Monitoring of construction projects

Monitoring, controlling

Monitoring, Controlling

- Monitoring – collecting, recording, and reporting information concerning project performance that project manger and others wish to know
- Controlling – uses data from monitor activity to bring actual performance to planned performance

Why?

- Because we woud like to know what happens,
- To detect and react appropriately to deviations and changes to plans
- To pay according to the progress

When

- End of the project
- Regularly, monthly
- At task completion
- At pre-planned decision points (milestones)

What do we monitor ?

- Cost
- Time
- Quality/Technical Performance
- Materials

How

- Through meetings with clients, parties involved in project (Contractor, supplier,etc.)
- Comparing cost and labor hour
- Using Earned Value Analysis
- Milestones
- Spent labor hours
- Tests and inspections

Baseline plan

- Last technical, scheduling, budget plan; After the last modified contract/agreement
- During one construction project there can be 6-7 baseline plans.

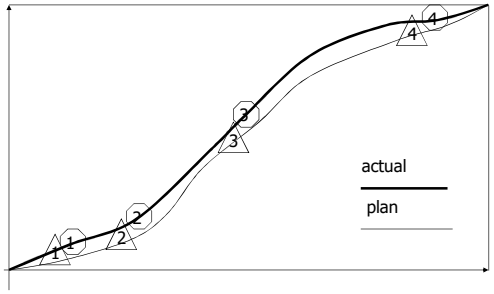
Milestones

Measuring at pre-planned decision points

Examples on milestones

	Planed finish date	Planed cost	Act. Finish date	Actual cost
Foundation	4	5	5	6
Loadbearing structures	15	12	16	14
Building installations	30	40	33	42
Finishing works	40	50	42	56

Monitoring with milestones

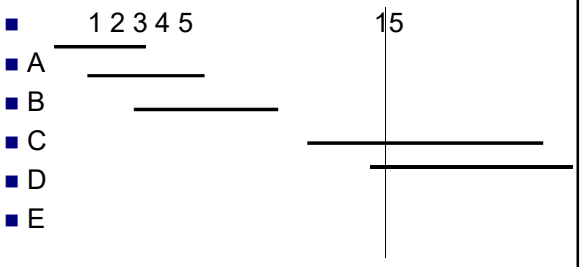


Milestones pros/cons

- It is simple, easy for one small project
- For a complex project it is not good

Cost and labor hour

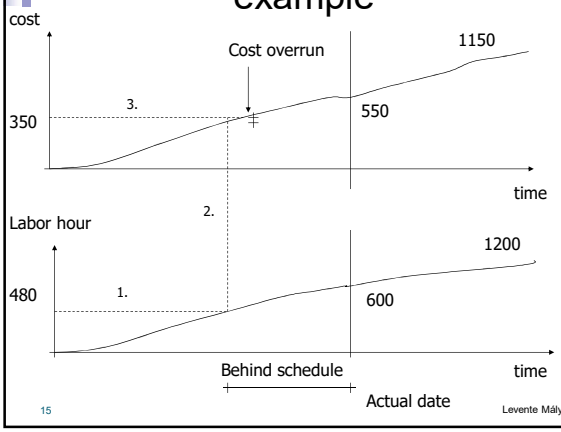
Sample bar chart



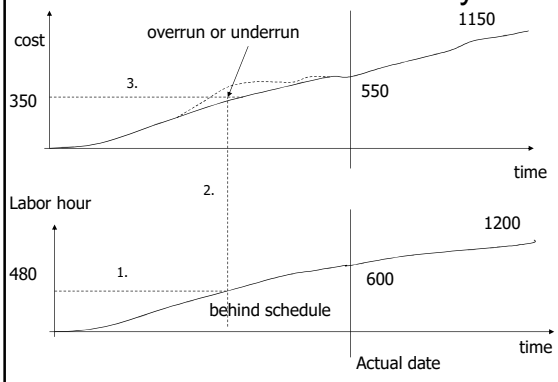
sample

- 40% of labor hours were complete (480 laborhours)
- 30% of the cost was spent (345 units)
- How is the progress? Behind or ahead of schedule? Cost is overrun or underrun?

example



cost / labor hour analysis



Cost labor hour pros/cons

- It is not simple, labor hour is not an exact measure
- For a complex project it is not good

Earned Value Analysis

Earned Value

- A way of measuring overall performance (not individual task) is using an aggregate performance measure - Earned Value
- Earned value of work performed (value completed) for those tasks in progress found by multiplying the estimated percent physical completion of work for each task by the planned cost for those tasks. The result is amount that should be spent on the task so far. This can be compared with actual amount spent.

