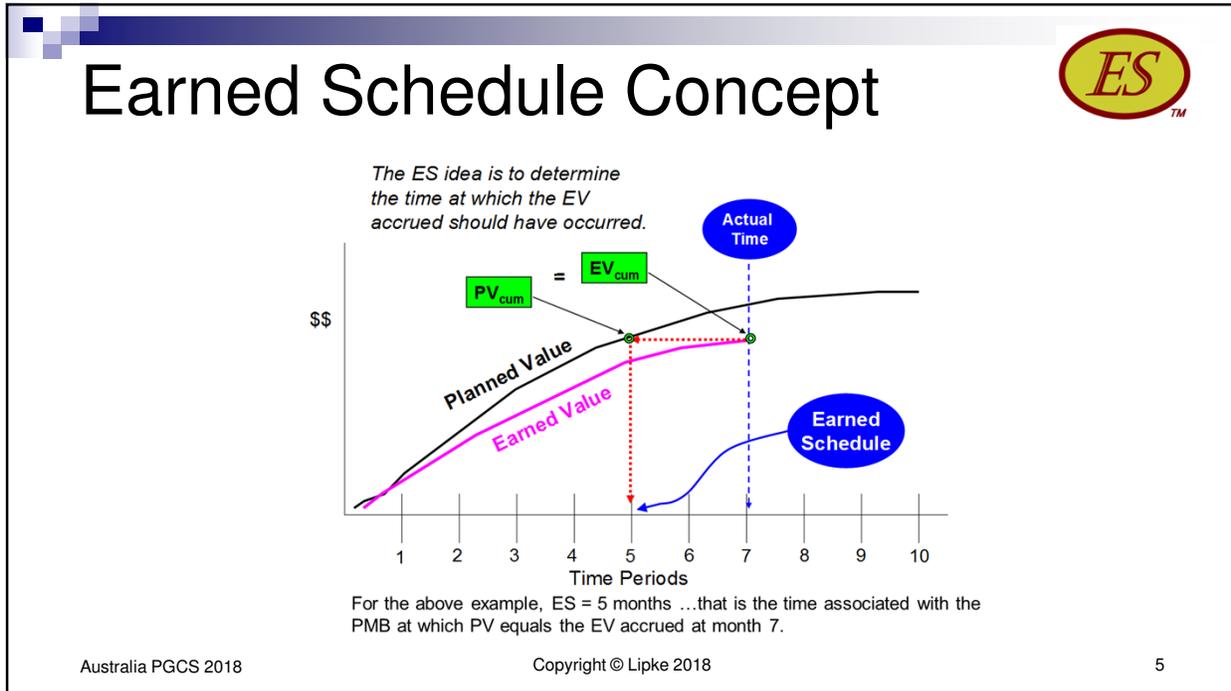


Australia PGCS 2018

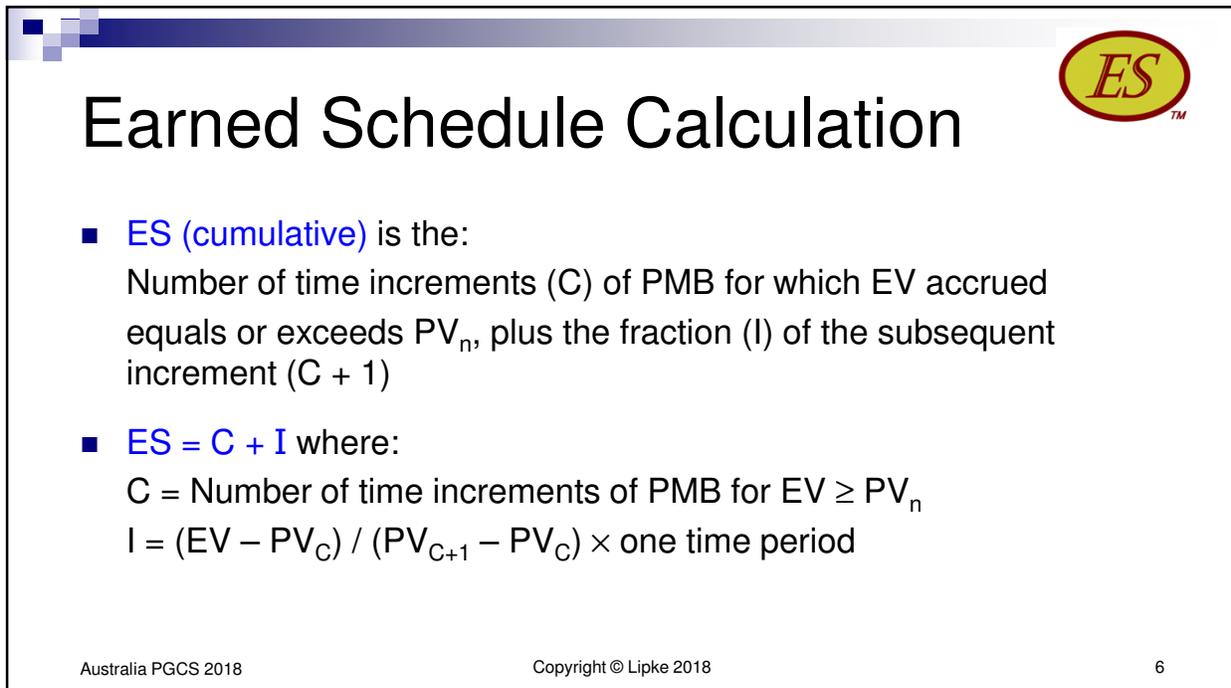
Copyright © Lipke 2018

4

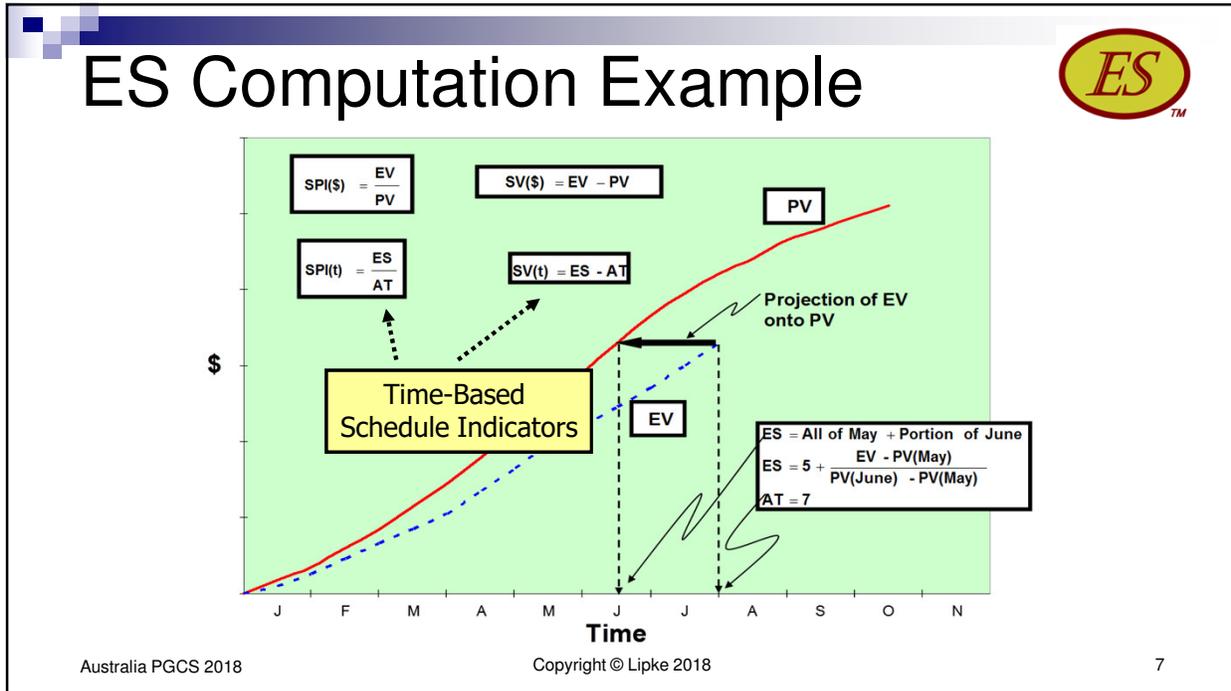
