



PROJECT MANAGEMENT

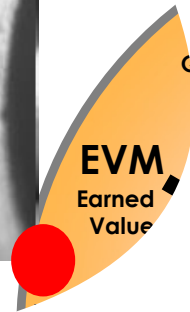
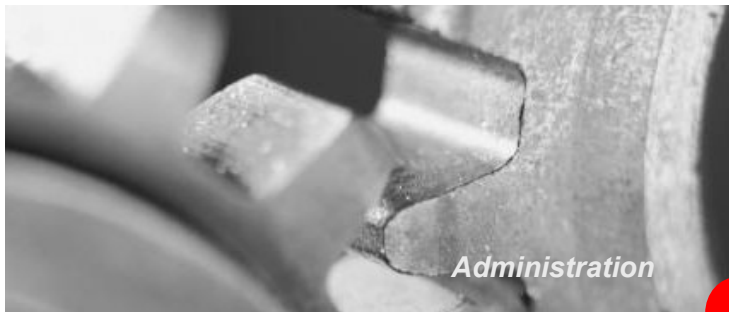
EVM: Earned Value Management

Bogdan Lent

60 Minutes



Project Controlling



Earned Value Management



Project Management

10:00 EVM Earned Value Management:

10:10 Goals Elaboration of management decisions
based on the evaluation:

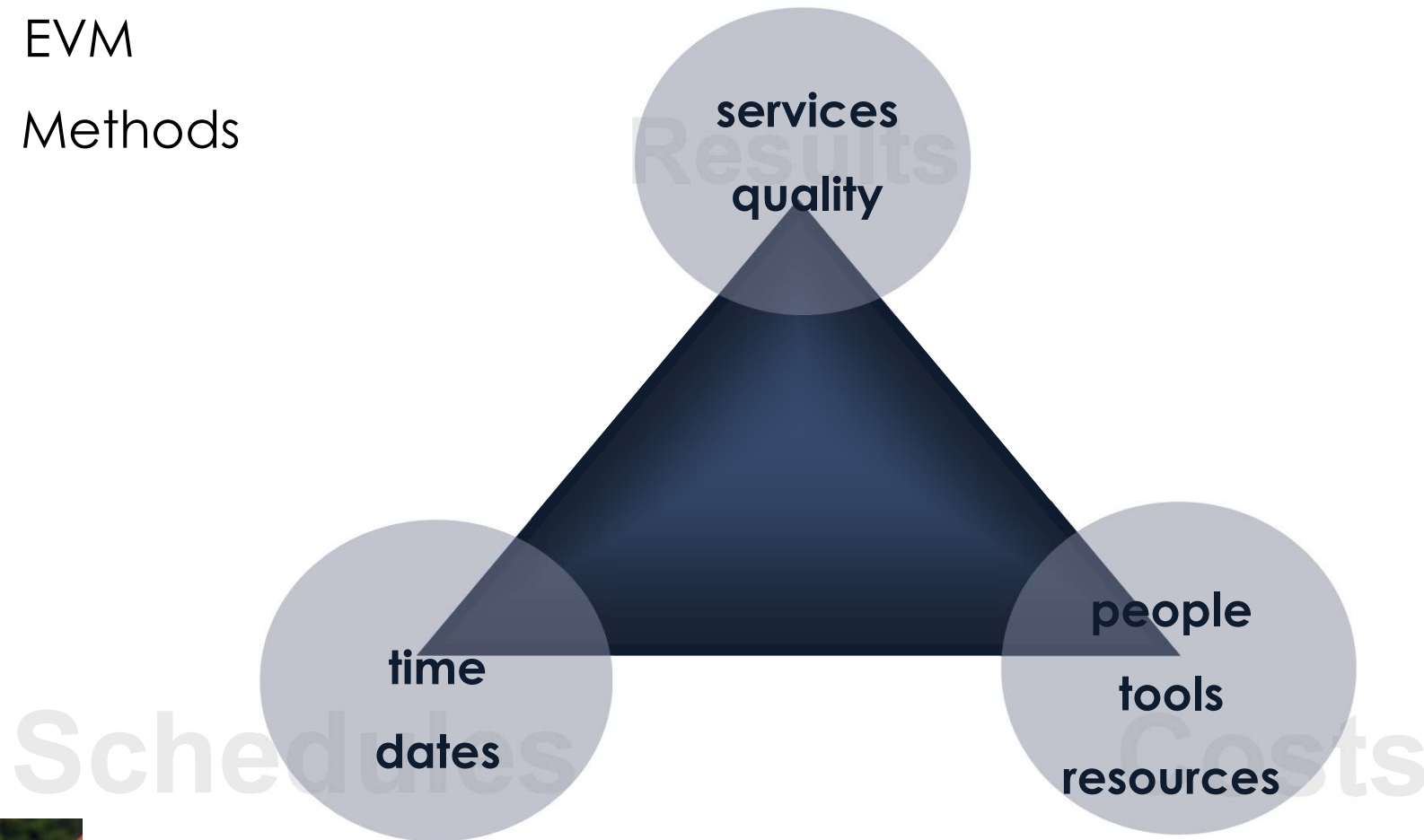
- of the progress towards the project goals
- in relation to the time and costs used,
- compared to the project planning,
- taking into account
an influence of the concurrent events.



Parameters measured:

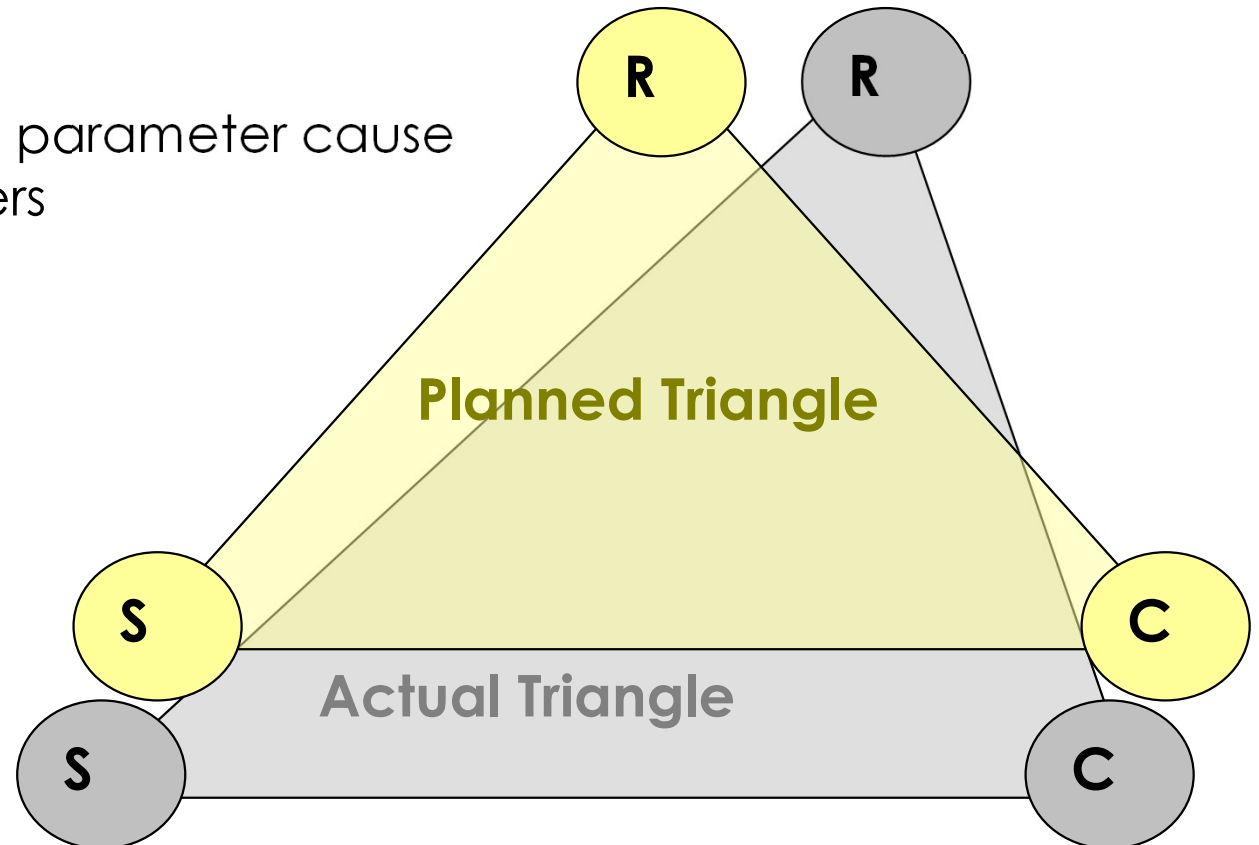
10:00 EVM

10:20 Methods



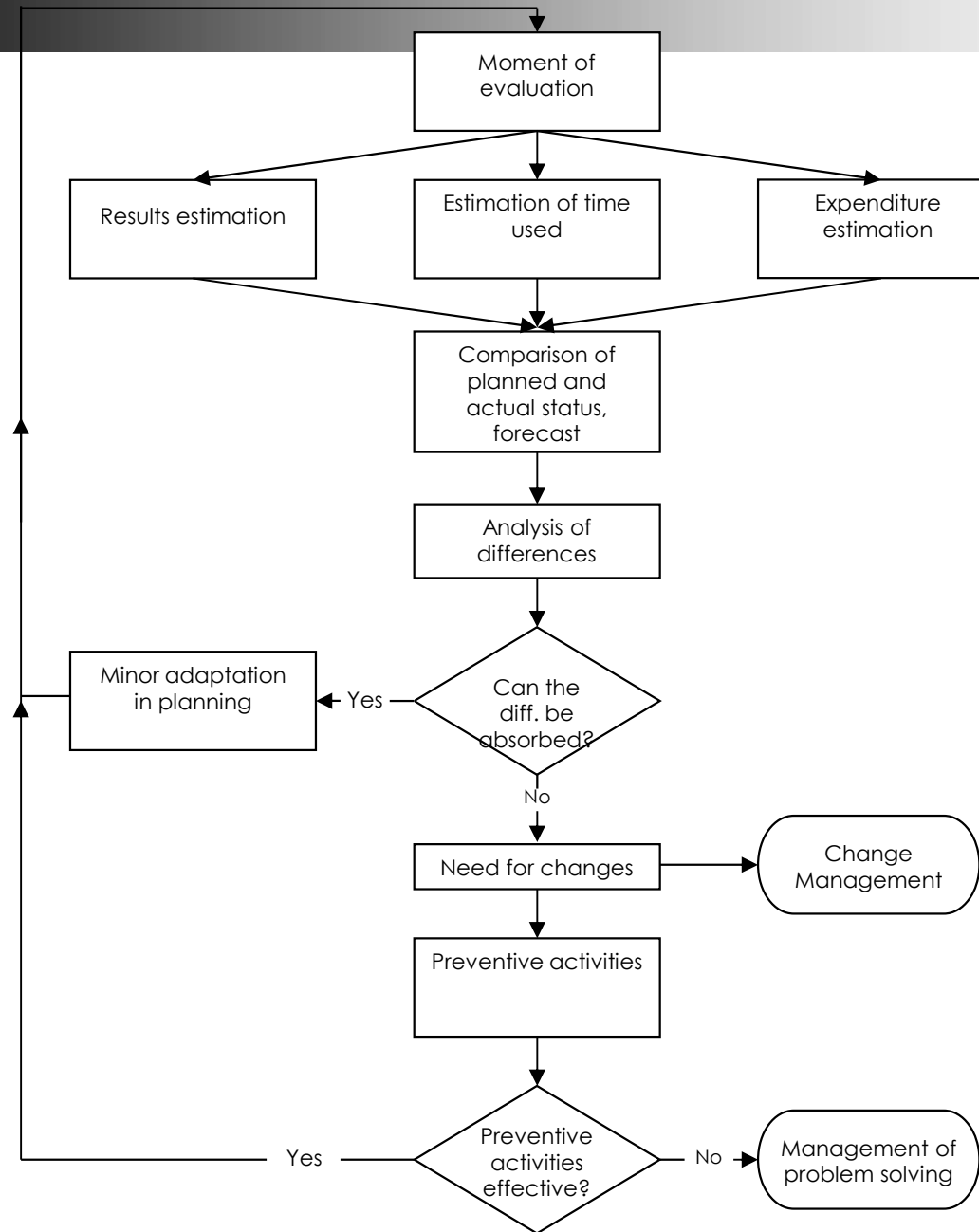
Interdependence:

- Change in one parameter cause change in others
- The new parameters create new triangle



