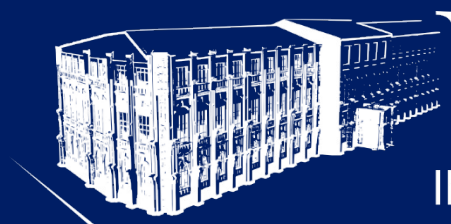


WESTMINSTER

INTERNATIONAL UNIVERSITY IN TASHKENT

An Accredited Institution of the University of Westminster (UK)

# Project Management

## Lecture 11
## Project Monitoring and Controlling.
## Earned Value Management

**by**

**Ulugbek Islamov**

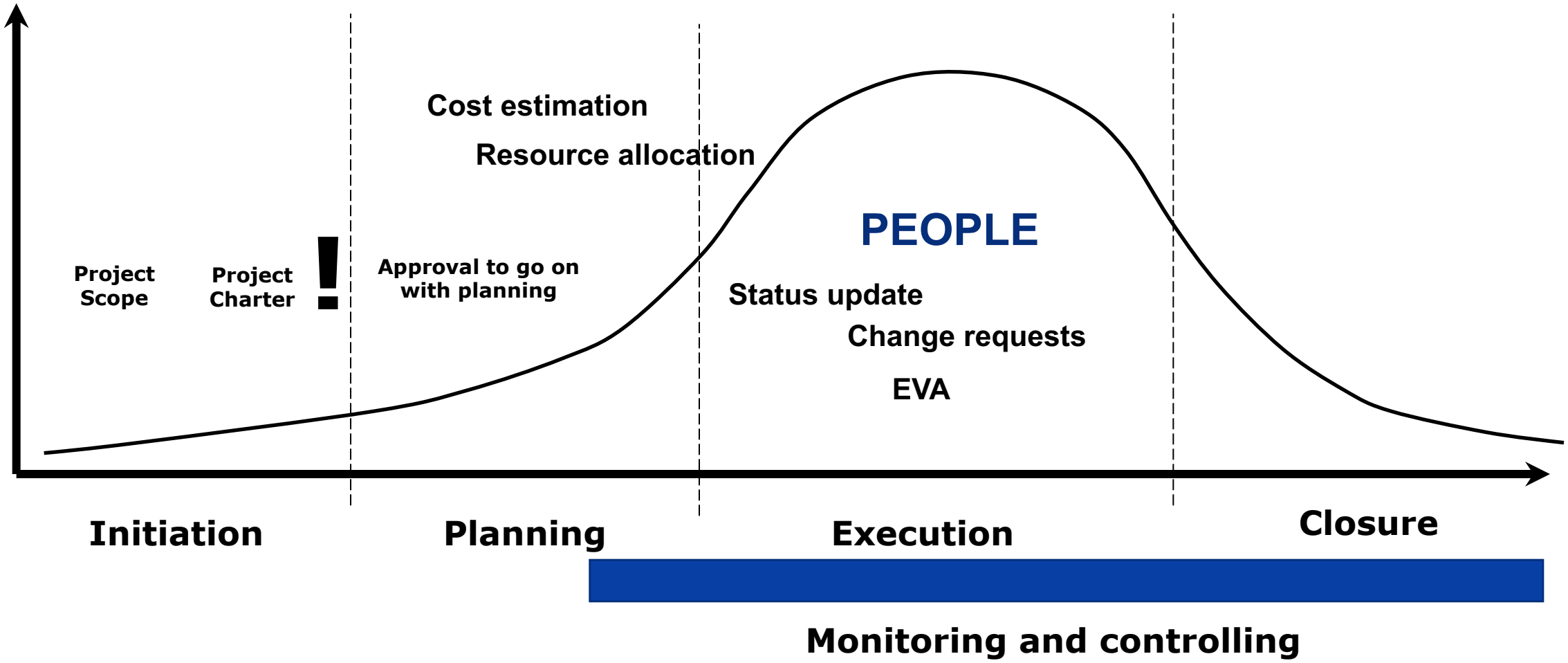
# Agenda



- Plan Monitor Control Cycle
- Project Monitoring and Controlling
- Earned Value Management
- Class Activity

