

# CB 510

# Project Management

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“No battle plan survives contact with the enemy”

Field Marshal Helmuth von Moltke, German military strategist

# Project progress

- Reactive Vs. Proactive management
- Evaluating the project progress conditions
- Update the plan and schedule based on actual conditions
- Predict the final cost and schedule based on the new information
- Take corrective actions

# How?

- Periodic reports and meetings (weekly, bi-weekly, etc.)
- Report on work done to date and work in progress
- Set work for the following period
- Agree on corrective actions for delay

# Measuring work progress

- Units completed

For activities with milestones and units

- Actual start and finish dates

For short term activities with specific start and finish dates

- Cost ratio

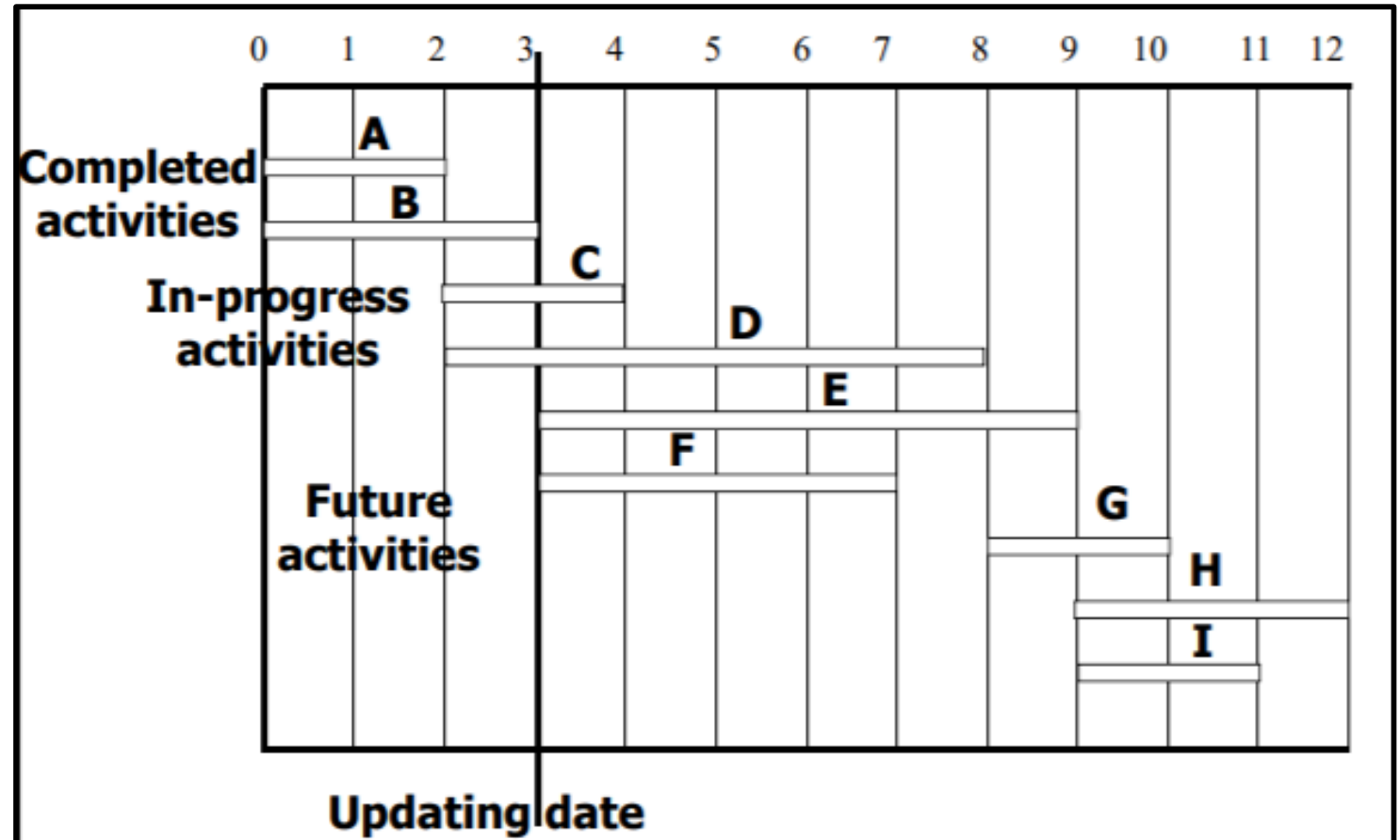
For activities developed and measured by their cost

# Schedule updating

- The original plan is used as a baseline for future comparison
- Frequent updating is carried out on a copy of the baseline
- Change the start date, expected finish date, and any necessary information that changes the schedule.