10:00 EVM Earned Value Management

Evaluation steps:



Earned Value Elaboration

10:00 EVM

10:30 Techniques

Procedure:

1. Actualize dates and schedules
2. Calculate theoretically earned value
3. Estimate real earned value
4. Balance value and cost



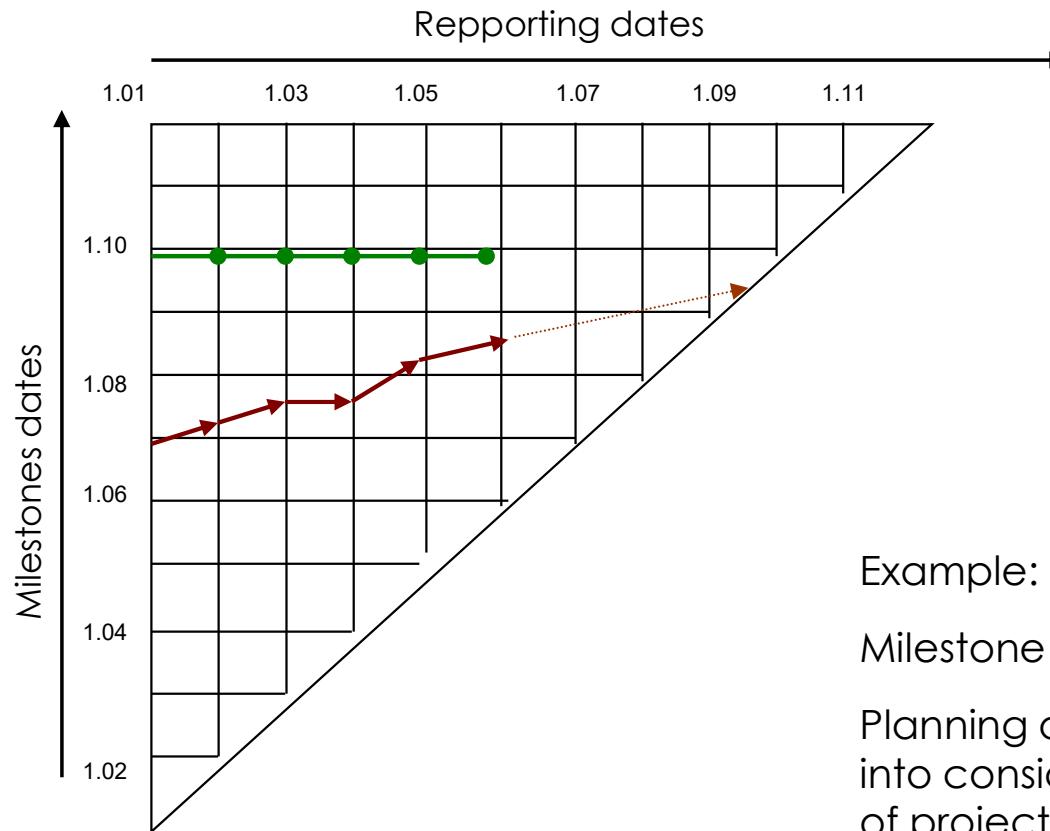
Time Estimation

YOU CAN'T STOP TIME...



Time Estimation

Milestone Trend Analysis



Example:

Milestone ► is not achieved.

Planning of a milestone ● doesn't taking into consideration this changes is a source of project risk



Cost Estimation



Figure 15–1.
Do you control costs, or do costs control you?

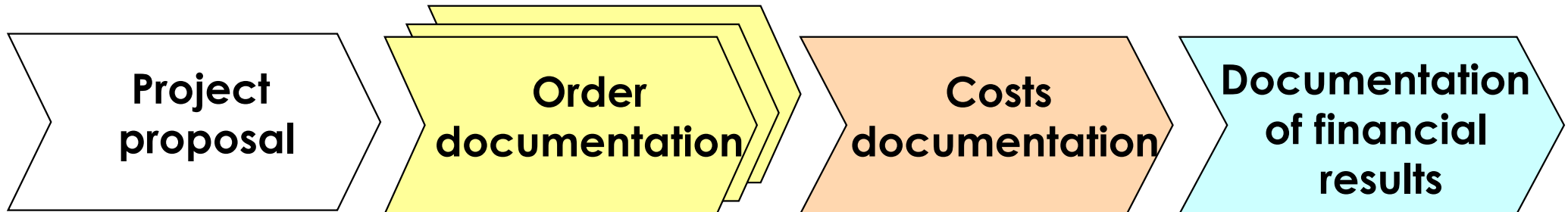


**POLITECHNIKA
BYDGOSKA**
Wydział Zarządzania

Dr. hab. rer oec., Dr.-Eng. Bogdan Lent, prof. PBS

10:00 EVM Earned Value Management

Cost Estimation



Project Management

Cost Estimation

Project proposal cost/time submission

Project: Control System of Surveillance Cameras CSSC

1. Project phases

Phase	Start	End		Cost	
		Plan	Real	Plan	Real
Planning	1.01.2022	30.04.2022	10.05.2022	8.000	8.000
Implement.	1.05.2022	31.05.2022	30.10.2022	18.000	18.000

2. Finances structure

Project No		Account	7077137	comment	
		intern	7077137 100100		
		extern	7077137 100200		

Cost Estimation

Planned expenditures

Nr	Product	Start	End	Days	State	Schedules								
						1	2	3	4	5	6	7	8	9
1.	Initiation	1.01.22	30.04.22	80	ok.	←————→								
2.	Planning	30.04.22	30.05.22	20	ok.					↔				
3.	Implementation	1.06.22	1.08.22	40	crit.						↔			
4.	Closing & Eval.	1.08.22	30.08.22	20	crit.								↔	



Cost Estimation

Periodical control

			January								
Nr	Product	End	intern		extern		goods		summary		%
			SAP	forecast	SAP	forecast	SAP	forecast	SAP	forecast	
1	Concept	30.04	-	1000	-	-	-	60	-	1060	100
2	Project	30.05	-	-	-	-	-	-	-	-	-
3	Realisation	01.08	-	-	-	-	-	-	-	-	-
4	Implementati on	30.08	-	-	-	-	-	-	-	-	-



Project Management

Cost Estimation

Contracts Cost Management

Contract nr	Title	Issue from - to	max. costs	Max. additional costs	Payment plan		payments		
					Date	Amount	Date	Amount	Δ
LS-V01	CSSC	01.01.2022 31.08.2022	26.000	1.000	30.06.2022	8.000	29.06.2022	8.000	0
					31.08.2022	16.000	30.08.2022	10.000	+6
					30.09.2022	2.000	30.10.2022	6.000	+2
							30.11.2022	2.000	0
						26.000	0		



Earned Value Elaboration

Example:

David plans to spend 2000 Euro on technician, who will install the software on laptops to be rented. It should take one months to make a complete installation on 100 laptops.

