Turning Visions
into Business.

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Project Management

Measurement and Analysis

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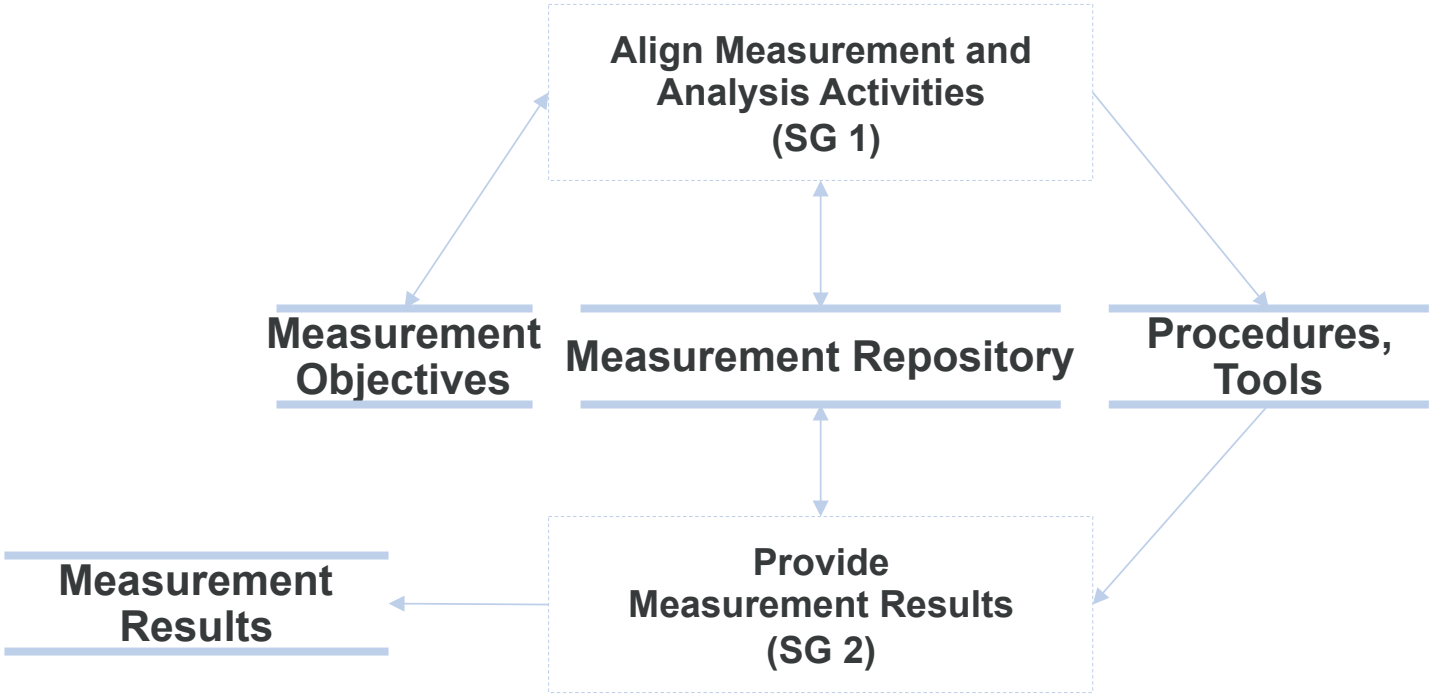
Measurement and Analysis in CMMI

Develop and sustain a measurement capability that is used to support management information needs.



Measurement and Analysis is importand for (project) management, because measurements provide objective data for monitor and control.

How do you compare project progress against the plan?

- List some ...

What other questions do you have as a project team?

- List some ...

