Software Engineering: Project Management

Project Monitoring and Control

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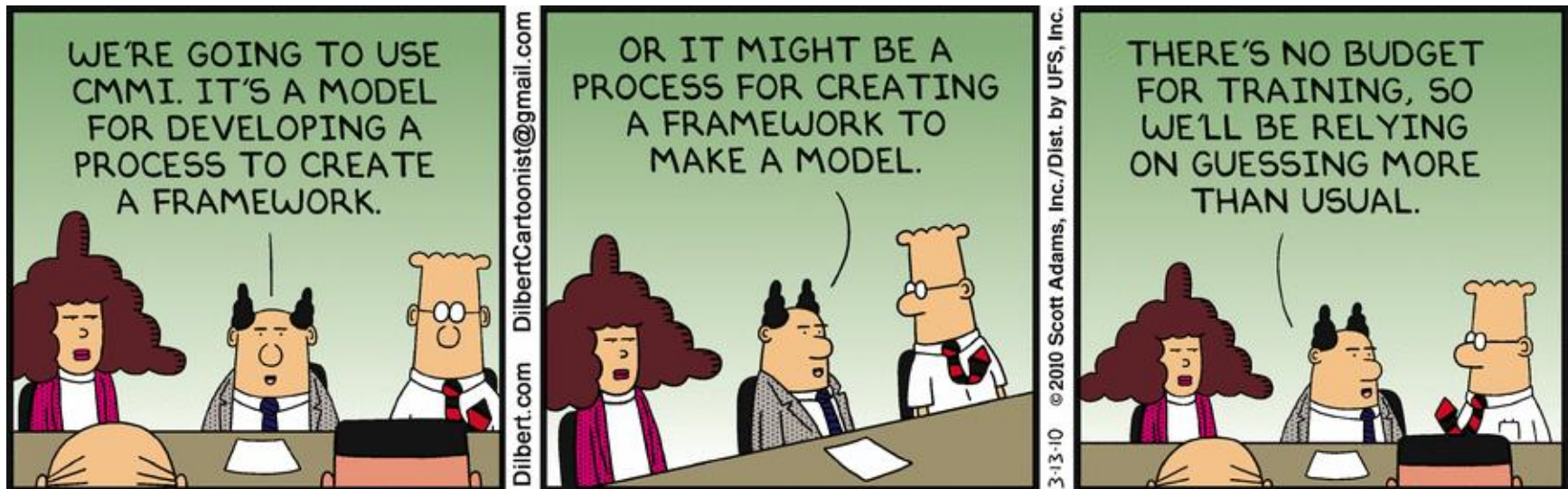Manikandan Ravichandran

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1.1 PROJECT MONITORING AND CONTROL

"The Project Monitoring and Control is a Process that track, review, and orchestrate the progress and performance of a project; identify any areas in which changes to the plan are required; and initiate the corresponding changes." – *A Guide to the Project Management Body of Knowledge (PMBOK Guide) Fifth Edition.*

1.2 CAPABILITY MATURITY MODEL INTEGRATION

❑ The Capability Maturity Model Integration is a process model.

❑ It defines the most important elements that are required to build great products, or deliver great services, and wraps them all up in a comprehensive model.

❑ It has 5 maturity levels and 3 capability models.

❑ Project Monitoring and control is part of CMMI process area which comes under maturity level 2 in CMMI for development.

1.3 SCRUM

The Agile: Scrum Framework at a glance

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2.1 WHY PMC?

❑ Planning alone is not enough.

❑ Monitoring and control ensures

1. Quality

2. Budget

3. Timely delivery

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PMC	SG1	SP 1.1	Monitor Project Planing Parameters
	Monitor the Project Against the Plan	SP 1.2	Monitor Commitments
Project Monitoring & Control		SP 1.3	Monitor Project Risks
		SP 1.4	Monitor Data Management
		SP 1.5	Monitor Stakeholder Involvement
		SP 1.6	Conduct Progress Reviews
		SP 1.7	Conduct Milestone Reviews
	SG2 Manage Corrective Action to Closure	SP 2.1	Analyze Issues
		SP 2.2	Take Corrective Action
		SP 2.3	Manage Corrective Actions

❑ Relation with CMMI

> Monitor the actual values of the project planning parameters against the project plan.