Earned Value: steps

- Define network with WBS and PDM
- Assign a value to each activity
- Define earning rules

Definitions

- **BCWS**: Budgeted Cost of Work Scheduled (Budgeted Cost); Planed Value (PV)
- **BCWP**: Budgeted Cost of Work Performed (Earned Value) ; Earned Value (EV)
- **ACWP**: Actual Cost of Work Performed (Actual Cost) ; Actual Cost (AC)

Indicators

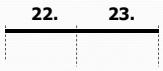
- Cost Variance:
- CV=BCWP-ACWP (negative value - cost overrun)

- Cost Performance Index:
- CPI=BCWP/ACWP
- Schedule Variancy:
- SV= BCWP-BCWS (negative value - behind schedule)

- Scheduled Performance Index:
- SPI=BVWP/BCWS

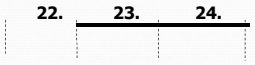
Earned Value Analysis

Planed value: 200 Ft/day (BCWS)

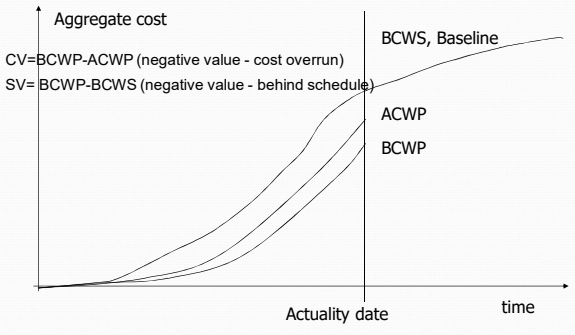


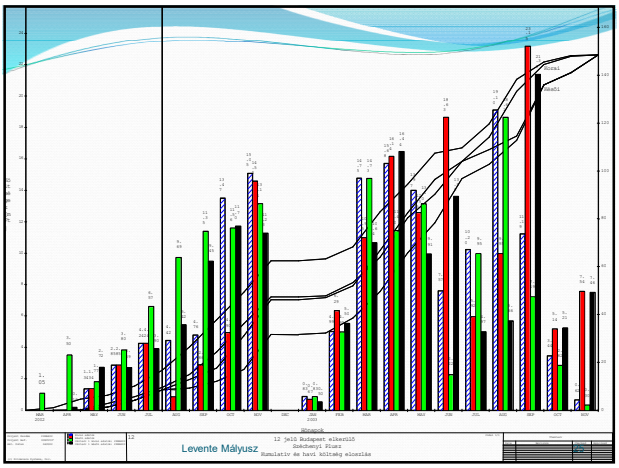
Earned Value: 200 Ft/day (BCWP)

Actual cost data: 220 Ft/day (ACWP)

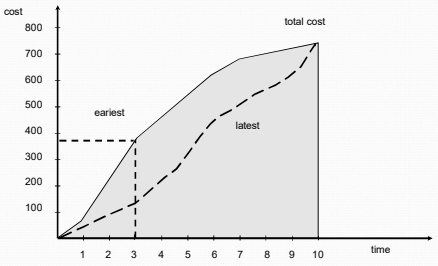


Earned Value Analysis





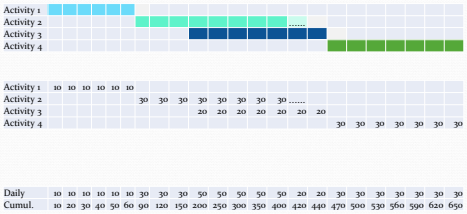
Cumulative cost curve



Earned Rules

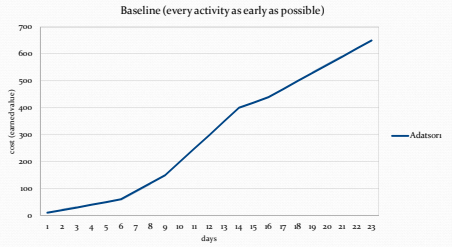
0/100 rule to all activities 0 at begining and 100 at the end
50/50 rule credit at begining and at the end
or
25/75 25% at start 75% at end
20/80 …
balanced