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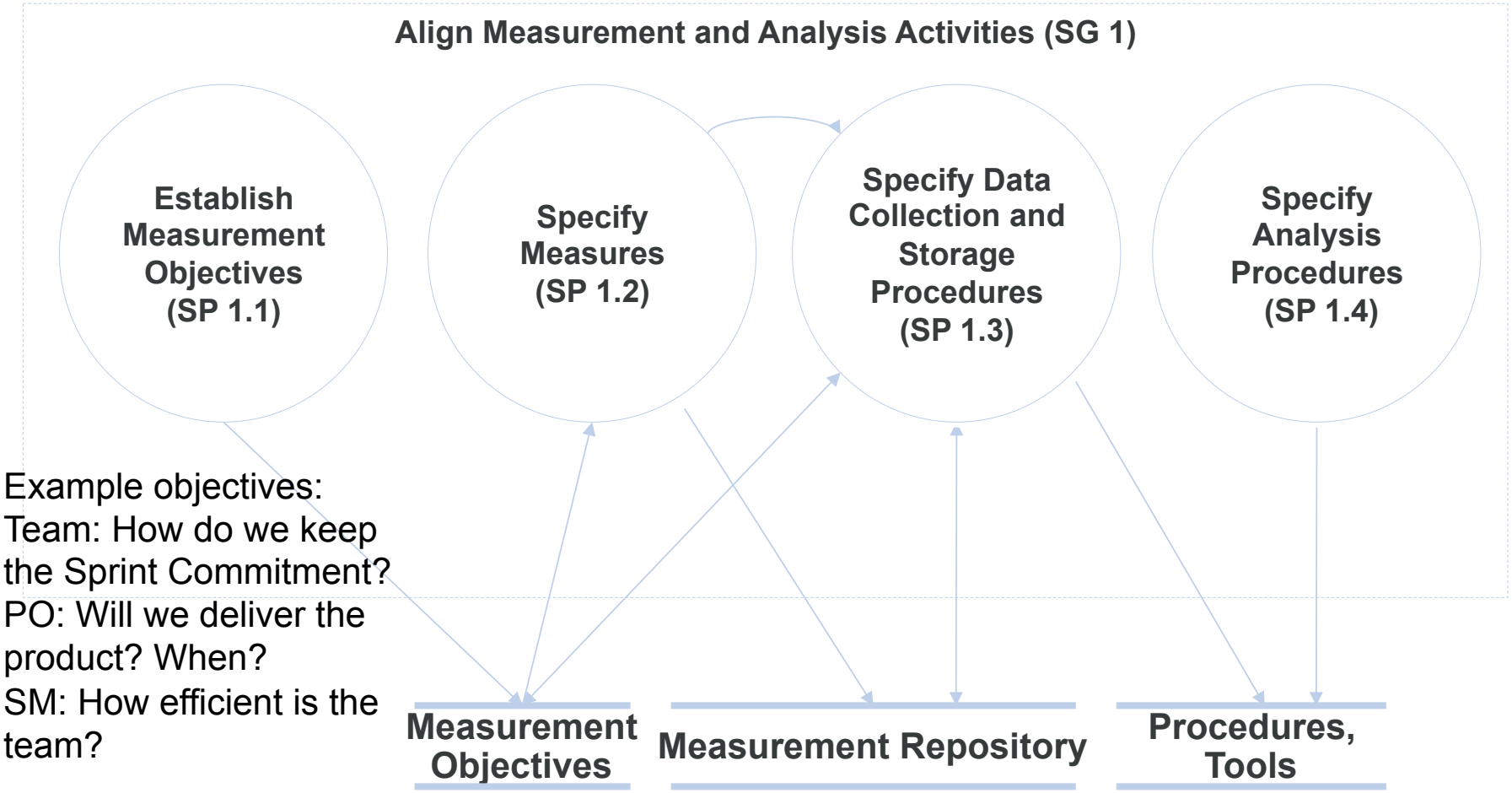
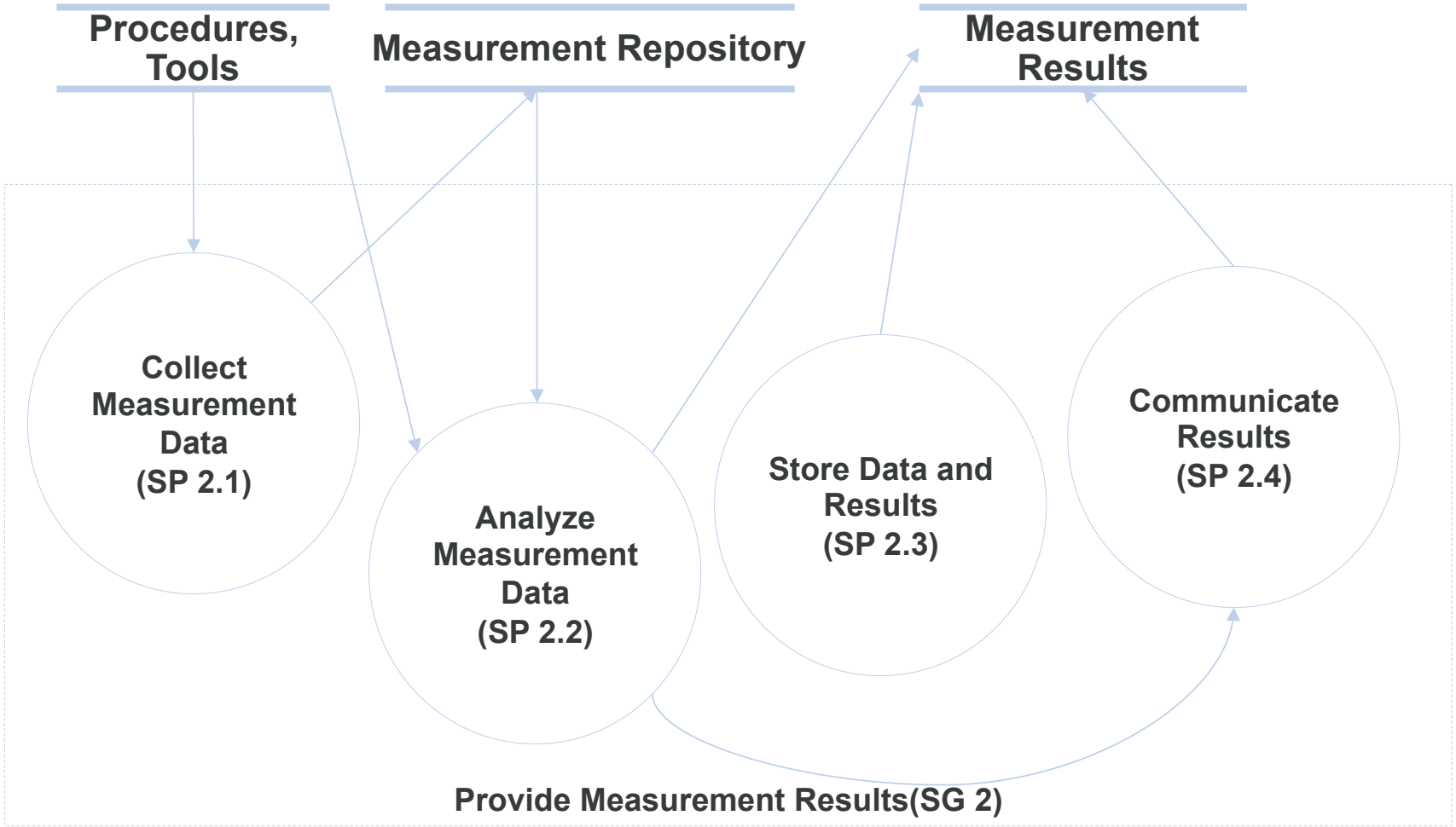
Measurement objectives and activities are aligned with identified information needs and objectives.

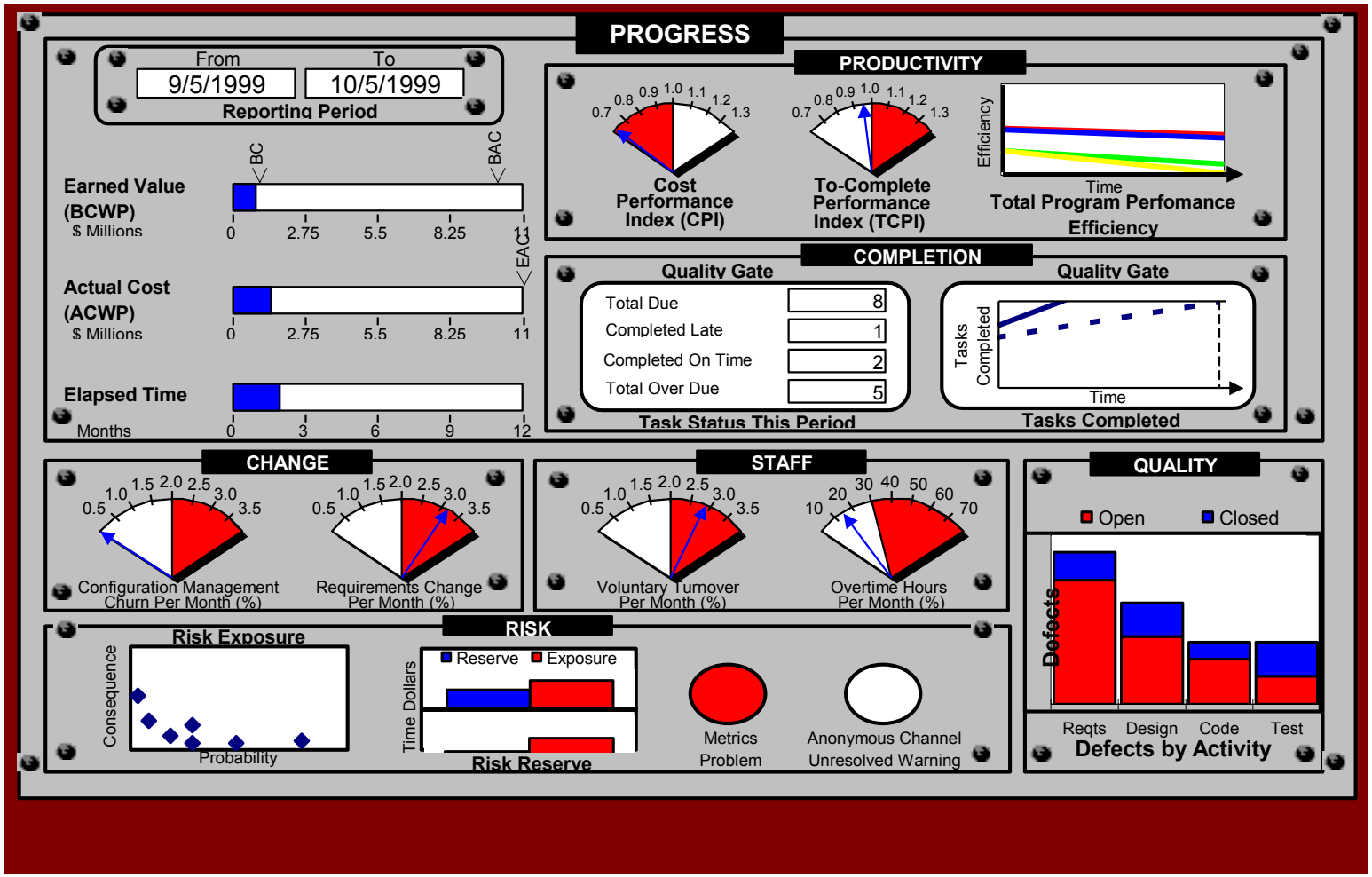


Example objectives:
Team: How do we keep the Sprint Commitment?
PO: Will we deliver the product? When?
SM: How efficient is the team?