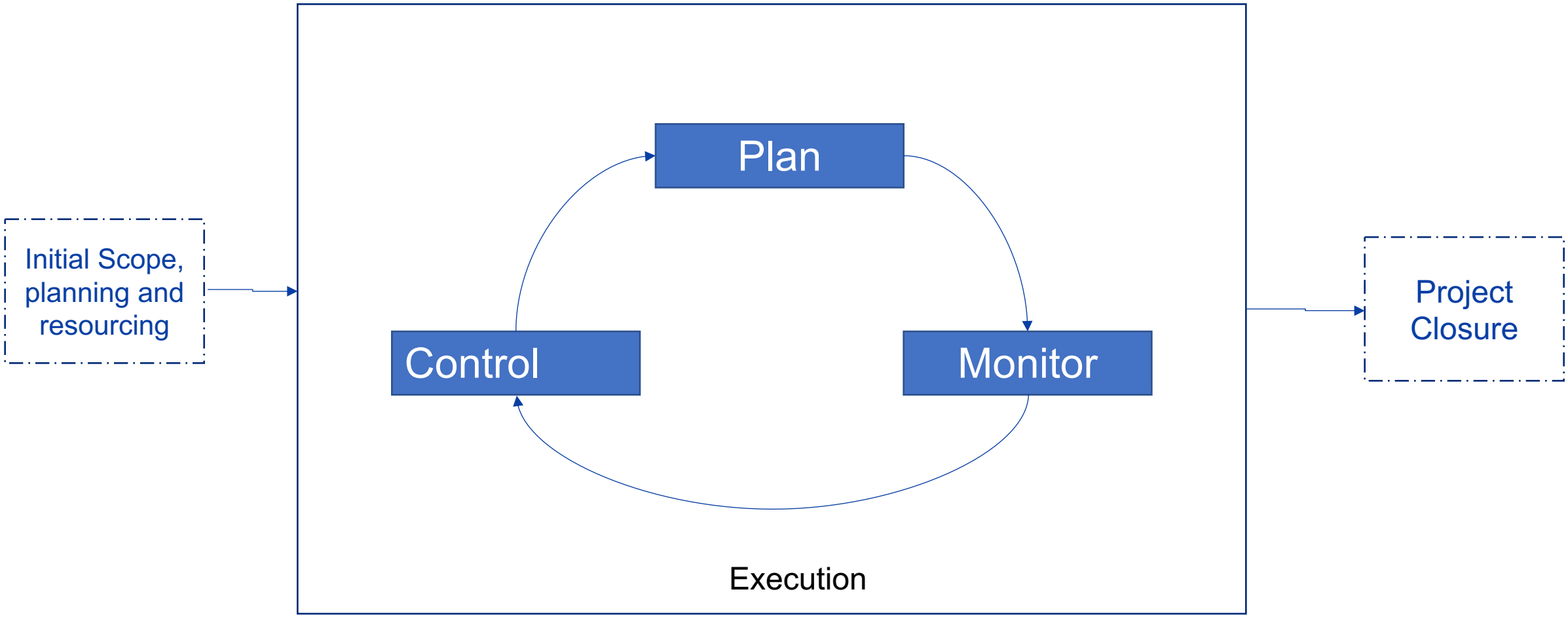
# Project Execution





# Plan Monitor Control Cycle

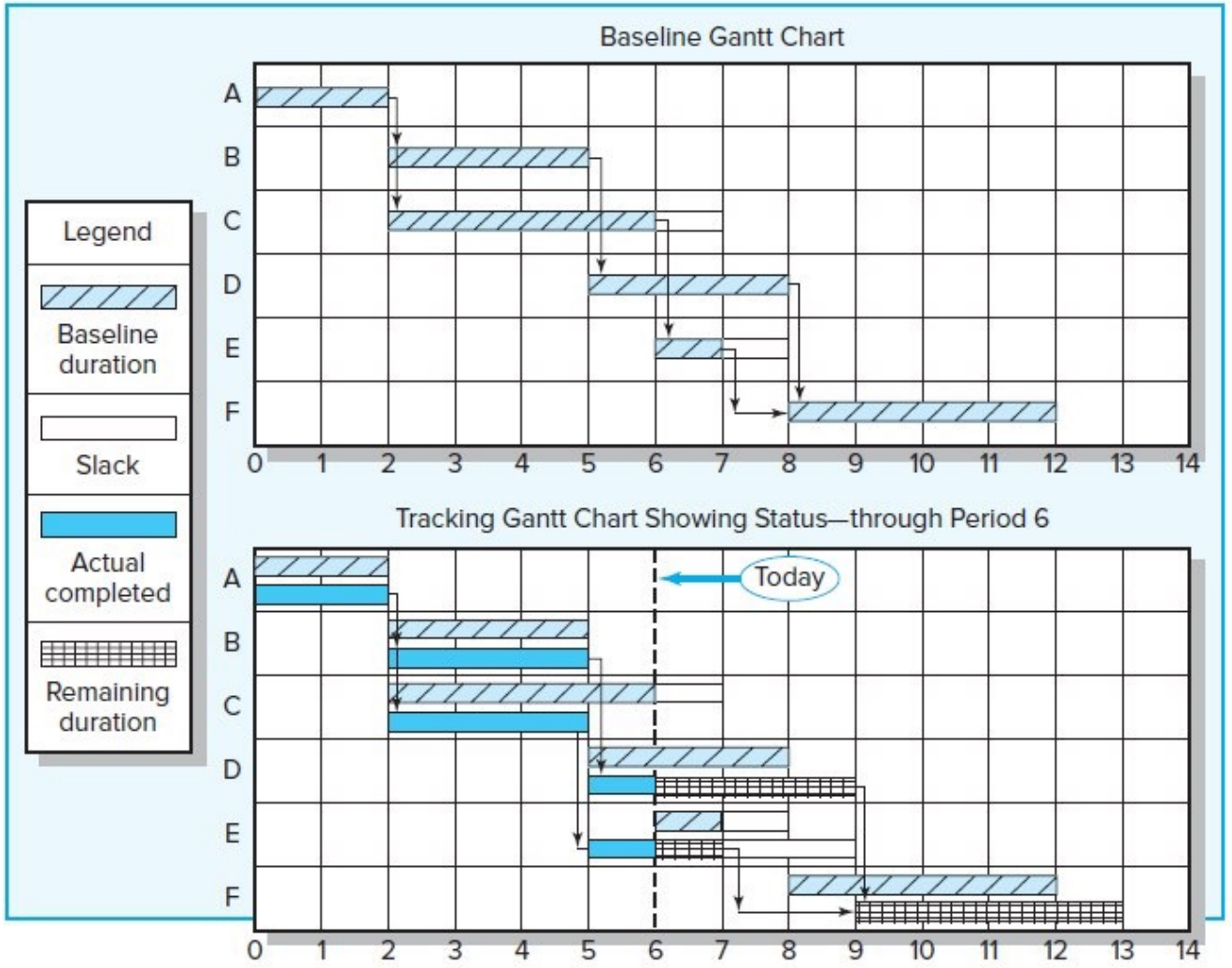





Adapted from *Briefly describe the monitoring and controlling cycle in Project Management*. Ques10. (1968, June 1). https://www.ques10.com/p/65719/briefly-describe-the-monitoring-and-controlling-cy/

# Tracking Gannt Chart






Larson, E., & Gray, C. (2018). Project Management: The Managerial Process 7e. McGraw Hill, page 463

***Project monitoring*** is a process of **collecting data**, **recording**, and **reporting the project information** concerning any and all aspects of project performance that is of importance for project stakeholders.

***Project control*** uses output of the project monitoring, data and information about project performance stance, and **involves actions to bring project's actual performance into planned one**.

# Effort vs Duration



These two terms are not identical and it is quite important to distinguish them during the controlling and assessing the performance.

For example:

There is a task that requires 2 weeks to complete. After week 1 it is not necessarily true that task is finished to 50%.

It only means that 50% of the duration is over but the effort given can be different.

At times the progress of a task is not updated until the point of its full completion – 0% to 100%.

# Earned value management



It is used to evaluate the performance of the project in terms of schedule and cost. (project control method)

Using EVM or earned value analysis Project Manager can identify if the project is:

- ahead of ; on ; or behind schedule
- under; on ; or over budget

# The values



- **Planned Value (PV)** — The **budgeted value** of the work completed so far at a specific date. What was planned in the project. ***Budgeted Cost of Work Schedule***

- **Earned Value (EV)** — The **actual value** of the work completed so far at a specific date. ***Budgeted Cost of Work Performed***

- **Actual Cost (AC)** — The total expenditure for the work so far at a specific date. The real time cost of the project, task or deliverable. ***Actual Cost of Work Performed***

# EVM identifies



The difference in the schedule and costs and reveals the health of the project

- **Schedule Variance (SV)** — difference between PV (planned value) and EV (earned value), tells whether the project work is ahead of,on,behind **schedule**