❑ Relation with SCRUM

1. Sprint burndown chart to check efforts remaining
2. Release burndown chart tracks completed story points which shows actual completion of the product functionality
3. Project Task Board tracks stories that are done, in progress, or ones that need verification

2.2.2 MONITOR COMMITMENTS

❑ Relation with CMMI

> Monitor commitments which are identified in the project plan

❑ Relation with SCRUM

1. Discussions on team commitments at the
   - Daily Scrum meeting
   - Sprint review meeting
2. Sprint burndown chart to check efforts remaining
3. Release burndown chart tracks completed story points which shows actual completion of the product functionality

2.2.3 MONITOR PROJECT RISKS

❑ Relation with CMMI

    Monitor the risks against those identified in the project plan

❑ Relation with SCRUM

1. Risks are identified in daily scrum meetings.

2. The scrum master knows what actions need to take to mitigate the risks.

3. Risks can not be completely analyzed in this stage.

2.2.4 MONITOR DATA MANAGEMENT

❑ Relation with CMMI

Monitor the management of project data against those identified in the project plan

❑ Relation with SCRUM

Data management can not be completely addressed in this stage using scrum.

2.2.5 MONITOR STAKEHOLDER INVOLVEMENT

❑ Relation with CMMI

Monitor stakeholder involvement against the project plan

❑ Relation with SCRUM

1. Discussions on team commitments at the

➢ Daily Scrum meeting

➢ Sprint review meeting

2. Scrum master involves Stakeholders when required

2.2.6 CONDUCT PROGRESS REVIEWS

❑ Relation with CMMI

   Periodically review the project's progress, performance, and issues

❑ Relation with SCRUM

1. Discussions on team commitments at the

   ➢ Daily Scrum meeting

   ➢ Sprint review meeting

2. Retrospectives

2.2.7 CONDUCT MILESTONE REVIEWS

❑ Relation with CMMI

> Review the accomplishments and results of the project at selected project milestones

❑ Relation with SCRUM

1. Sprint review meeting

2. At the end of Sprint Deliverables and related issues are monitored

Steps taken to align future project direction with the stakeholders success measures.

The bedrock of a healthy quality system

A barometer of system health

Mitigates risk

Assures control

2.3.1 ANALYZE ISSUES

❑ Relation with CMMI

Collect and analyze the issues and determine the corrective actions necessary to address the issues