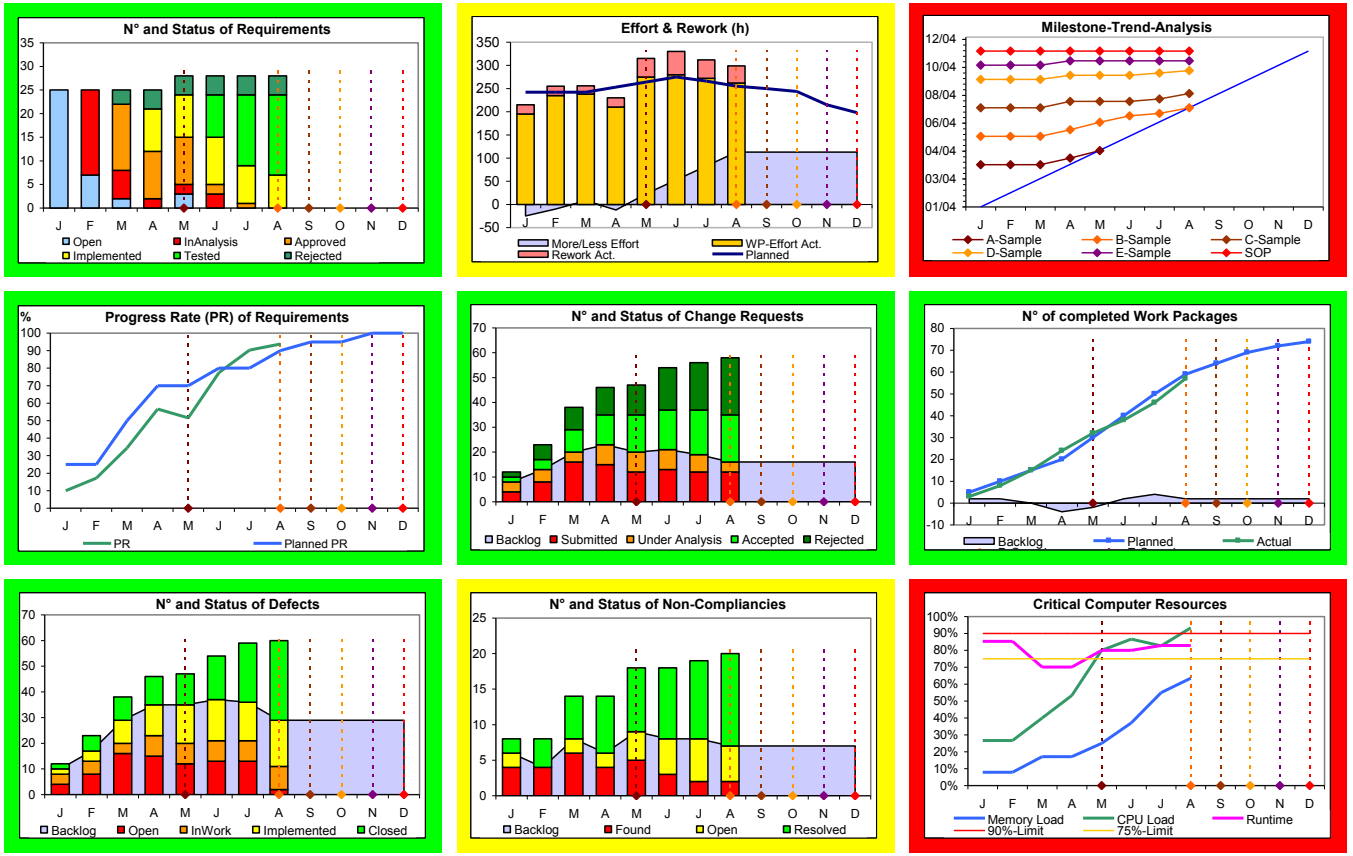
Measurement results that address identified information needs and objectives are provided.