At the end of that months Jan confirmed, that only 80 laptops were ready.

That means that the scheduled value would be:

$$SV = 0,8 \times 2000 \text{ Euro} = 1600 \text{ Euro}.$$

However, due to the new release of JBoss, the external support by Claudia costed David another 400 Euro.

So in total Supareak spent 2400 Euro getting installed only 80 laptops. Thus 100 laptops will costs 3000 Euro. Cost difference in elaborated value is (2400-1600) and budget will be exceed by (3000-2000) Euro.

If David will not increase his budget by 20% he will be able to produce only about 70 laptops/month. If his technician learns JBoss and get back to originally scheduled 2000 Euro in the following month, earned value will increase to 1600 Euro. And only if the technician will speed up and make 100 units per months, earned value will equal spent value of 2000 Euro .



Earned Value Elaboration

Earned Values Project xy (in Euro, cumulated)

Week of the project	1	2	3	4	5	6	7	8	9	10
Planned costs	2	4.8	7.5	10.0	11.3	12.2	14.0	14.6	14.9	16.2
Actual costs	2.4	6.8	10.3	11.0	12.2	12.9	13.5	14.6	14.7	15.2
Earned Value	1.6	3.5	5.5	9.6	11.8	12.5	13.0	14.0	15.7	17.0

Project xy Indexes

CPI	0.67	0.51	0.53	0.87	0.97	0.97	0.96	0.96	1.07	1.12
SPI	0.80	0.73	0.73	0.96	1.04	1.02	0.93	0.95	1.05	1.05

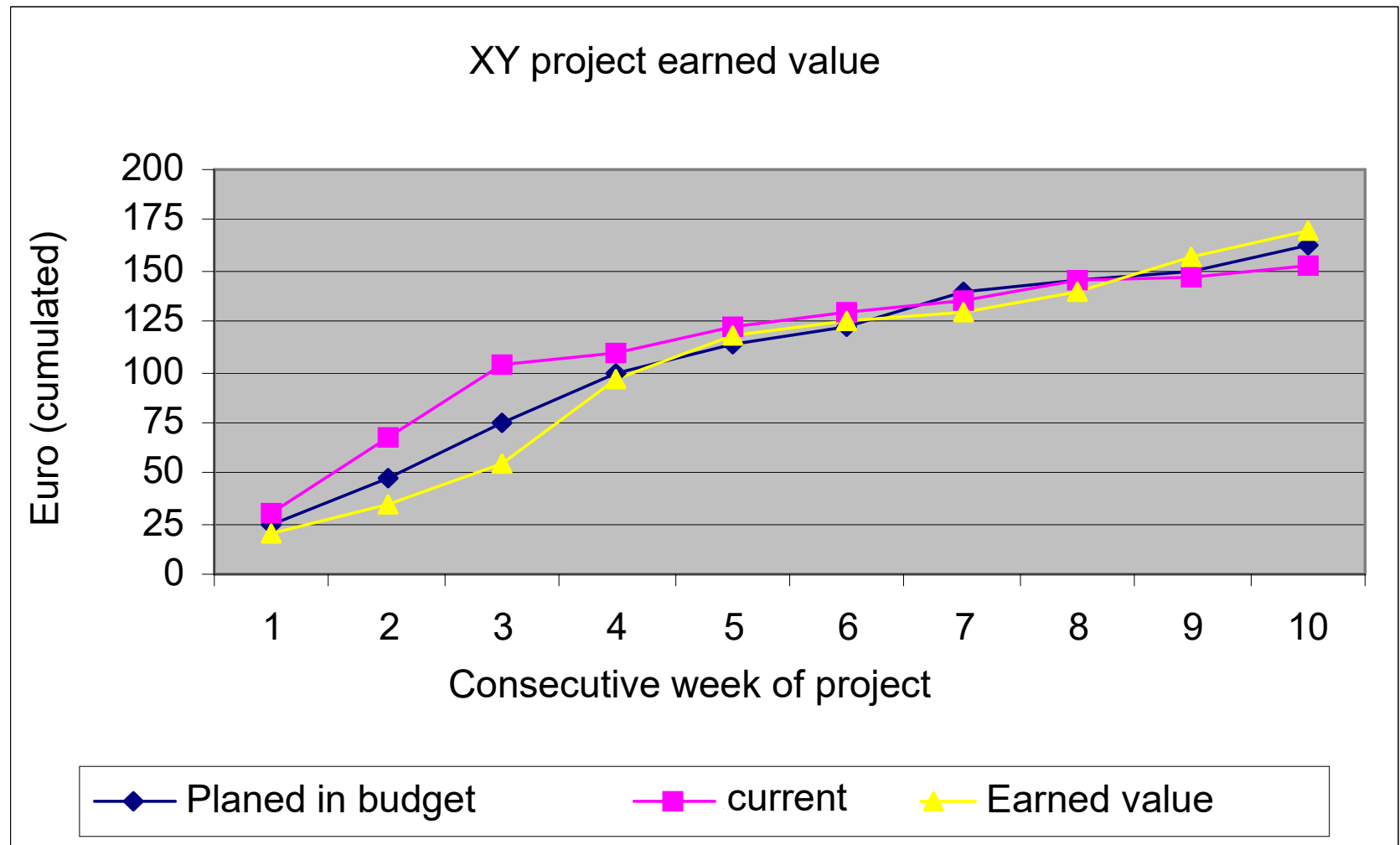
CPI = Cost Performance Index, calculated: $\text{Earned Value} / \text{Actual Costs}$

SPI = Schedule Performance Index, calculated: $\text{Earned Value} / \text{Budgeted Costs}$



Earned Value Elaboration

Graphical Visualization:



Earned Value Indexes

Example: Each period individually

Month	January	February	March
Budget: submitted to SAP	2	2	2
Present: forecast	1,06	1,8	1,8
Performance Ratio	95%	30%	100%
Earned value	1,9	0,6	2
Index of cost realization*	1,8	0,3	1,1
Index of plan realization**	0,95	0,3	1
Critical ratio***	1,7	0,09	1,1

$$* = \frac{\text{Earned value}}{\text{present costs}}$$

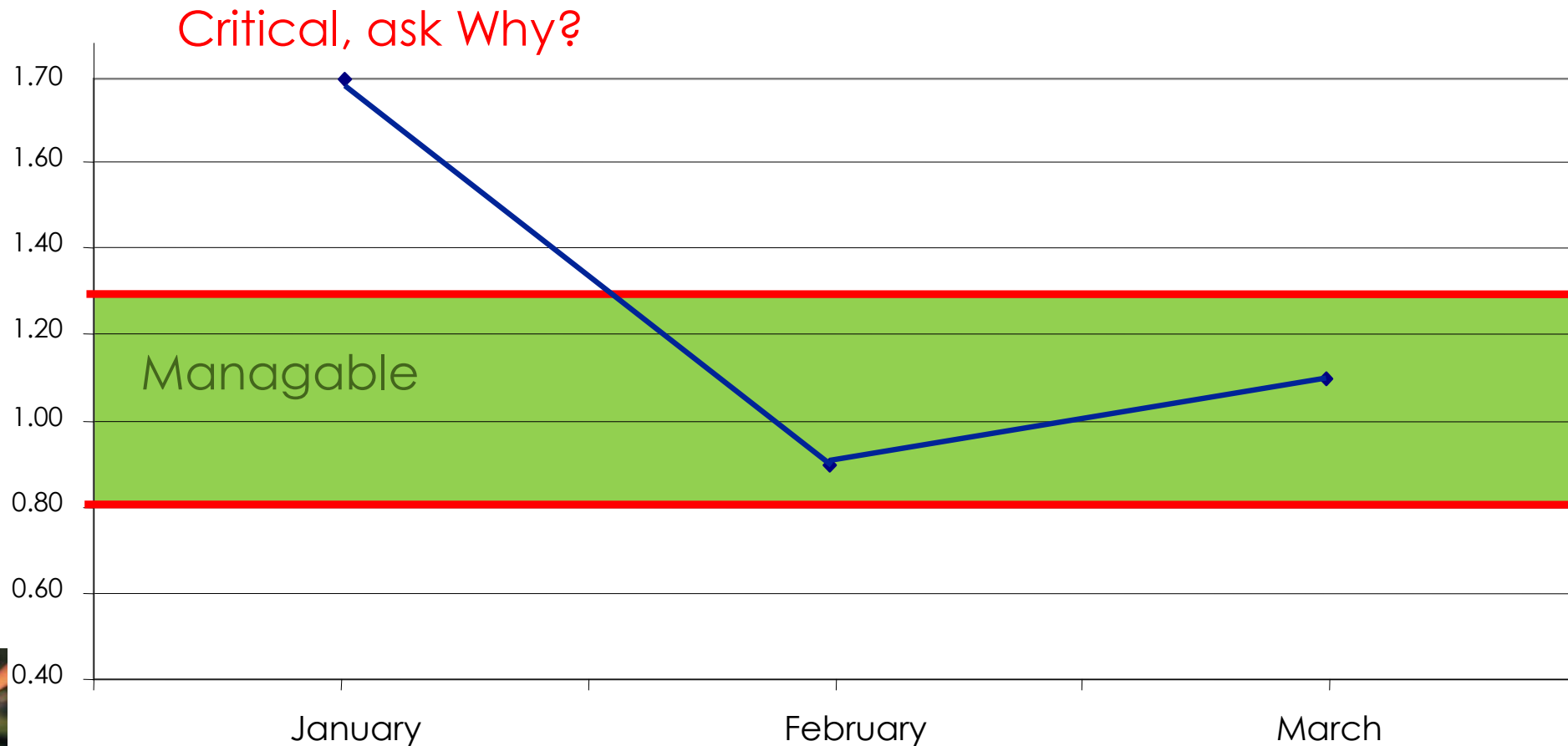
$$** = \frac{\text{Earned value}}{\text{Budgeted costs}}$$

$$*** = \text{index of cost realization} \times \text{index of plan realization}$$



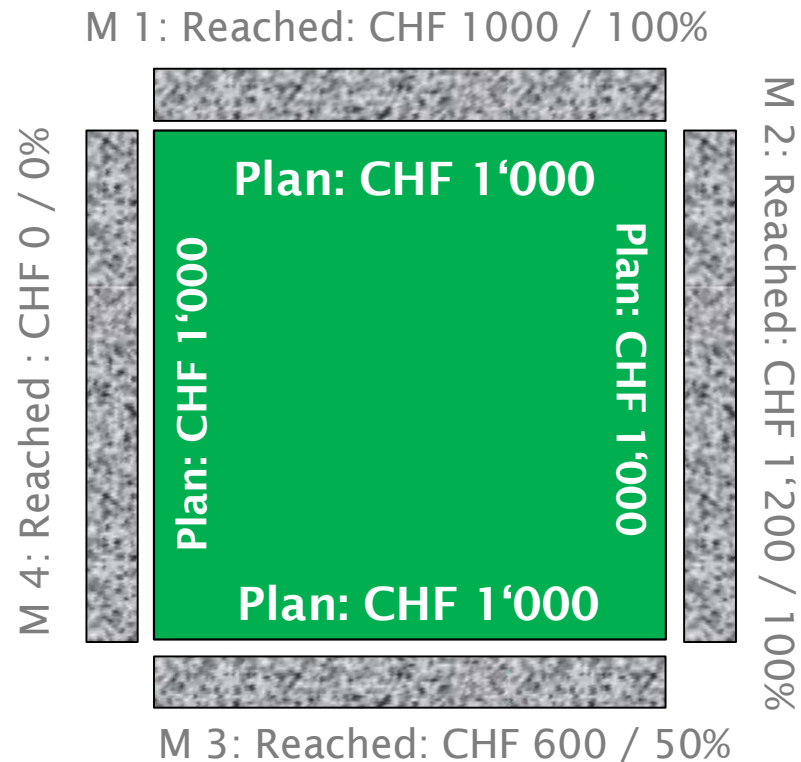
Earned Value Indexes

Critical ratio CR (SPI i) x (CPI i)



Exercise 1 End after 3 days work

2 out of 4 walls are done. On the third day only half has been built (50%) but CHF 600 were spent. However, the whole third wall shall be done on the day 3 for CHF 1'000.