  **SV = EV – PV**

- **Schedule Performance Index (SPI)** — ratio between EV and PV, to reflect whether the project work is ahead of, on, behind **schedule in relative terms**

  **SPI = EV/PV**

**If SPI is below 1 – the project is behind schedule, if above 1 – ahead.**

# EVM identifies



- **Cost Variance (CV)** — difference between EV and AC, to tell whether the project work is under / on / over **budget CV = EV – AC**
- **Cost Performance Index (CPI)** — ratio between EV and AC, to reflect whether the project work is under / on / over **budget in relative terms CPI = EV/AC**

- **If CPI is below 1 – the project is over budget, if above 1 – under budget.**

# Estimate at completion



With such information Project Manager can detect what would be the budget at completion of the project – final cost of it. (EAC- estimate at completion)

To calculate it, we will need the BAC (budget at completion) – overall planned budget of the project

- **EAC = BAC/CPI** *If we believe the project will continue to spend at the same rate up to now*
- **EAC = AC + (BAC-EV)**
  *If we believe that future expenditures will occur at the original forecasted amount (no more delays of the same kind in future)*

# Example



- The project task A has estimated duration of 5 days and overall cost for its completion is set as 40 000$ and the cost is distributed equally (40 000 / 5)
- By the day 4 we have following status:
  - Task A completed to 70%
  - Actual cost of the task is 34 000$

What is Earned value of the task?

Earned value of the task is the amount of costs that incur with respect to completion of it

So, Earned Value is 70% of 40 000$ 28 000$

What is Planned value of the task?

The amount of budget planned for the task by certain duration
So, Planned Value is 8+8+8+8 32 000$

# Example (cont)



EV = 28 000$ PV = 32 000$ AC = 34 000$

**SV = EV – PV** SV = 28000 – 32000 = **- 4000**

**CV = EV – AC** CV = 28000 – 34000 = **- 6000**

**Schedule Performance Index (SPI)**
**SPI = EV/PV**
SPI = 28000/32000 = **0.875**
**(behind schedule)**

**Cost Performance Index (CPI)**
**CPI = EV/AC**
CV = 28000/34000 = **0.823**
**(over budget)**

**EAC = BAC/CPI** **BAC = 40 000** **EAC = 40000/0.823 = 48 573** if rate does not change

**EAC = AC + (BAC-EV)** **EAC = 34k + (40k-28k)= 46 000** if goes back to planned

# Extended example



What if we have 2 tasks:

- the one we just discussed
- And another one (Task B)

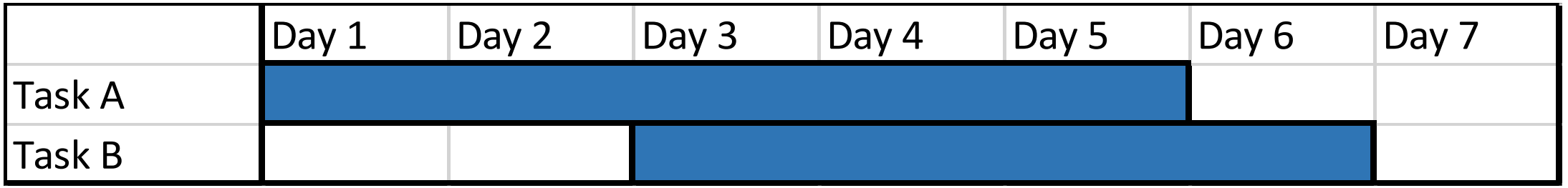
Task B has estimated duration of 4 days and starts 2 days after Task A. It has the dedicated budget of 60 000$ and it is distributed equally.

Calculate CPI, SPI, EAC for day 4, if on day 4 Task B has the following performance:

- Task B completed to 60%
- Actual cost of the task is 27 000$

# Extended example






What is EAC if costs occur as scheduled in the future?