Measurements can look like this …

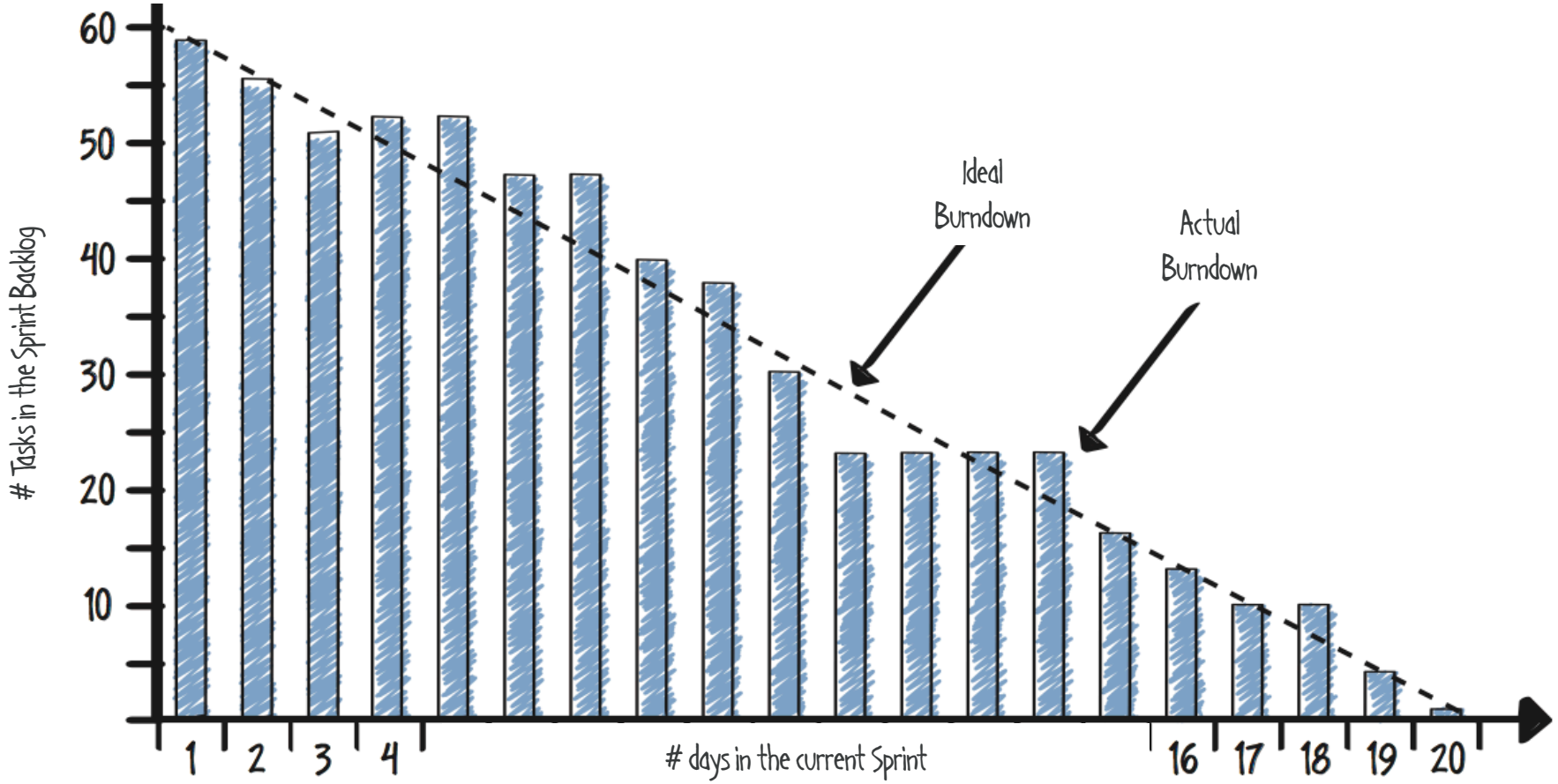


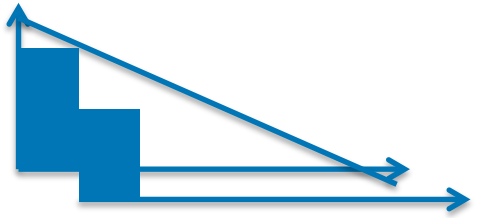
… or like this …



Reporting date: DD-MM-YYYY

... or like this (Sprint Burndown).





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Release Burndown compared to CMMI:

Measurement Objective:

- As a Product Owner I want to measure the progress of user stories over time in order to understand the progress of the product.

Specification:

- 3 Base measures:
  - » story points of all user stories (of the release)
  - » story points of to-do user stories
  - » # Sprints of release
- Graph:
  - » X-Axis: # Sprint, Y-Axis: # Story points of Product Backlog items in release
  - » Plot # story points of to-do user stories at the end of each Sprint, Lower x Axis by # Story Points added before a Sprint

Data Collection & Storage:

- Responsible person: Product Owner ,
- Collect Data by reading the product backlog. Draw graph on flipchart at team's door. Do this at end of Sprint Planning One.

Analysis Procedure:

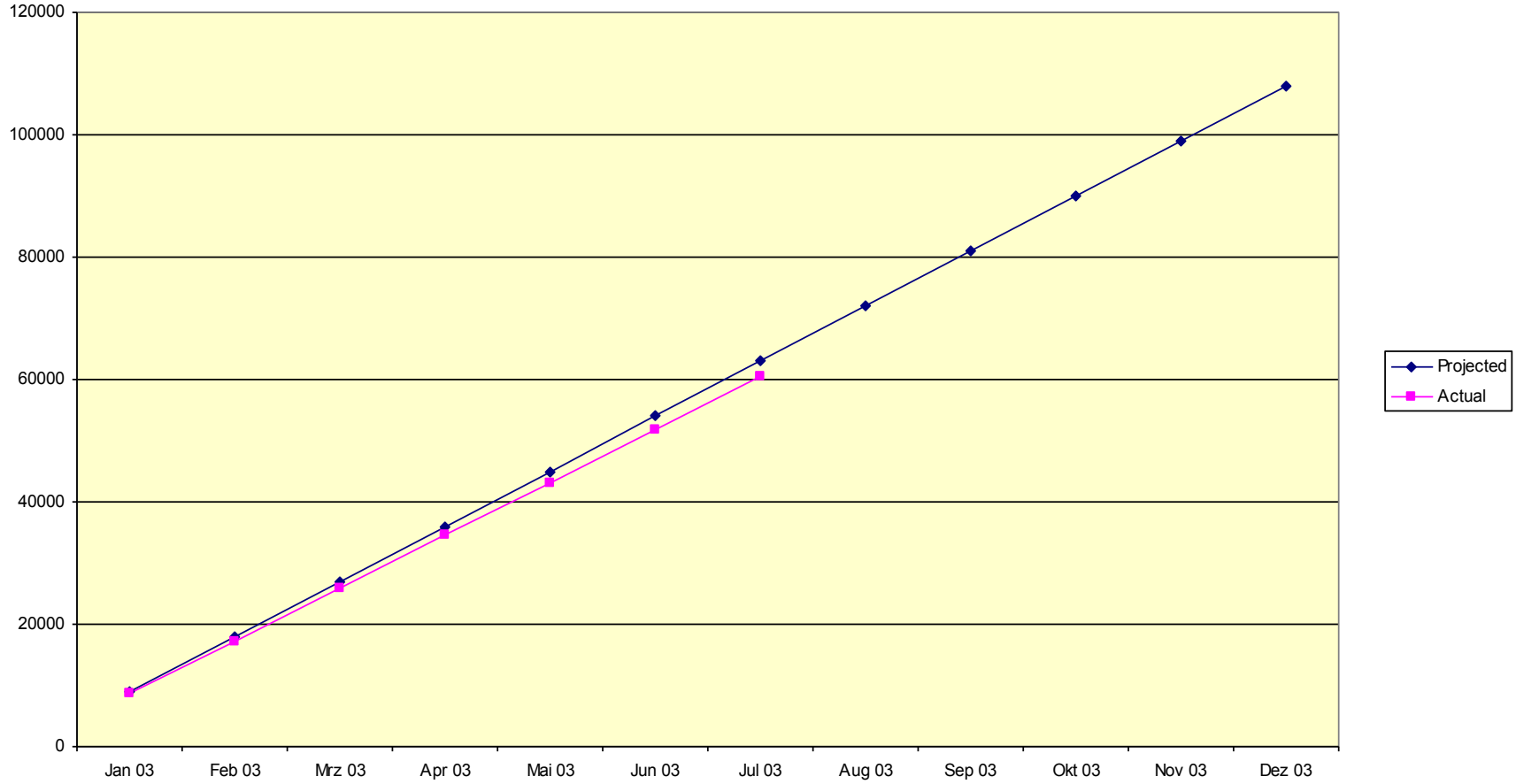
- When: at Sprint Planning One, look at Release Burndown. Estimate time till release finishes. Discuss with team.

Establish and maintain only those measures that can be maintained with real data. Choose the simplest measure that does the job.