Please calculate

Day	1	2	3
Plan Costs PV	1000		
Actual Costs AC			
Performance Ratio			
Earned value EV			
Index of cost realization*			
Index of plan realization**			
Critical ratio***			

CPI * $\frac{\text{Earned Value}}{\text{Actual Costs}}$

=

SPI * $\frac{\text{Earned Value}}{\text{Plan Costs}}$

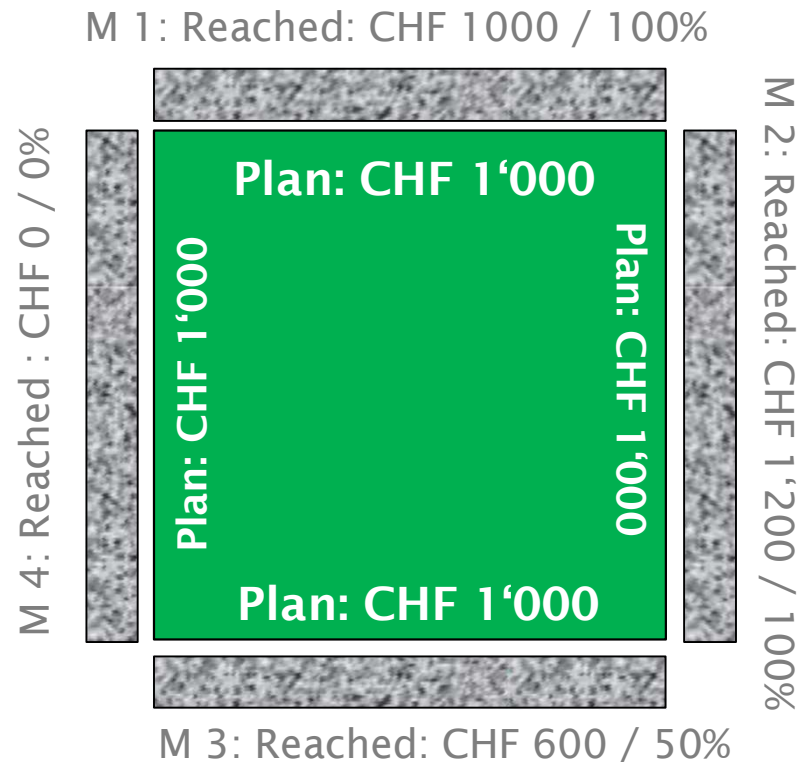
* =

CR*** = index of cost realization CPI x index of plan realization SPI



Exercise 1 End after 3 days work

2 out of 4 walls are done. On the third day only half has been built (50%) but CHF 600 were spent. However, the whole third wall shall be done on the day 3 for CHF 1'000.



Please calculate

Day	1	2	3
Plan Costs PV	1000	2000	3000
Actual Costs AC	1000	2200	2800
Performance Ratio	100%	200%	250%
Earned value EV	1000	2000	2500
Index of cost realization*	=1.0	=0.93	=0.89
Index of plan realization**	=1.0	=1.0	=0.83
Critical ratio***	=1.0	=0.93	=0.73

CPI * $\frac{\text{Earned Value}}{\text{Actual Costs}}$

=

SPI * $\frac{\text{Earned Value}}{\text{Plan Costs}}$

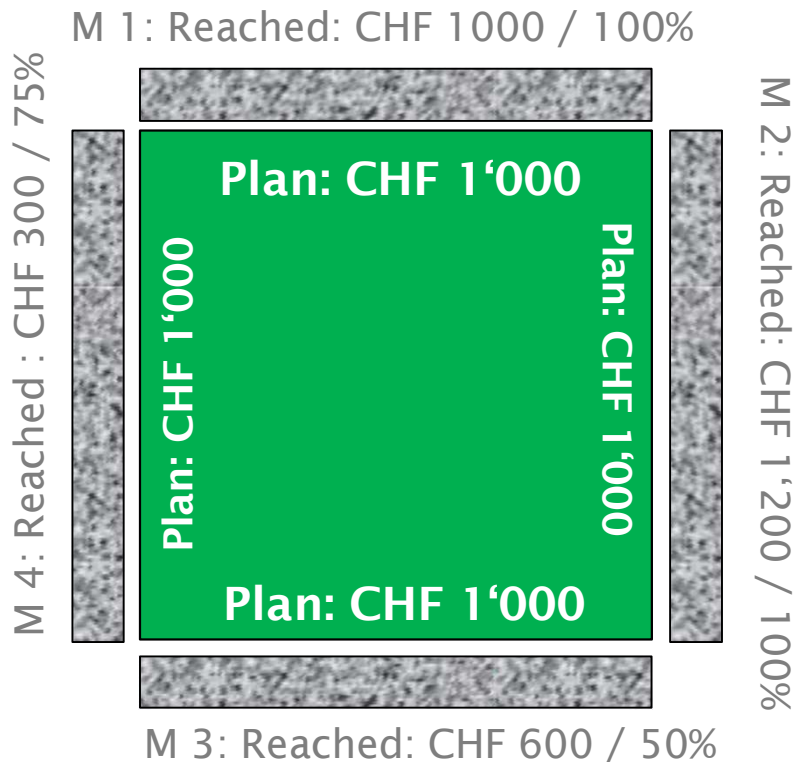
* =

CR*** = index of cost realization CPI x index of plan realization SPI



Exercise 2 End after 4 days work

2 out of 4 walls are done. On the third day only half has been built (50%) but CHF 600 were spent. However, the whole third wall shall be done on the day 3 for CHF 1'000. Day four brought 75% of the wall for just CHF 300.-.