4



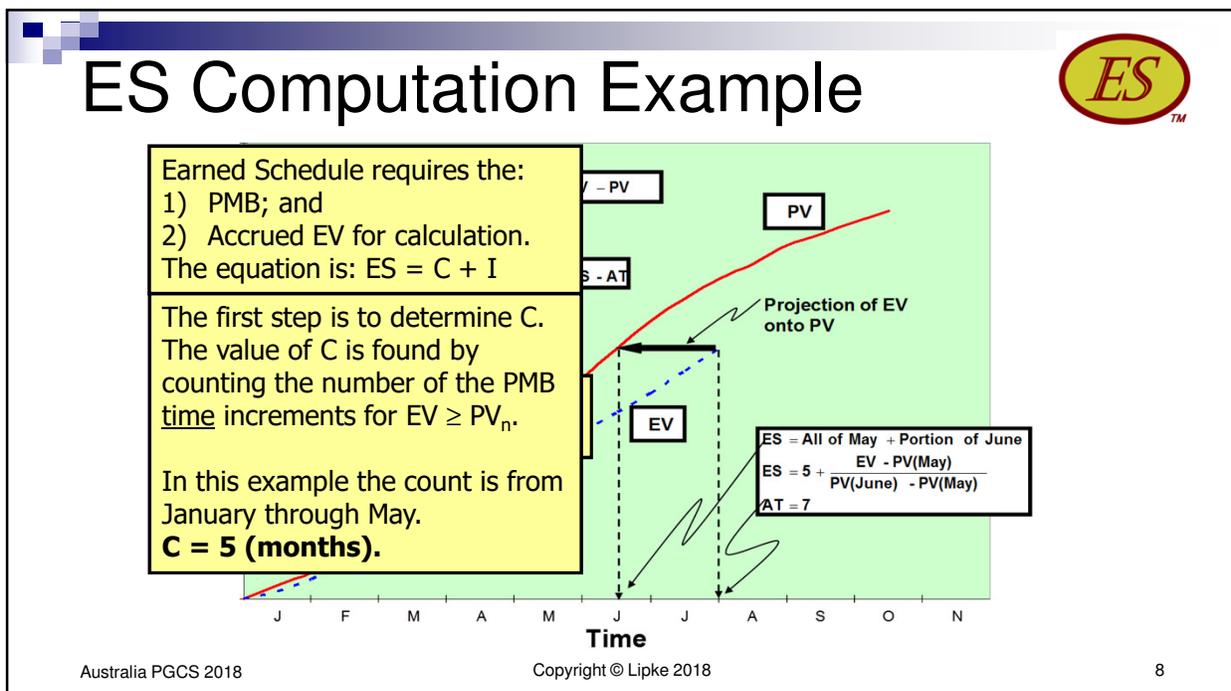
5



6



7



8

# ES Computation Example



Thus far,  $ES = 5 + I$  (months).  
 In the small box at the lower right, is the equation for calculating I.  
 For the example, let

- 1)  $EV = 100$
- 2)  $PV_5$  (May) = 90
- 3)  $PV_6$  (June) = 110.