# Schedule updating

- Completed activities
- In-progress activities
- Future activities

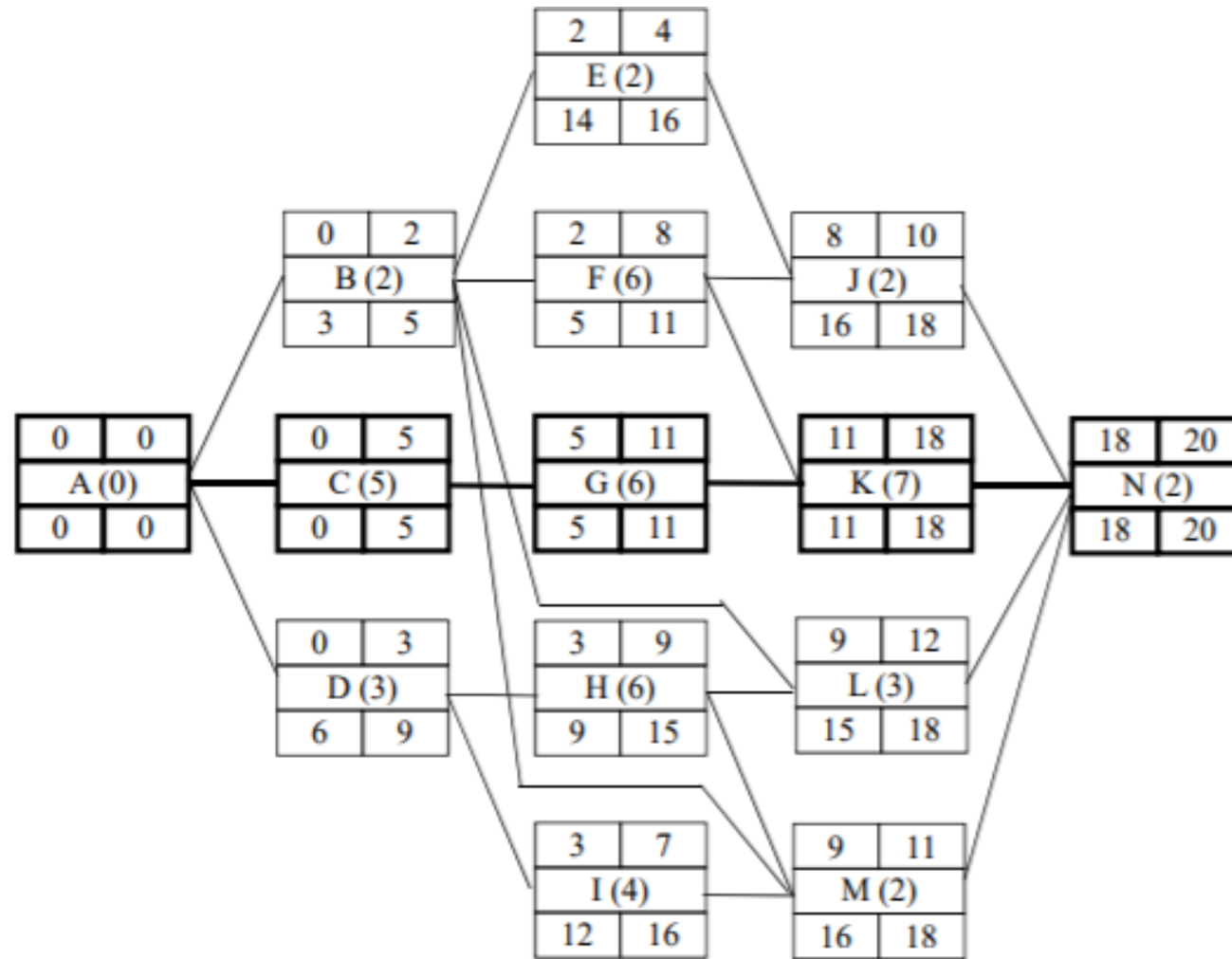


# Example

Activity	Duration	Predecessor
A	0	--
B	2	A
C	5	A
D	3	A
E	2	B
F	6	B
G	6	C
H	6	D
I	4	D
J	2	E,F
K	7	F,G
L	3	B,H
M	2	B,H,I
N	2	J,K,L,M