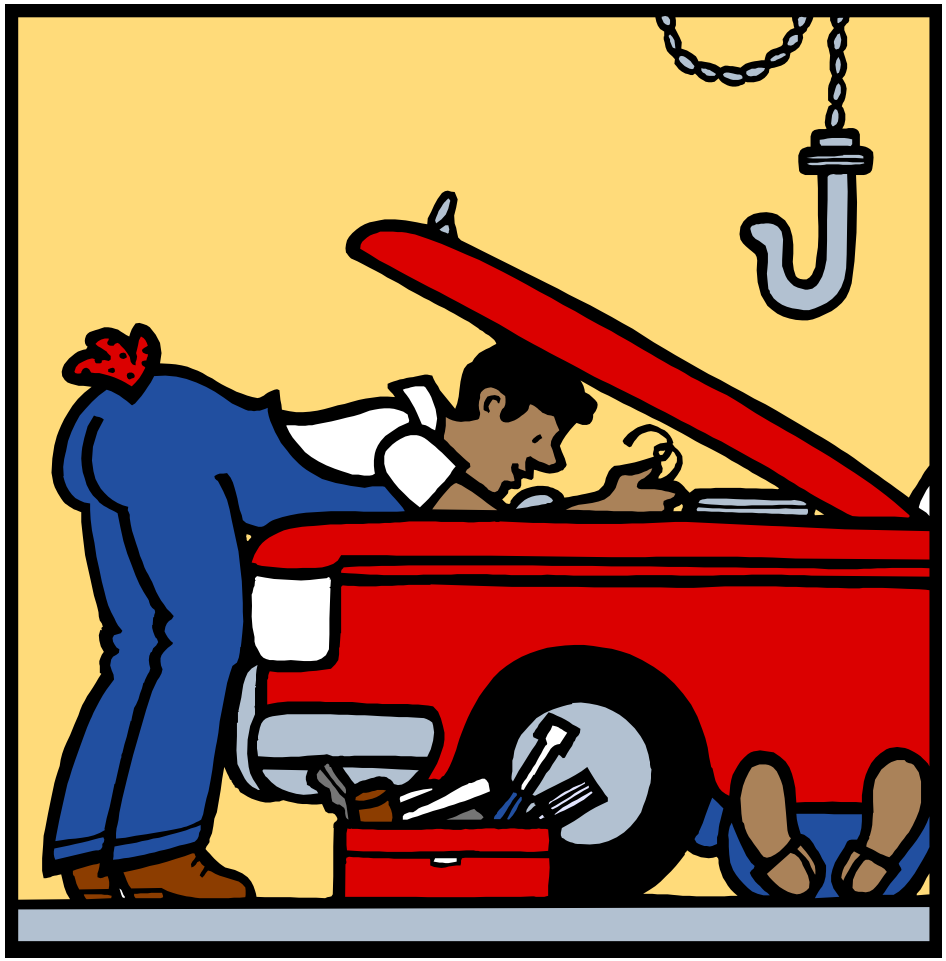
- Decide what you need to know/ask
- Define what you need to monitor in order to have an answer to your question
- Only measurements that are maintained are useful – rather work with few measurements that work (e.g. just one) than with too many.
- Be aware of nice looking charts withz lots of data – motsly they are not maintained. Adapt the number of measurements to your project‘s and organization‘s size.

Earned Value Analysis

How is this project doing?



Let’s Take A Look Under The Hood



The „%-complete“ approaches to answer the question “Have we done what we said we’d do?” are subjective, incomplete and draw false conclusions

- The classic approach:
  „% complete“ estimating
  - » % of Budget spent
  - » % of work done
  - » % of time elapsed

Earned Value Analysis is an industry standard to monitor and control schedule and budget.

"Earned Value Analysis" is an industry standard way to:

- measure a project's progress,
- forecast its completion date and final cost
- provide schedule and budget variances along the way

By integrating three measurements, Earned Value provides consistent, numerical indicators with which you can evaluate and compare projects.

Earned Value Analysis answers all three questions: schedule performance, budget performance and completion performance.

It compares the

- PLANNED amount of work with
- what has actually been COMPLETED

to determine if

- COST
- SCHEDULE
- WORK ACCOMPLISHED

are progressing as planned.

Work is “Earned” or credited as it is completed.

Earned Value provides an “Early Warning” signal for prompt corrective action

- Bad news does not age well.
- Still time to recover
- Timely request for additional funds

Some New Terms

BCWS - Budgeted Cost of Work Scheduled (Planned Cost of Work Planned)

- Planned cost of the total amount of work scheduled to be performed by the milestone date.

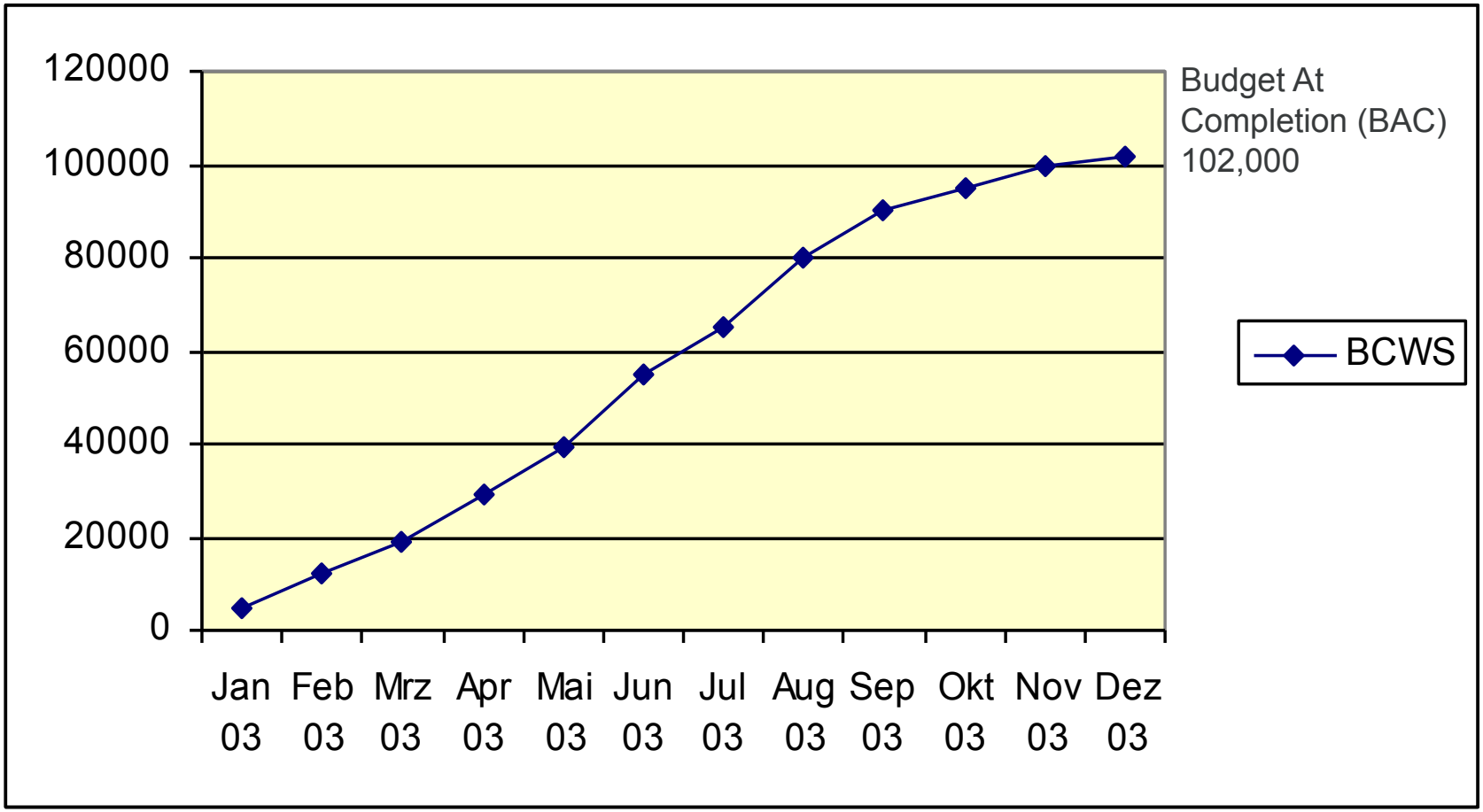
ACWP - Actual Cost of Work Performed

- Cost incurred to accomplish the work that has been done to date.