Let's calculate I:  
 $I = (100 - 90) / (110 - 90) = 0.5$

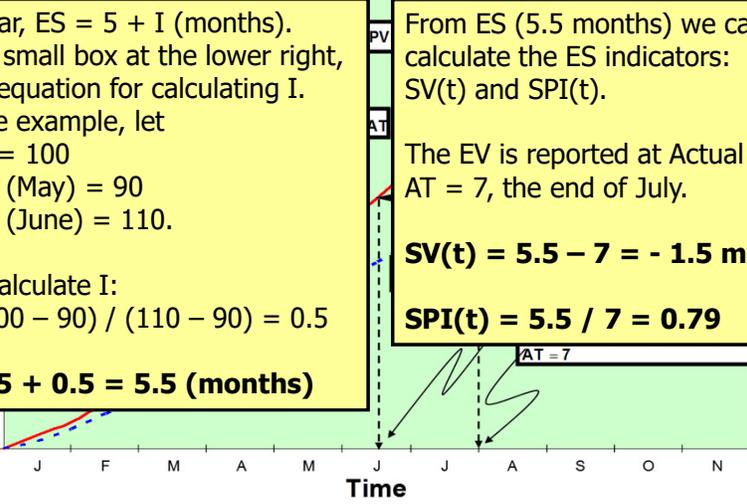
**$ES = 5 + 0.5 = 5.5$  (months)**

From ES (5.5 months) we can now calculate the ES indicators:  $SV(t)$  and  $SPI(t)$ .

The EV is reported at Actual Time  $AT = 7$ , the end of July.

**$SV(t) = 5.5 - 7 = -1.5$  months**

**$SPI(t) = 5.5 / 7 = 0.79$**



Time

Australia PGCS 2018

Copyright © Lipke 2018

9

9



# Schedule Adherence

Australia PGCS 2018

Copyright © Lipke 2018

10

10



# Schedule Adherence

- Recall the initiatives to improve project performance and quality over the last 30+ years: SPC, TQM, SEI CMM®, and ISO 9001
- What was their message?

*Undisciplined project execution leads to inefficient performance and defective products.*

- Then ...doesn't it make sense to measure how well the plan (process) is being followed?

Australia PGCS 2018 Copyright © Lipke 2018 11

11



# Measuring Schedule Adherence

- We want to know:

*Did the accomplishment match exactly the expectation from the planned schedule?  
- "Schedule Adherence" -*

- Earned Schedule provides a means to measure Schedule Adherence

Australia PGCS 2018 Copyright © Lipke 2018 12

12



# Measuring Schedule Adherence

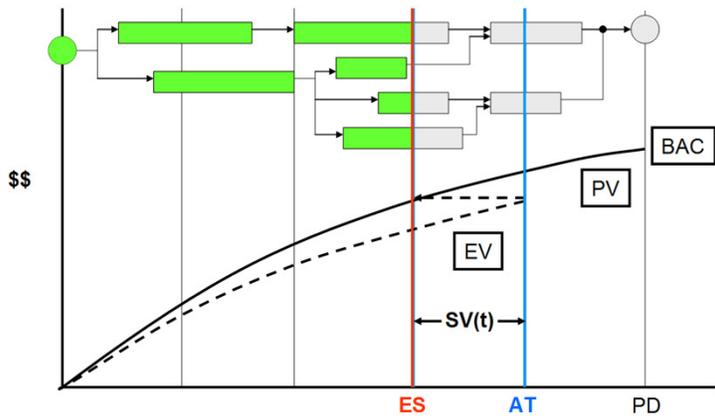
- The connection between ES and the PMB is remarkable  
*...regardless of the project's position in time, we can know what should have been accomplished*
- For a claimed amount of EV at a status point AT, the portion of the PMB which should be accomplished is identified by ES

Australia PGCS 2018 Copyright © Lipke 2018 13

13



# Measuring Schedule Adherence



Australia PGCS 2018 Copyright © Lipke 2018 14

14



# Measuring Schedule Adherence

- It is more likely performance is not synchronous with the schedule ...EV is not being accrued in accordance with the plan
- The next chart is an example ...the EV accrued is the same amount as shown on the previous chart, but has a different distribution

## What do you see?

Australia PGCS 2018
Copyright © Lipke 2018
15

15



# Measuring Schedule Adherence

Australia PGCS 2018
Copyright © Lipke 2018
16

16



# Measuring Schedule Adherence

- Tasks behind – indicates the possibility of impediments or constraints
- Tasks ahead – indicates the likelihood of future rework
- Both, lagging & ahead cause poor performance efficiency ...ahead performance is most likely caused by the lagging tasks

Concentrating management efforts on alleviating impediments & constraints will have the greatest positive impact on project performance