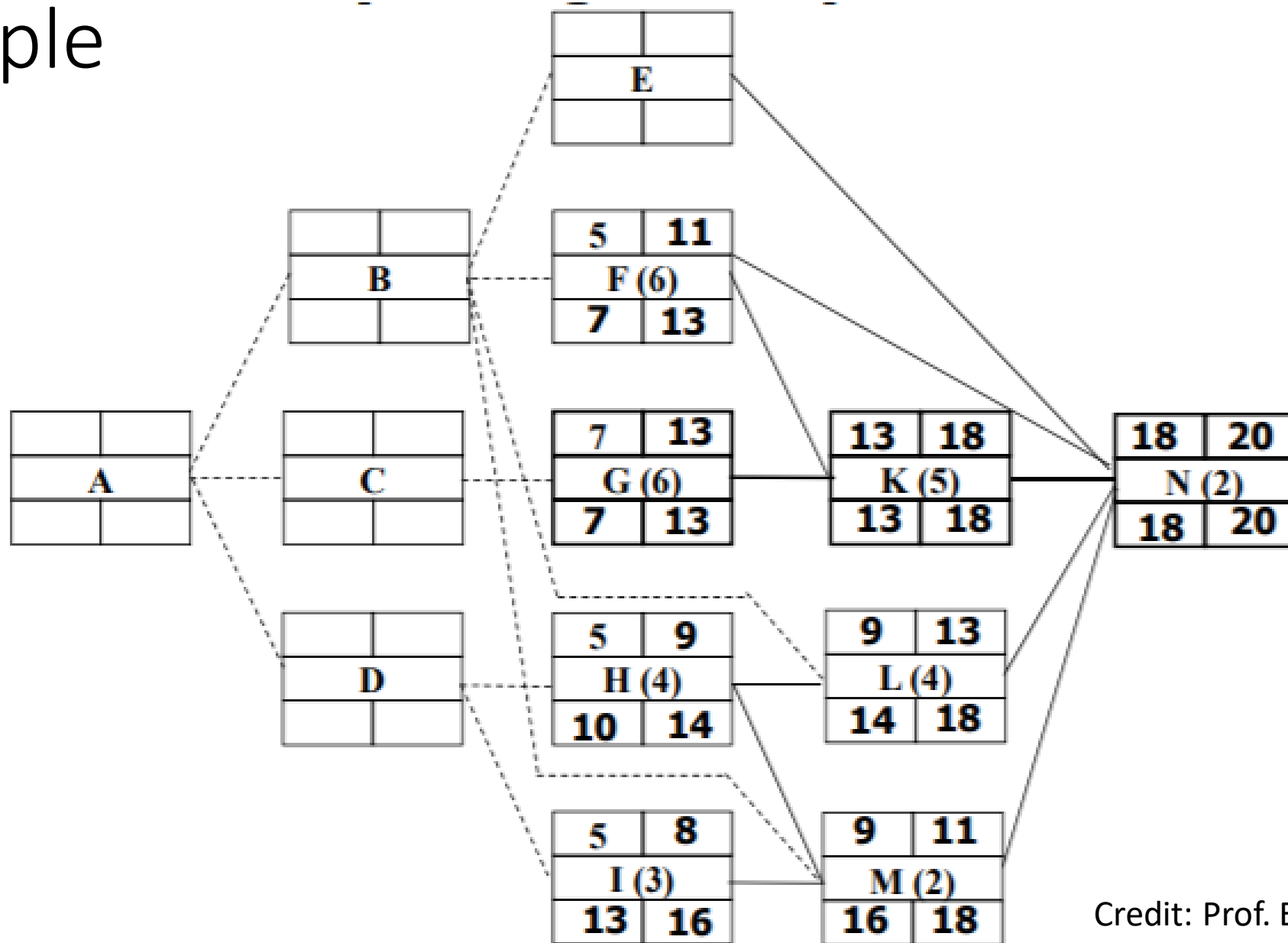
# Example



# Example – Updating at week 5

- Activities A,B,C, D, and E have been completed on time
- Activity F is ready to start starting week 6
- Activity G will not start until end of week 7
- Remaining duration of activity H is 4 weeks
- Remaining duration of activities I is 3 weeks
- Activity J has been omitted
- It is decided to shorten activity K by 2 weeks
- Volume of work in activity L has been increased by 33%