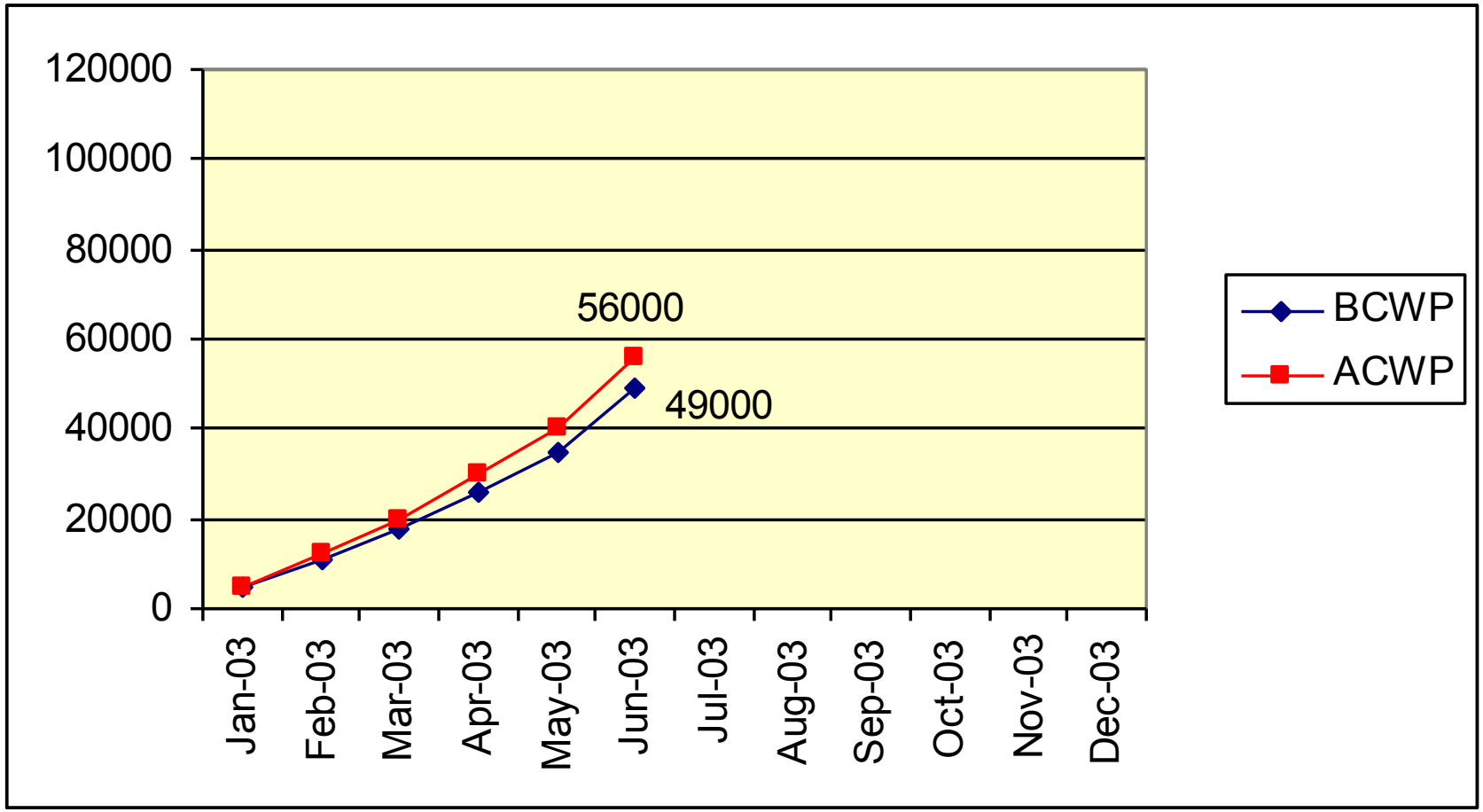
BCWP - Budgeted Cost of Work Performed (Planned Cost of Work Performed)

- The planned (not actual) cost to complete the work that has been done.