Australia PGCS 2018 Copyright © Lipke 2018 17

17



# Measuring Schedule Adherence

- Ahead tasks are frequently performed without complete information
- Performers must anticipate the inputs from the incomplete preceding tasks
- When anticipation is incorrect a significant amount of rework is created
- Complicating the problem the rework created for a specific task will not be recognized for a time ....until all of the inputs are known or the output is incompatible for a dependent task

Australia PGCS 2018 Copyright © Lipke 2018 18

18



# Measuring Schedule Adherence

- By measuring the portion of the EV accrued that is congruent with the planned schedule we can have an indicator for controlling the process
- Schedule Adherence is defined as:
 
$$P = \frac{\sum EV_j}{\sum PV_j}$$
 where the subscript j denotes the identity of the tasks comprising the planned accomplishment
- The value of  $\sum PV_j$  is equal to the EV accrued at AT
- $\sum EV_j$  is the amount of EV for the j tasks, limited by the value of the corresponding  $PV_j$

Australia PGCS 2018 Copyright © Lipke 2018 19

19



# Measuring Schedule Adherence

- Recall the question ...
 

*Did the accomplishment match exactly the expectation from the planned schedule?*
- The P-Factor is the indicator for answering the question
- Characteristics of the P-Factor
  - Its value must be between 0.0 and 1.0
  - P = 1.0 at project completion
  - P = 0.0 indicates accomplishment out of sequence
  - P = 1.0 indicates perfect conformance to schedule

Australia PGCS 2018 Copyright © Lipke 2018 20

20



# Measuring Schedule Adherence

- When the value of P is much less than 1.0 the PM has a strong indication of an impediment, overload of a constraint, or poor process discipline
- When P has a value very close to 1.0, the PM can feel confident the schedule is being followed ....and that milestones and interim products are occurring in the proper sequence

The PM now has an indicator which enhances the description of project performance portrayed by EVM & ES