**EAC = AC + (BAC-EV)**

| EV | PV | AC |
|---|---|---|
| Task A 28 000$ | Task A 32 000$ | Task A 34 000$ |
| Task B 36 000$ | Task B 30 000$ | Task B 27 000$ |
| Total = 64 000$ | Total = 62 000$ | Total = 61 000$ |

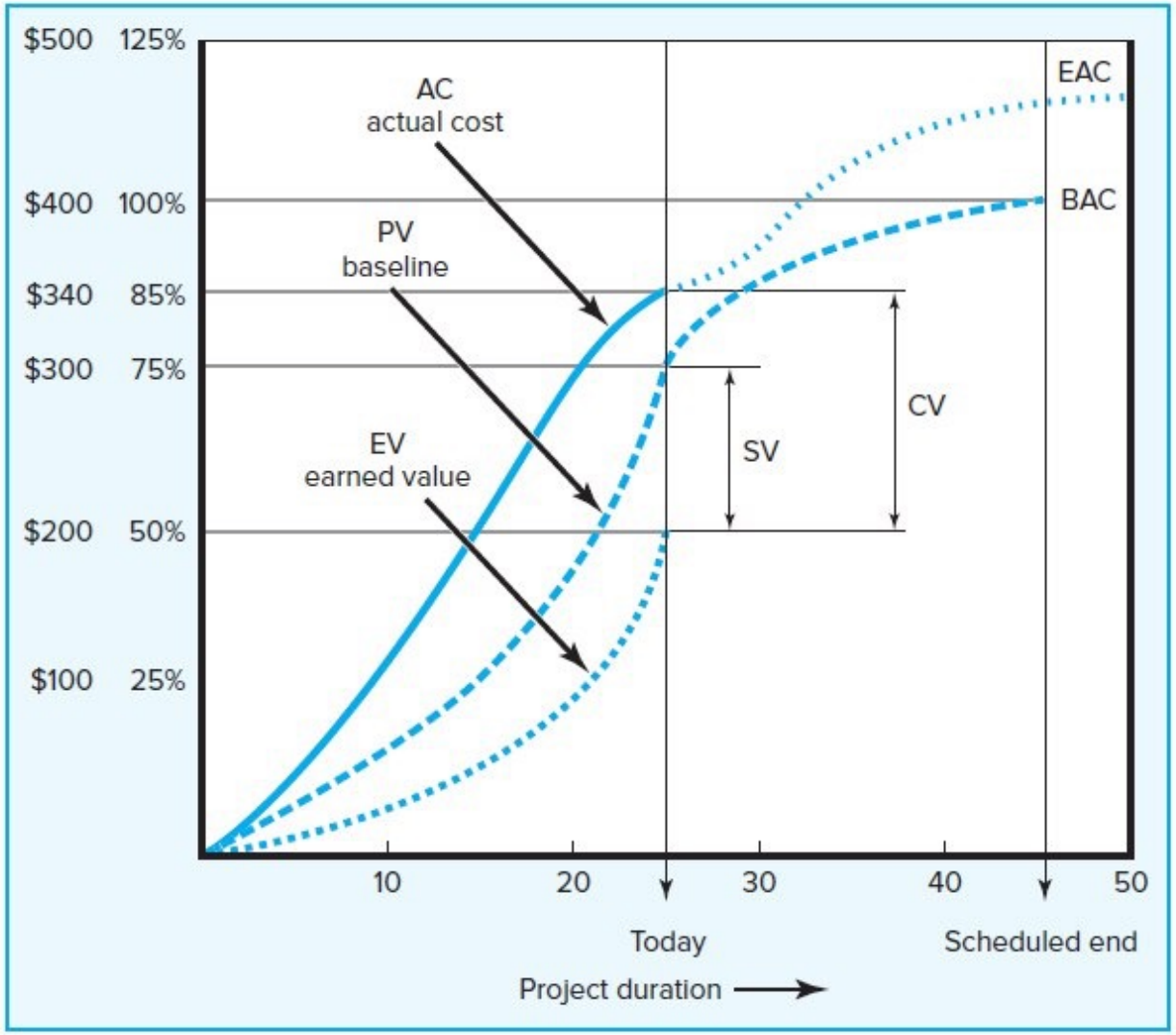
**SPI = EV/PV** **CPI = EV/AC** **CPI = 64/61= 1.049**