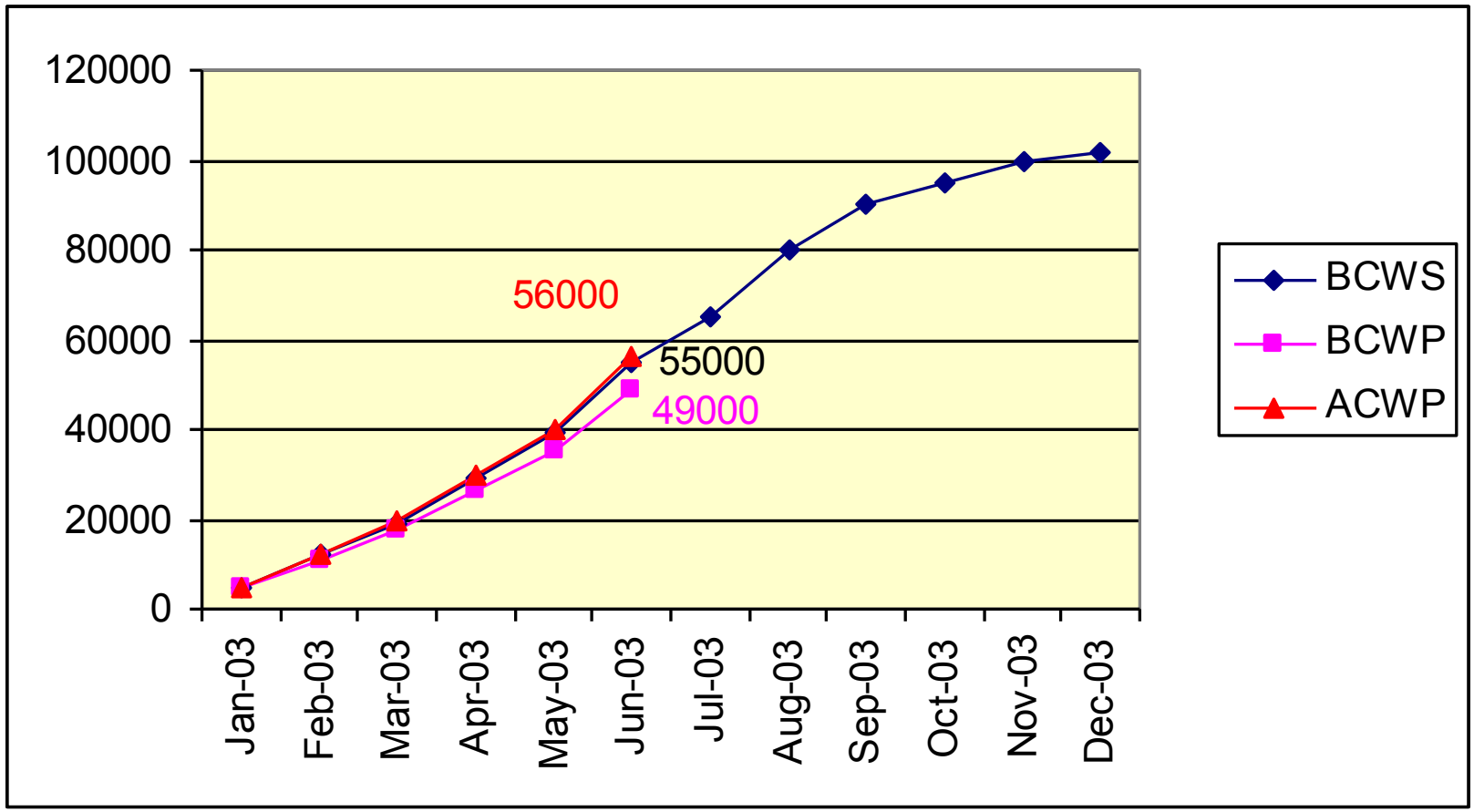
BCWS - Budgeted Cost of Work Scheduled



ACWP and BCWP - Actual Cost of Work Performed and Budgeted Cost of Work Performed



The Whole Story



Some Derived Metrics

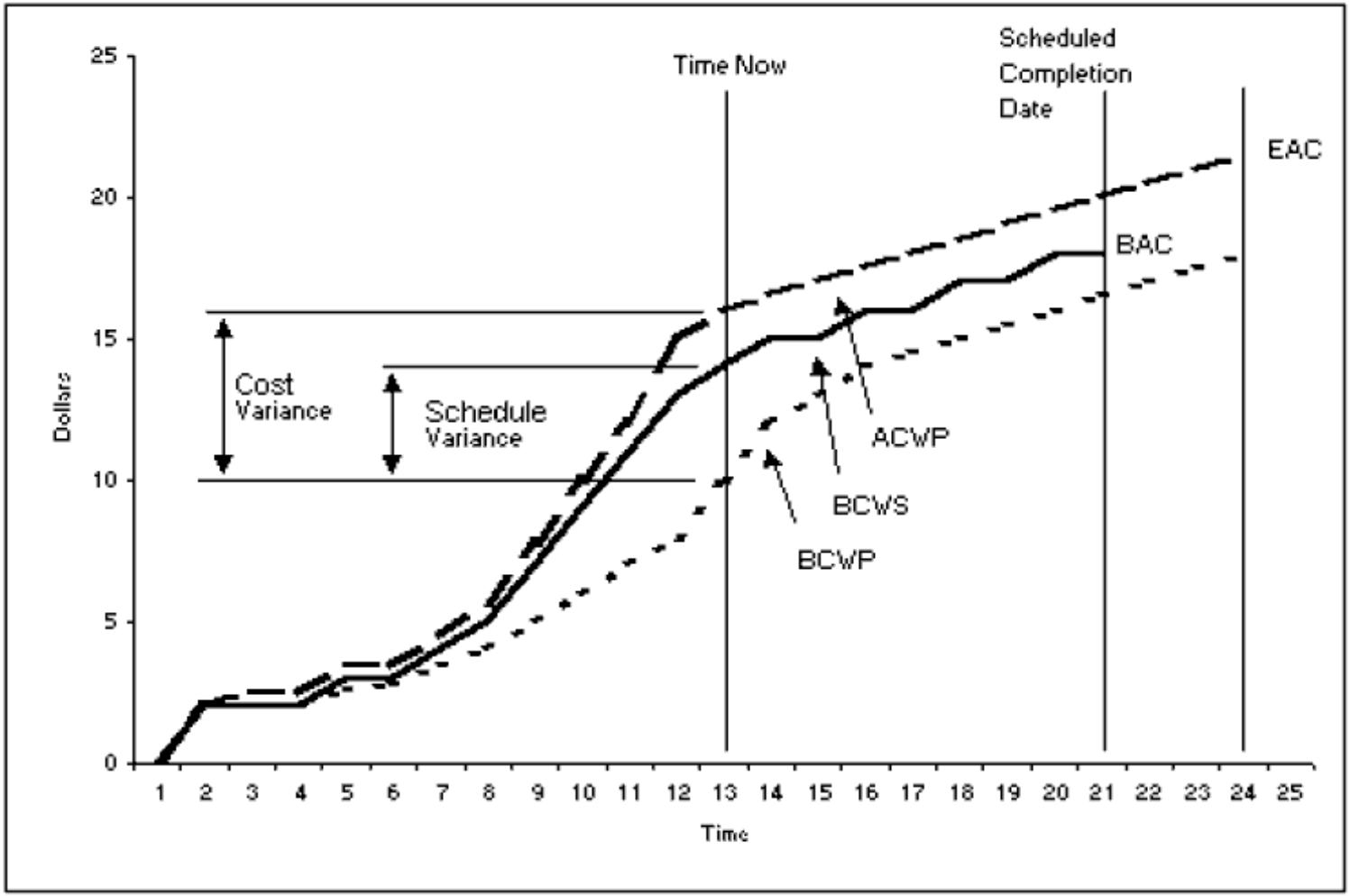
SV: Schedule Variance (BCWP-BCWS)

- A comparison of amount of work performed during a given period of time to what was scheduled to be performed.
- A negative variance means the project is behind schedule

CV: Cost Variance (BCWP-ACWP)

- A comparison of the budgeted cost of work performed with actual cost.
- A negative variance means the project is over budget.

All indicators at a glance



More Derived Metrics

SPI: Schedule Performance Index

- SPI=BCWP/BCWS
- SPI<1 means project is behind schedule

CPI: Cost Performance Index

- CPI= BCWP/ACWP
- CPI<1 means project is over budget

CSI: Cost Schedule Index (CSI=CPI x SPI)

- The further CSI is from 1.0, the less likely project recovery becomes.