Australia PGCS 2018 Copyright © Lipke 2018 21

21

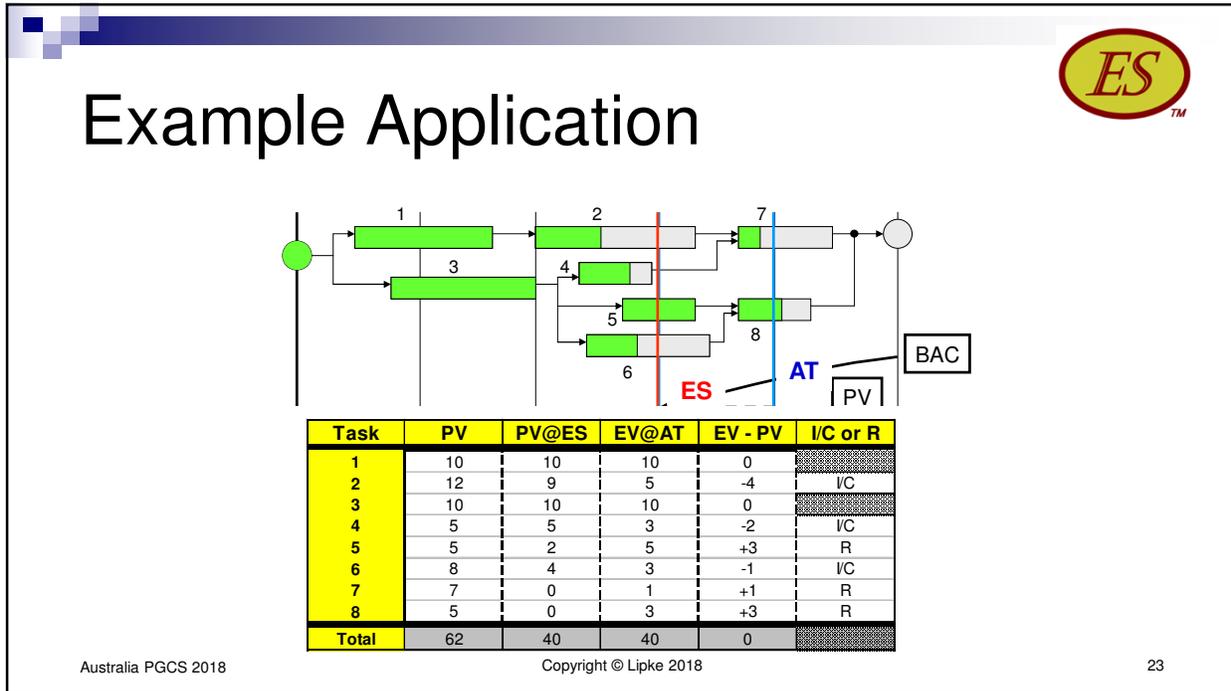


# Example Application

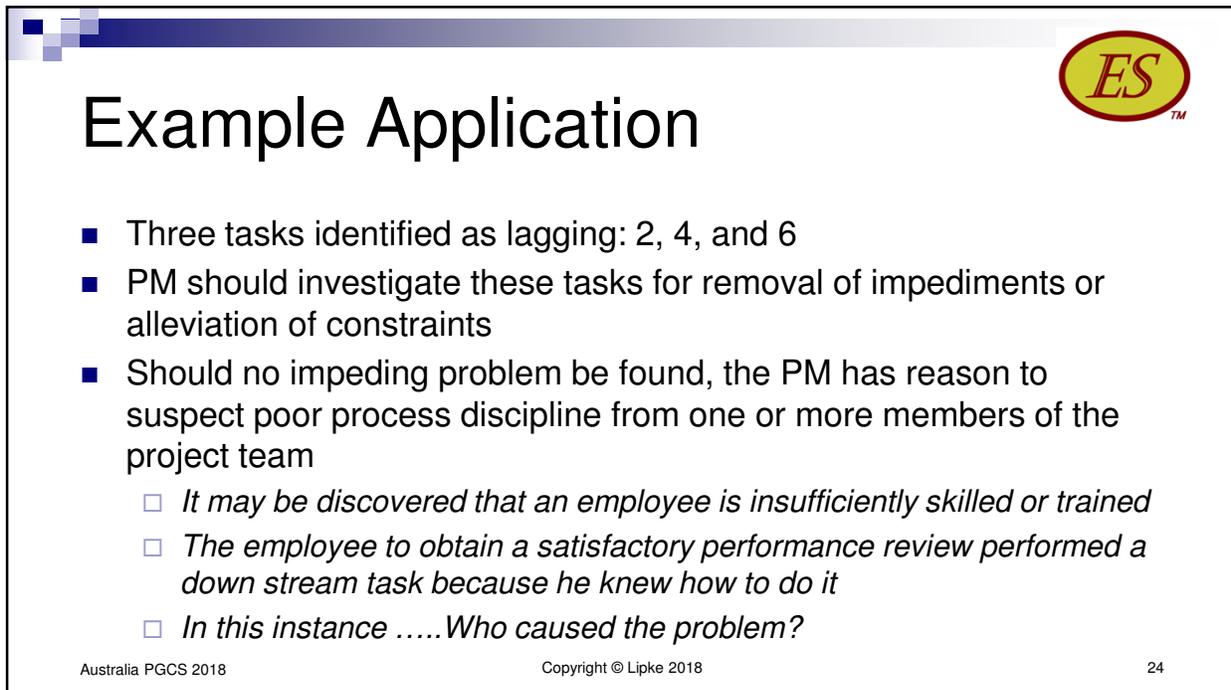
- Notional data has been created to illustrate the application of Schedule Adherence
- The task numbers in the table are associated with the numbering shown on the chart of the network schedule
- By calculating the difference between PV@ES and EV@AT, impediments/constraints (I/C) and rework (R) can be identified to specific tasks

Australia PGCS 2018 Copyright © Lipke 2018 22

22



23



24



# Example Application

- Tasks identified for potentially creating rework are: 5, 7, and 8.
- Clearly tasks 7 & 8 are at risk of rework because some or all of the required inputs are absent
- The potential for rework is not so obvious for task 5. ...it is not synchronous with the schedule, but the needed inputs are complete
  - By working ahead the worker presumes that his work is unaffected by other facets of the project
  - Subtle changes to task requirements often occur as more detail becomes known

Australia PGCS 2018 Copyright © Lipke 2018 25

25



# Example Application

- What is the value of the P-Factor for this example?