Example on tracking



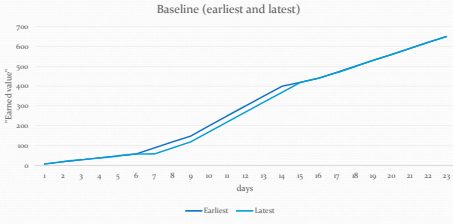
Activity 1	10	10	10	10	10	10																		
Activity 2							30	30	30	30	30	30	30	.....										
Activity 3										20	20	20	20	20	20									
Activity 4																30	30	30	30	30	30	30		
Daily	10	10	10	10	10	10	30	30	30	50	50	50	50	50	20	20	30	30	30	30	30	30	30	
Cumul.	10	20	30	40	50	60	90	120	150	200	250	300	350	400	420	440	470	500	530	560	590	620	650	

Example on tracking

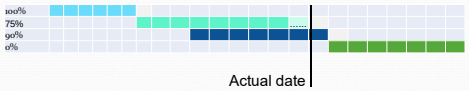


Example on tracking

Activity 1	10	10	10	10	10	10																		
Activity 2							30	30	30	30	30	30	30	.....										
Activity 3										20	20	20	20	20	20									
Activity 4																30	30	30	30	30	30	30		
cumul 1	10	20	30	40	50	60	90	120	150	200	250	300	350	400	420	440	470	500	530	560	590	620	650	
cumul 2	10	20	30	40	50	60	60	90	120	170	220	270	320	370	420	440	470	500	530	560	590	620	650	



Example on tracking

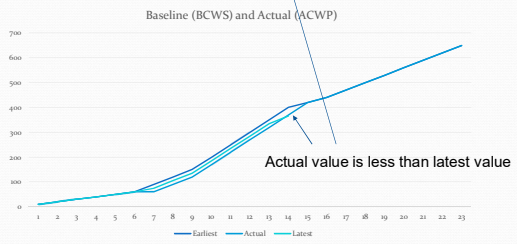


Actual date

Assumptions:
Labor work is balanced

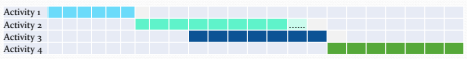
Example on tracking

ealiest	10	20	30	40	50	60	90	120	150	200	250	300	350	400	420	440	470	500	530	560	590	620	650	
latest	10	20	30	40	50	60	60	90	120	170	220	270	320	370	420	440	470	500	530	560	590	620	650	
actual	10	20	30	40	50	60	75	105	135	185	235	285	335	366										



Actual value is less than latest value

Example on tracking, a commonly used solution

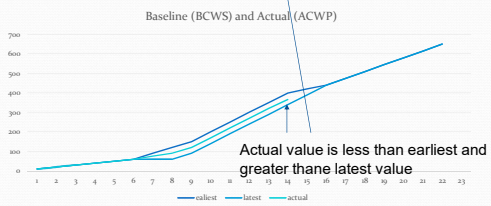


Activity 3 is 7 days=56 labour hours if base calendar is 8 hours daily
Activity 4 is 7 days=56 labour hours if base calendar is 8 hors daily

Change base calendar to 10 hours per workday
Schedule:
Activity 3 is 56 labour hours that is 5,6 days, 10% is less than a day
Activity 4 is 56 labour hours that is 5,6 days instead of 7 days
Cost:

Example on tracking

ealiest	10	20	30	40	50	60	90	120	150	200	250	300	350	400	420	440	475	510	545	580	615	650
latest	10	20	30	40	50	60	60	60	90	140	190	240	290	340	390	440	475	510	545	580	615	650
actual	10	20	30	40	50	60	75	90	120	170	220	270	320	366								



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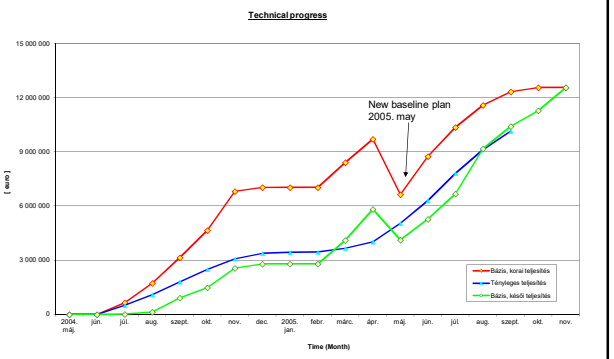

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Earned value analysis pros and cons

- It is one of the most accurate measuring system of project progress.
- Quality is not taken into consideration
- Takes time to collect data

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