Performance Metrics

SPI: BCWP/BCWS

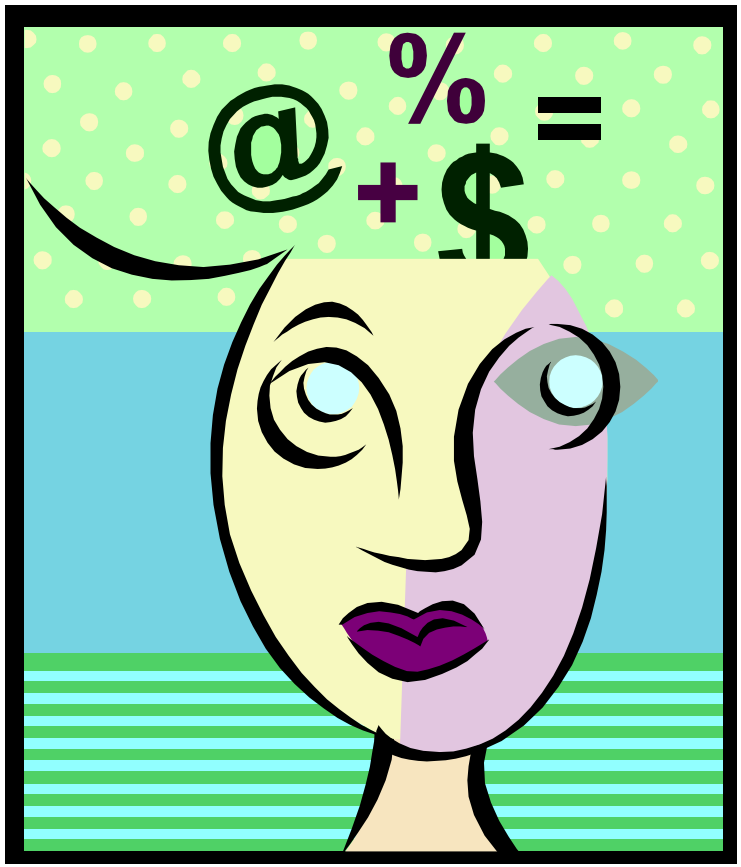
49,000/55,000 = 0.891

CPI: BCWP/ACWP

49,000/56000 = 0.875

CSI: SPI x CPI

.891 x .875 = 0.780



The cost performance index can be used to make budget projections

BAC: Budget at Completion

- The **planned** budget at completion

EAC: Estimate at Completion

- The **estimated** budget at completion
- EAC = BAC / CPI
- The EAC is an estimate of the final cost of a project.

Example:

- EAC
  = 102,000 / 0.875
  = 116,571

The schedule performance index can be used to make schedule projections

PAC: Plan at Completion

- Like the Budget at Completion (BAC), the project's **planned** completion date.

TAC: Time at Completion

- Like the Estimate at Completion (EAC), the project's **estimated** completion date.
- TAC = PAC / SPI

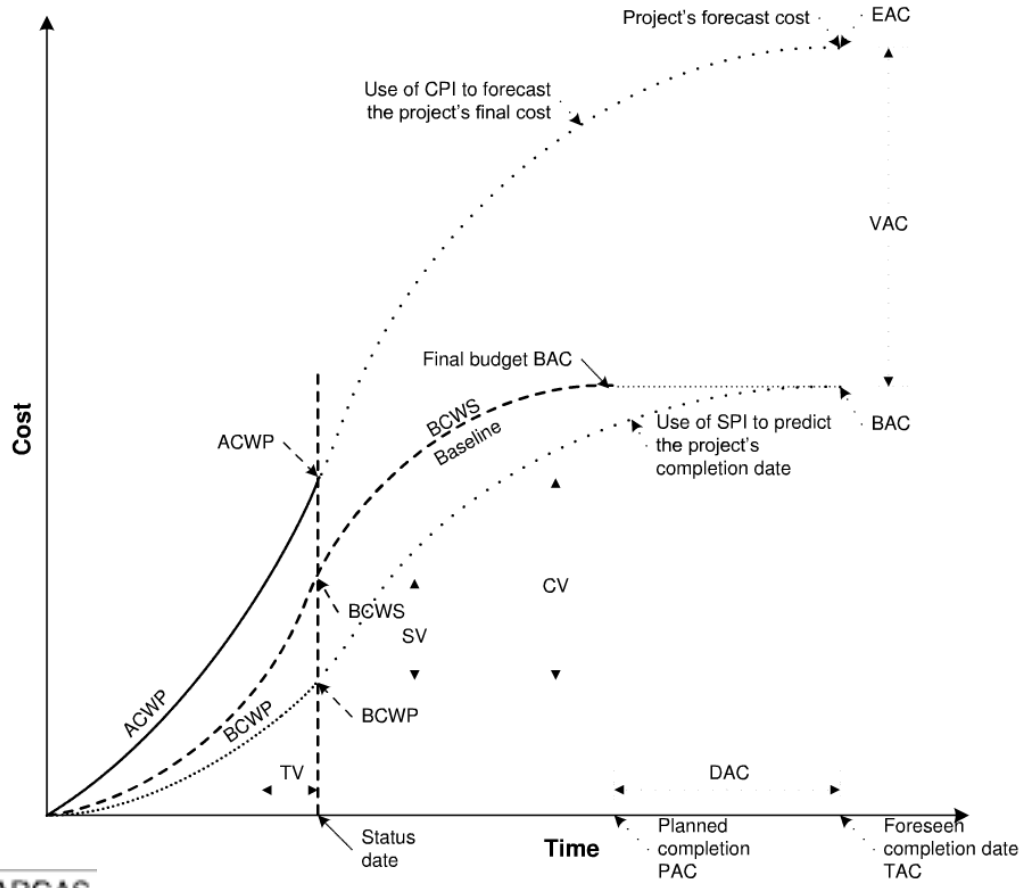
Example:

- TAC
  = 12 months / 0.891
  = 13,46 months

At the end

- The project will be 14% over budget
- The project will be 1 ½ months late

Everything in one picture



Set up a spreadsheet to calculate Earned Value

Break up in teams of 2-3.

Task and Results:

- Calculate the earned value of the exercise handed out

A	B	C	D	E	F	G	H	I
equirements pecification	18.01.13	5	18.01.13	4	5	5	4	
Usability Design	21.01.13	9	25.01.13	10	9	9	10	
Wireframes	25.01.13	5	28.01.13	10	5	5	10	
ystem Architecture	21.01.13	10	28.01.13	5	10	10	5	
Database Design	28.01.13	16		20	16	0	0	
Class Diagram	13.02.13	9	13.02.13	8	9	9	8	
Web page texts	15.02.13	4	18.02.13	5	4	4	5	
creens	15.02.13	7	22.02.13	3	7	7	3	
Backend code	27.02.13	5	22.02.13	7	0	5	7	
ystem Test	28.02.13	8			0	0	0	
User Validation	21.03.13	2			0	0	0	
User Acceptance Test	25.03.13	9			0	0	0	
essons Learned	01.04.13	1			0	0	0	
ums	----	90	-----		65	54	52	
				SV = BCWP-BCWS			-11	days
				CV = BCWP-ACWP			2	days
				SPI = BCWP/BCWS			0,83	days
				CPI = BCWP/ACWP			1,04	days
				BAC			90	days
				EAC = BAC / CPI			86,7	days
				PAC: either planned end date or planned duration in days	01.04.13	or	75	days
				TAC = PAC / SPI	17.04.13	or	90,3	days
lotes:								
				Start Date			17.01.13	

Exercise

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Revision History

Rev. #	Status	Date	Description	Responsible
1.0	Finished	15.10.2004	Initial version	Malte Foegen
1.1	Finished	22.01.2006	Updated layout	Malte Foegen
1.2	Finished	23.12.2007	Updated layout	Malte Foegen
1.3	Finished	19.01.2008	Added formula overview for Earned Value	Malte Foegen
1.4	Finished	07.02.2009	Updated exercises	Malte Foegen
1.5	Finished	18.01.2010	Updated layout	Malte Foegen
1.6	Finished	03.02.2012	New Exercise	Malte Foegen
1.7	Finished	05.02.2012	Added TAC	Malte Foegen
1.8	Finished	23.03.2012	Corrected TAC formula	Malte Foegen
1.9	Finished	25.01.2014	Added Scrum Slides, Added Case Study	Malte Foegen
1.10	Finished	04.02.2015	Updated layout and content	Malte Foegen
1.11	Finished	20.02.2016	Simplified	Malte Foegen