**SPI = 64/62 = 1.03** **BAC= 100 000$**

**EAC?** **EAC= BAC/CPI = 100000/1.049** **95 328$**

# Summary graph

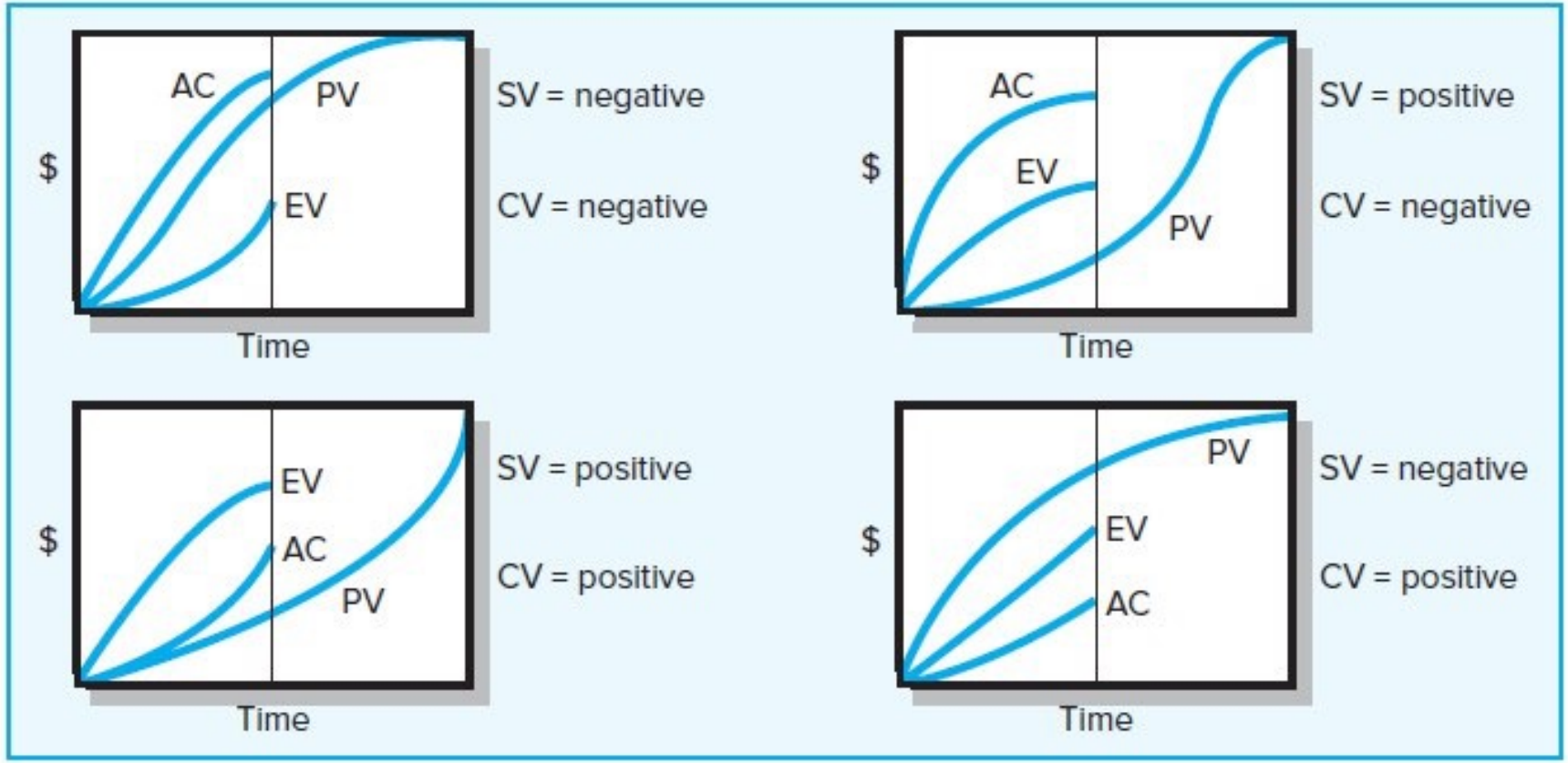





Larson, E., & Gray, C. (2018). Project Management: The Managerial Process 7e. McGraw Hill, page 469

# Summary graph






Larson, E., & Gray, C. (2018). Project Management: The Managerial Process 7e. McGraw Hill, page 469

# Class Activity



| Project Deliverables | Budget $(000s) | Cost distribution | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 | Week 9 | Week 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Design specs | 15 | Mixed | 8 | 7 | | | | | | | | |
| Shell and power | 20 | Prorated | | | | | | | | | | |
| Memory/software | 20 | Prorated | | | | | | | | | | |
| Zoom system | 40 | Prorated | | | | | | | | | | |
| Assemble | 10 | Prorated | | | | | | | | | | |
| Test | 5 | Finish | | | | | | | | | | |

Deliverables list taken form Larson, E., & Gray, C. (2018). Project Management: The Managerial Process 7e. McGraw Hill, page 471