Please calculate

Day	1	2	3	4
Plan Costs PV	1000	2000	3000	
Actual Costs AC	1000	2200	2800	
Performance Ratio	100%	200%	250%	
Earned value EV	1000	2000	2500	
Index of cost realization*	=1.0	=0.93	=0.89	
Index of plan realization**	=1.0	=1.0	=0.83	
Critical ratio***	=1.0	=0.93	=0.73	

CPI * $\frac{\text{Earned Value}}{\text{Actual Costs}}$

=

SPI * $\frac{\text{Earned Value}}{\text{Plan Costs}}$

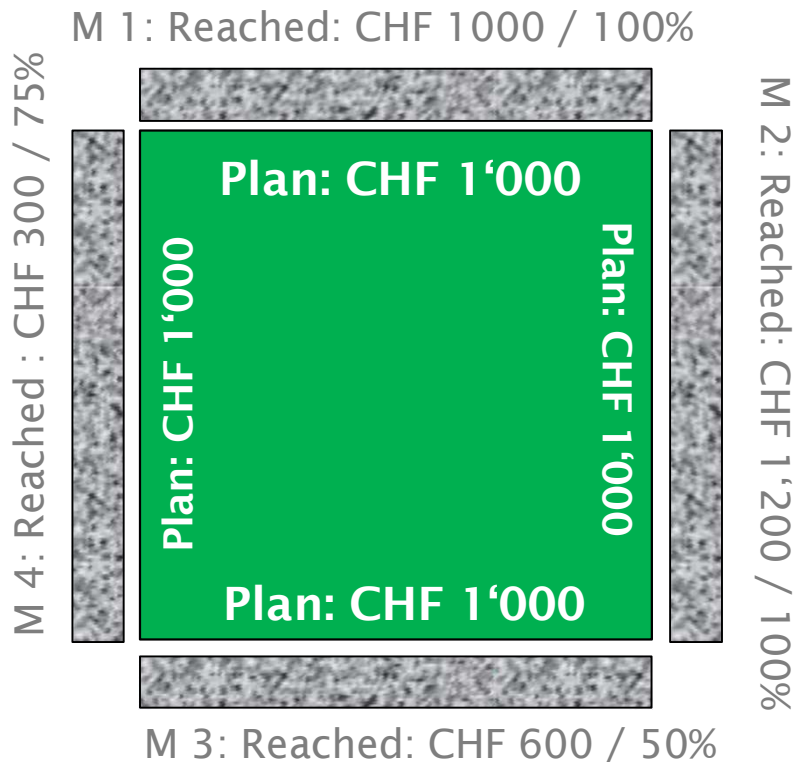
* =

CR*** = index of cost realization CPI x index of plan realization SPI



Exercise 2 End after 4 days work

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Please calculate

Day	1	2	3	4
Plan Costs PV	1000	2000	3000	4000
Actual Costs AC	1000	2200	2800	3100
Performance Ratio	100%	200%	250%	325%
Earned value EV	1000	2000	2500	3250
Index of cost realization*	=1.0	=0.93	=0.89	=1.05
Index of plan realization**	=1.0	=1.0	=0.83	=0,81
Critical ratio***	=1.0	=0.93	=0.73	=0,85

CPI * $\frac{\text{Earned Value}}{\text{Actual Costs}}$

=

SPI * $\frac{\text{Earned Value}}{\text{Plan Costs}}$

* =

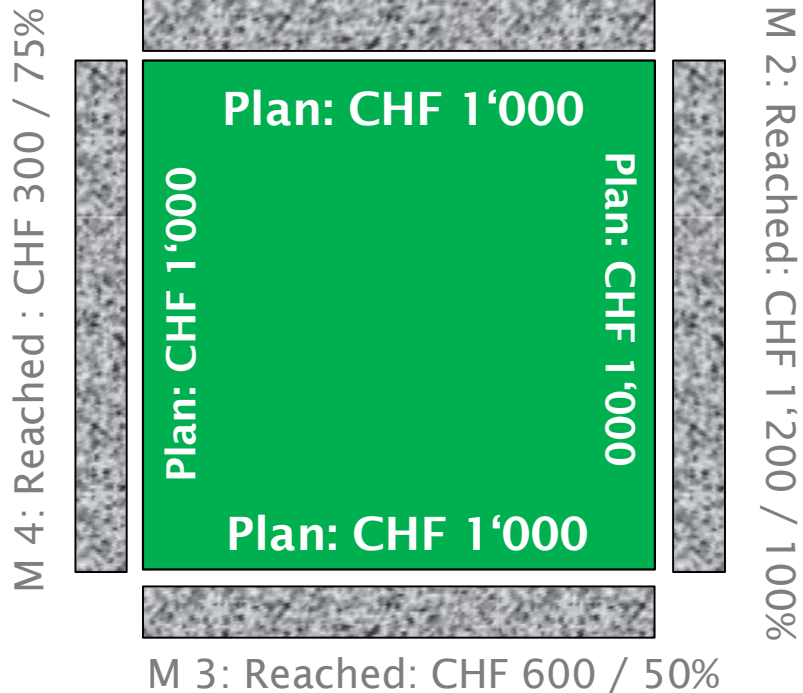
CR*** = index of cost realization CPI x index of plan realization SPI