Task	PV	PV@ES	EV@AT	EV - PV	I/C or R
1	10	10	10	0	
2	12	9	5	-4	I/C
3	10	10	10	0	
4	5	5	3	-2	I/C
5	5	2	5	+3	R
6	8	4	3	-1	I/C
7	7	0	1	+1	R
8	5	0	3	+3	R
<b>Total</b>	62	40	40	0	

- It is seen that  $PV@ES = EV@AT$  ...  $PV@ES$  identifies the tasks which should be in-work/complete: 1 through 6

Australia PGCS 2018 Copyright © Lipke 2018 26

26



## Example Application

Task	PV	PV@ES	EV@AT	EV - PV	I/C or R
1	10	10	10	0	
2	12	9	5	-4	I/C
3	10	10	10	0	
4	5	5	3	-2	I/C
5	5	2	5	+3	R
6	8	4	3	-1	I/C
7	7	0	1	+1	R
8	5	0	3	+3	R
<b>Total</b>	<b>62</b>	<b>40</b>	<b>40</b>	<b>0</b>	

- Sum of EV@AT for 1 thru 6 is equal to 36 ...but the amount of EV for task 5 is +3 with respect to its corresponding task PV ...and thus,  $\Sigma EV_j = 36 - 3 = 33$
- The P-Factor can now be calculated:

$$P = \Sigma EV_j / \Sigma PV_j = 33 / 40 = 0.825$$

Australia PGCS 2018 Copyright © Lipke 2018 27

27



## Example Application

- From the value of P ...~80 percent of the execution is in conformance with the schedule
- Presuming all of the claimed accomplishment not in agreement with the schedule requires rework, i.e. 7 units ....then:
  - ~18 percent of claimed EV requires rework
  - Without a large amount of MR, successful completion is unlikely
  - The PM has much to do to save this project ...however, without the P-Factor indicator and the analysis ES facilitates, it is unclear as to what he/she should investigate and take action to correct

Australia PGCS 2018 Copyright © Lipke 2018 28

28



# Schedule Adherence Summary

- Earned Schedule, an extension to EVM for schedule performance analysis, is extended further ...creating a useful tool for PMs
- EV and ES with the PMB are used to develop the concept of Schedule Adherence
  - Measure for Schedule Adherence:  $P = \frac{\sum EV_j}{\sum PV_j}$
  - Identification of Impediments/Constraints & Rework
- High value of P leads to ...
  - Maximum performance for Cost & Schedule
  - Greater understanding of excellent project planning

Australia PGCS 2018 Copyright © Lipke 2018 29

29



# Final Remarks

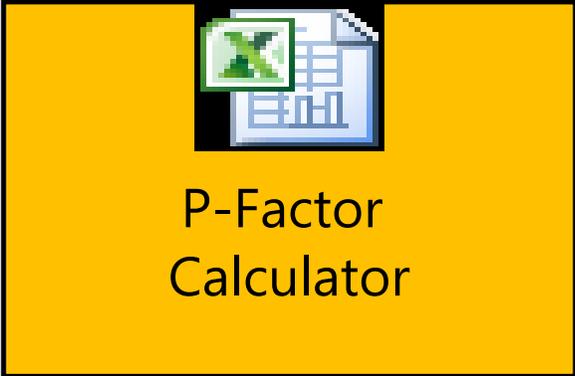
- Some EVM experts & practitioners believe that schedule analysis is possible only through detailed examination of the network schedule
- Schedule Adherence is a PM tool for process control not available from traditional analysis of the network schedule
- Use of the P-Factor measure is encouraged ...a calculator is available from the ES website

Australia PGCS 2018 Copyright © Lipke 2018 30

30



# P-Factor Calculator



P-Factor  
Calculator

Australia PGCS 2018

Copyright © Lipke 2018

31

31