# Class Activity



| Project Deliverables | Budget $(000s) | Cost distribution | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 | Week 9 | Week 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Design specs | 15 | Mixed | 8 | 7 | | | | | | | | |
| Shell and power | 20 | Prorated | | | 10 | 10 | | | | | | |
| Memory/software | 20 | Prorated | | 5 | 5 | 5 | 5 | | | | | |
| Zoom system | 40 | Prorated | | | 8 | 8 | 8 | 8 | 8 | | | |
| Assemble | 10 | Prorated | | | | | | | | 5 | 5 | |
| Test | 5 | Finish | | | | | | | | | | 5 |

# Status Report 1



| Project Deliverables | Budget $(000s) | Cost distribution | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 | Week 9 | Week 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Design specs | 15 | Mixed | 8 | 7 | | | | | | | | |
| Shell and power | 20 | Prorated | | | 10 | 10 | | | | | | |
| Memory/software | 20 | Prorated | | 5 | 5 | 5 | 5 | | | | | |
| Zoom system | 40 | Prorated | | | 8 | 8 | 8 | 8 | 8 | | | |
| Assemble | 10 | Prorated | | | | | | | | 5 | 5 | |
| Test | 5 | Finish | | | | | | | | | | 5 |

| ***Status Report Week 1*** | Completion | EV | AC | PV | CV | SV |
|---|---|---|---|---|---|---|
| Design specs | 40% | | 7 | | | |
| **Cumulative Total** | | | **7** | | | |

# Status Report 2



| Project Deliverables | Budget $(000s) | Cost distribution | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 | Week 9 | Week 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Design specs | 15 | Mixed | 8 | 7 | | | | | | | | |
| Shell and power | 20 | Prorated | | | 10 | 10 | | | | | | |
| Memory/software | 20 | Prorated | | 5 | 5 | 5 | 5 | | | | | |
| Zoom system | 40 | Prorated | | | 8 | 8 | 8 | 8 | 8 | | | |
| Assemble | 10 | Prorated | | | | | | | | 5 | 5 | |
| Test | 5 | Finish | | | | | | | | | | 5 |

| ***Status Report Week 3*** | Completion | EV | AC | PV | CV | SV |
|---|---|---|---|---|---|---|
| Design specs | 100% | | 14 | | | |
| Shell and power | 60% | | 13 | | | |
| Memory/software | 50% | | 14 | | | |
| Zoom system | 10% | | 5 | | | |
| **Cumulative Total** | | | | | | |

# Status Report 2



| ***Status Report Week 3*** | Completion | EV | AC | PV | CV | SV |
|---|---|---|---|---|---|---|
| Design specs | 100% | 15 | 14 | 15 | 1 | 0 |
| Shell and power | 60% | 12 | 13 | 10 | -1 | 2 |
| Memory/software | 50% | 10 | 14 | 10 | -4 | 0 |
| Zoom system | 10% | 4 | 5 | 8 | -1 | -4 |
| **Cumulative Total** | | 41 | 46 | 43 | -5 | -3 |

Is the project on schedule after Week 3? Calculate **SPI=(EV/PV)** – use cumulative totals

Is the project on budget after Week 3? Calculate **CPI=(EV/AC)** - use cumulative totals

What would be the estimated budget at completion if:

a. project will continue to spend at the same rate **EAC = BAC/CPI**

b. future expenditures will occur at the forecasted amount (no delays) **EAC = AC + (BAC-EV)**

# Status Report 2



| ***Status Report Week 3*** | Completion | EV | AC | PV | CV | SV |
|---|---|---|---|---|---|---|
| Design specs | 100% | 15 | 14 | 15 | 1 | 0 |
| Shell and power | 60% | 12 | 13 | 10 | -1 | 2 |
| Memory/software | 50% | 10 | 14 | 10 | -4 | 0 |
| Zoom system | 10% | 4 | 5 | 8 | -1 | -4 |
| **Cumulative Total** | | 41 | 46 | 43 | -5 | -3 |

Is the project on schedule after Week 3? Calculate **SPI=(EV/PV)** – use cumulative totals

41/43 = 0.953 – behind the schedule

Is the project on budget after Week 3? Calculate **CPI=(EV/AC)** - use cumulative totals