# Example



Credit: Prof. Emad Elbeltagi

We need to predict the final project completion and cost given the current project status

This is called Defined under **Project Control**

# What we need to measure?

- A schedule performance index: Schedule Index (SI)
  
- A cost performance Index: Cost Index (CI)

# What can we measure so far?

- The Budget Cost of Work Scheduled (BCWS)
- The Actual Cost of Work Performed (ACWP)
- The Budget Cost of Work Performed (BCWP), also known as earned value

# Budget Cost of Work Scheduled (BCWS)

- The estimated cost of the activities scheduled for a given period.
- Known as Planned Value
- We can determine that from a cost-loaded schedule

Task	Cost \$	Start Week	Finish Week	Week1	Week2	Week3	Week4	Week5	Week6	Week7	Week8
Mobilization	2,000	1	1	2,000							
Bridge excavation	5,000	2	2		5,000						
Install prefab bridge	47,000	2	3		23,500	23,500					
Backfill bridge	2,000	3	3			2,000					
Install culverts	10,000	3	4			5,000	5,000				
Rough excavation roadway	112,000	3	6			28,000	28,000	28,000	28,000		
Install saniatry sewer	57,000	6	7						28,500	28,500	
Install water lines	69,000	7	8							34,500	34,500
<b>Total</b>	<b>304,000</b>			<b>2,000</b>	<b>28,500</b>	<b>58,500</b>	<b>33,000</b>	<b>28,000</b>	<b>56,500</b>	<b>63,000</b>	<b>34,500</b>

BCWS after 3 weeks = \$89,000

Credit: Prof. Omar El-Anwar

# Actual Cost of Work Performed (ACWP)

- The actual costs incurred in the site for performing a specific set of activities.
- Also known as Actual Value



# Budget Cost of Work Performed (BCWP)

- The Earned Value for the contractor.
- This is the costs that the contractor can collect for performing the job under the current contract.
- For unfinished activities, we can use percentages to determine such value.

# Example

- Consider an excavation job that requires 120 hour of excavation. You assigned three excavator that works 8 hours a day. Each excavator costs \$500 per day.
- After 3 days, 50% of the work was done at a cost of \$3,200
- Calculate the BCWS, ACWP, and BCWP at the end of day 3.

# Solution

- Project estimated duration (day) =  $120\text{hr} / (8 \times 3) = 5$  days
- Project estimated cost =  $5 \text{ days} \times \$500/\text{day} \times 3 \text{ crews} = \$7,500$
- After 3 days, percentage completed =  $3/5$  days
- BCWS =  $3/5 \times 7,500 = \$4,500$
- ACWP =  $\$3,200$
- BCWP =  $\$1,500 \times (5 \times 50\%) = \$3,750$

# Schedule Variance and Schedule Index

- Schedule Variance (SV)

- The difference between BCWP and the BCWS

$$SV = BCWP - BCWS$$

+ve: ahead schedule

-ve: behind schedule

- Schedule Index (SI)

- The ration of BCWP to BCWS

$$SI = BCWP / BCWS$$

>1: ahead schedule

<1: behind schedule

# Cost Variance and Cost Index

- Cost Variance (CV)

- Is the difference between the BCWP and the ACWP

$$CV = BCWP - ACWP$$

+ve: under budget

-ve: over budget

- Cost Index (CI)

- Is the ratio between BCWP and the ACWP

$$CI = BCWP / ACWP$$

>1: under budget

<1: over budget

# Example

- Calculate SI, SV, CI, and CV for the aforementioned example

# Solution

- $BCWS = \$4,500$
- $ACWP = \$3,200$
- $BCWP = \$3,750$
  
- $SI = BCWP/BCWS = \$3,750/\$4,500 = 0.833$  (Behind schedule)
  
- $CI = BCWP/ACWP = \$3,750/\$3,200 = 1.17$  (Under budget)

# Prediction of final cost and duration

- Assuming that the current progress (cost and performance) will continue, we can now calculate the expected cost and duration
- Expected final duration = Total Estimated Duration / SI
- Expected final cost = Total Estimated Cost / CI



# For the same example

- Expected project final duration =  $5/0.833 = 6$  days
- Expected project cost =  $\$7500/ 1.17 = \$6,410$