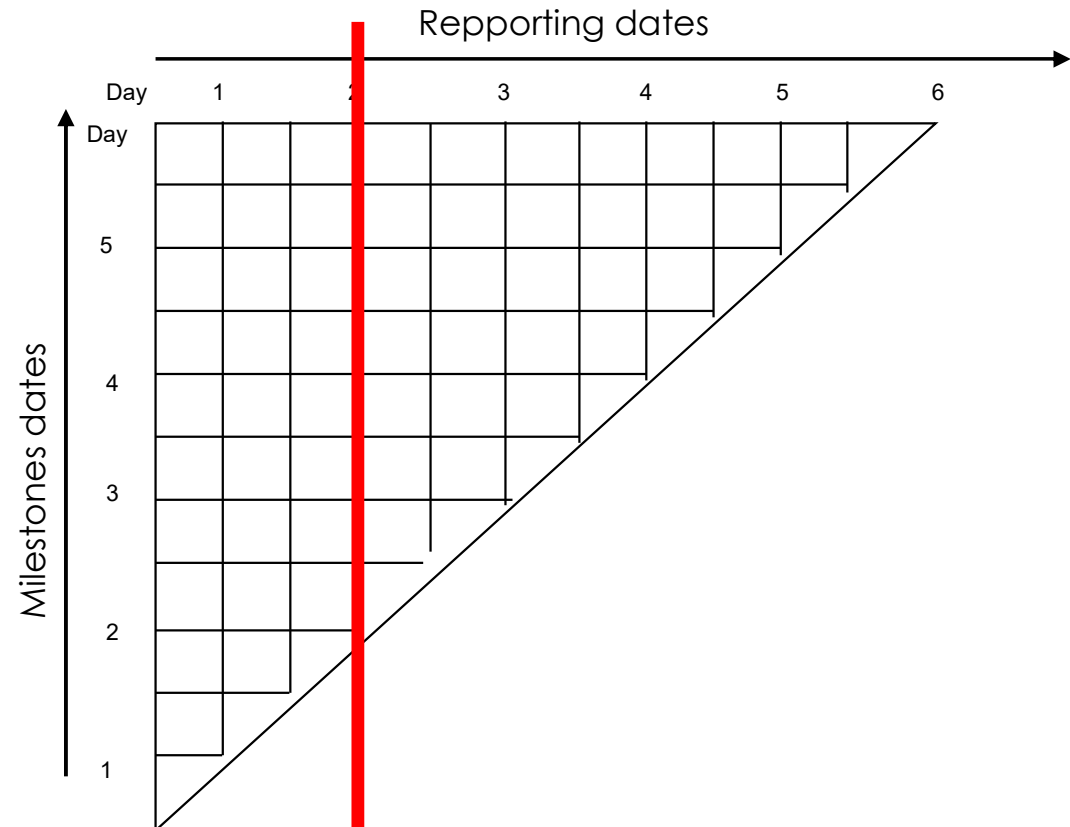
Exercise 3

Likely Milestone Trend Analysis at 4 days wall construction?

M 1: Reached: CHF 1000 / 100%



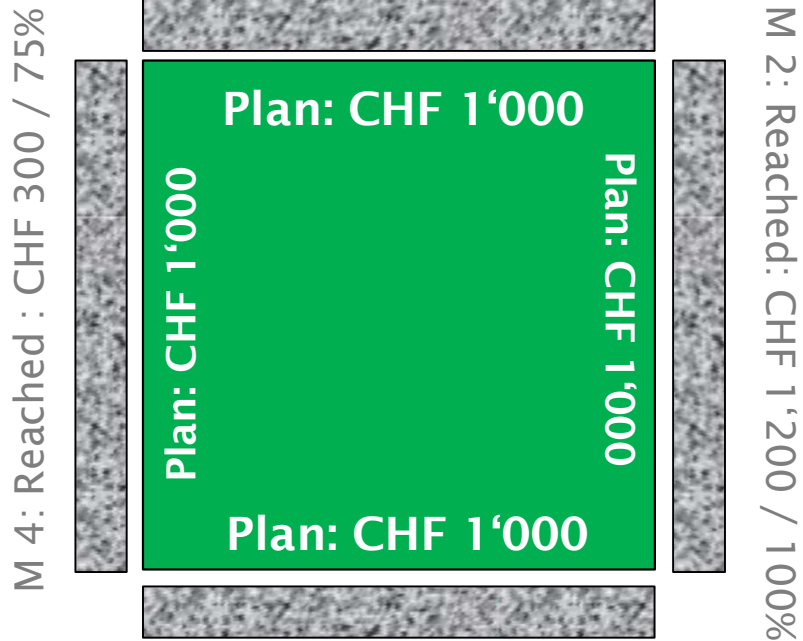
Evaluation and estimation on the second day?



Exercise 3

Likely Milestone Trend Analysis at 4 days wall construction?

M 1: Reached: CHF 1000 / 100%

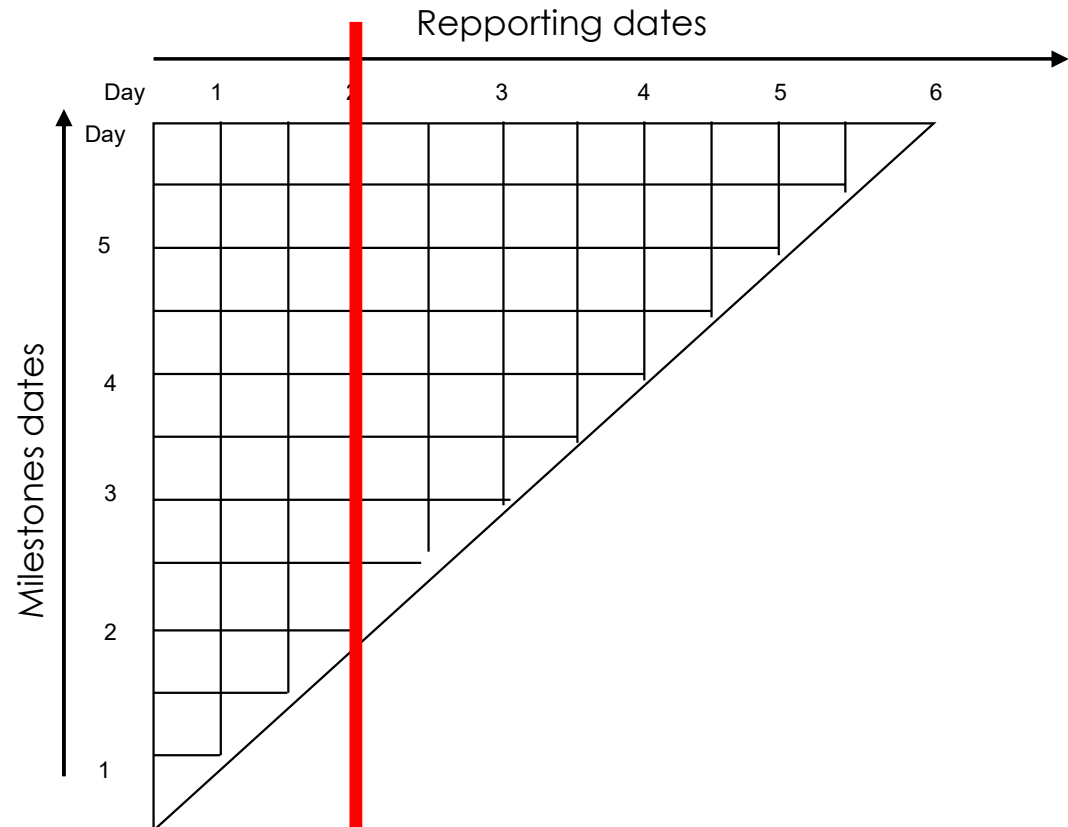


M 3: Reached: CHF 600 / 50%



Project Management

Evaluation and estimation on the second day?



EVM: Earned Value Management

Bogdan Lent

60 Minutes





PROJECT MANAGEMENT