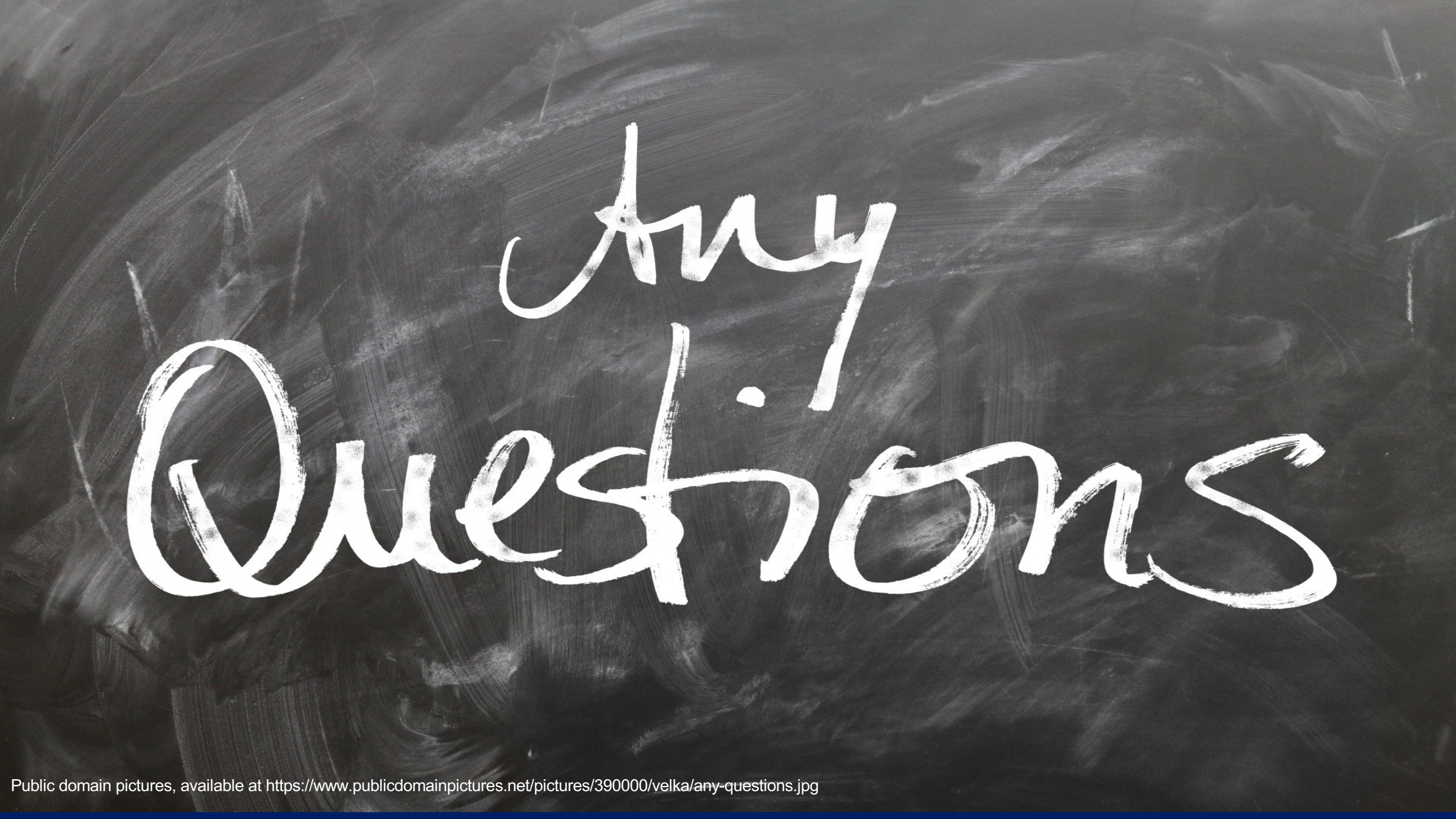
41/46 = 0.891 – overbudget

What would be the estimated budget at completion if:

a. project will continue to spend at the same rate **EAC = BAC/CPI** **110/0.891 = 123,45**

b. future expenditures will occur at the forecasted amount (no delays) **EAC = AC + (BAC-EV)**

**46 + (110-41) = 115**




Public domain pictures, available at https://www.publicdomainpictures.net/pictures/390000/velka/any-questions.jpg

# References




- Larson, E., & Gray, C. (2018). Project Management: The Managerial Process 7e. McGraw Hill, chapter 13, pages 458-501
- Burke, R. (2003). *Project Management: Planning and Control Techniques.* 4th edition, Wiley: West Essex. (chapters 15, 16).
- Gardiner, P. (2005) *Project Management: A Strategic Planning Approach.* Palgrave Macmillan (chapter 10).