❑ Relation with SCRUM

1. Discussions on team commitments at the

   ➢ Daily Scrum meeting

   ➢ Sprint review meeting

2.3.2 TAKE CORRECTIVE ACTIONS

❑ Relation with CMMI

> Take corrective action on identified issues

❑ Relation with SCRUM

1. Discussions on team commitments at the:

   ➢ Daily Scrum meeting

   ➢ Sprint review meeting

2.3.3 MANAGE CORRECTIVE ACTIONS

❑ Relation with CMMI

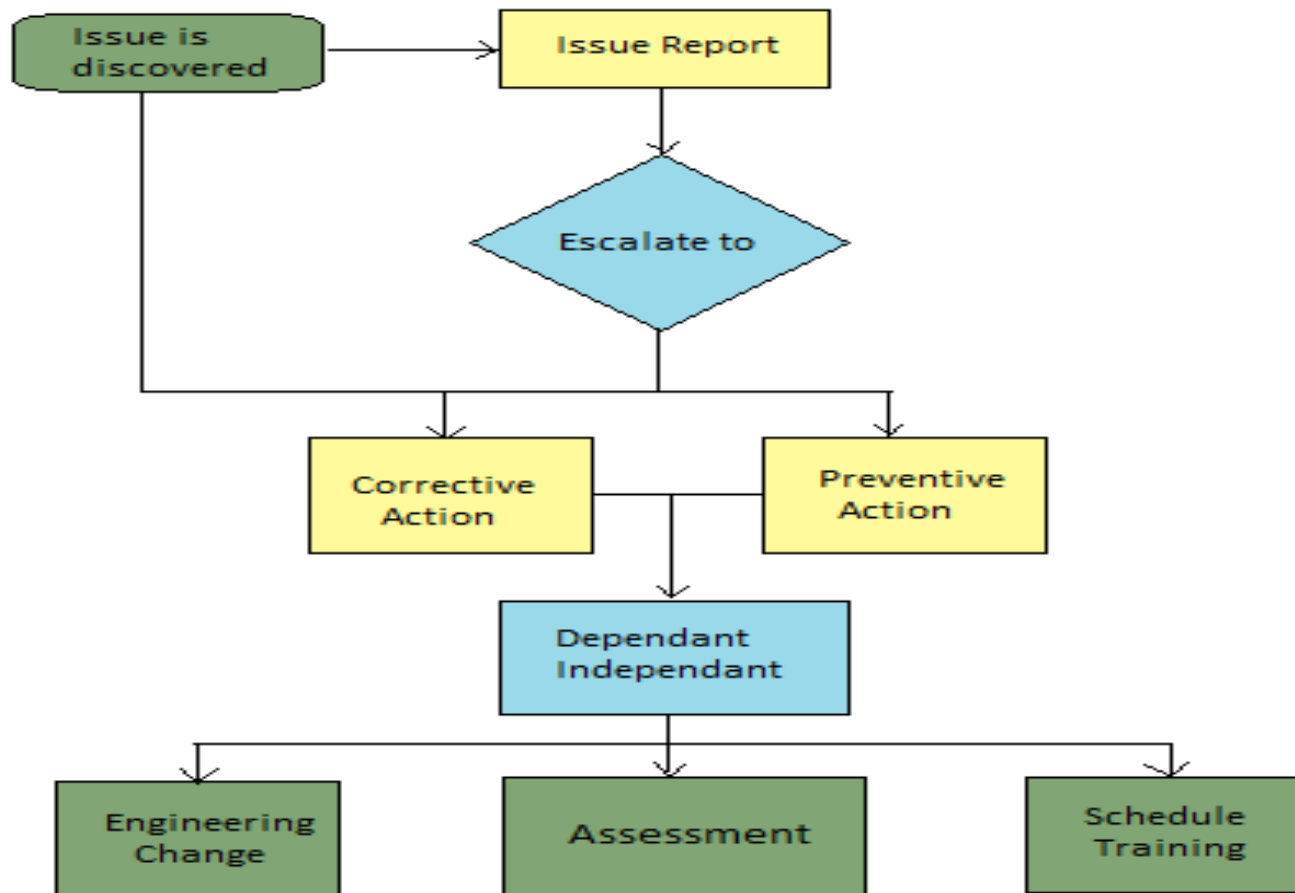   Manage corrective actions to closure

❑ Relation with SCRUM

1. Tracking the actions from:
   - ➢ Daily Scrum meeting
   - ➢ Sprint review meeting

2.4 CORRECTIVE ACTION WORKFLOW

2.4.1 TECHNIQUES FOR CHANGE CONTROL

❑ Tolerance

Acceptable margins of overshoot may be specified in the plan

❑ Contingency

Integrated change management

❑ Exception plans:

Original plan needs major changes

➢ Requires project board authority-change control board (CCB)

➢ Manage baseline

➢ Change Request form

2.4.1 TECHNIQUES FOR CHANGE CONTROL…

❑ Change Control Board

1. Formal group responsible for approving or rejection change request

2. Power and responsibilities should be well defined and agreed upon

3. Large project more CCBs

❑ Change request

1. Should be documented by requestor

2. All CRs are documented

3. Emergency changes are documented after the fact

4. Non-emergency changes are documented by requestor before being considered
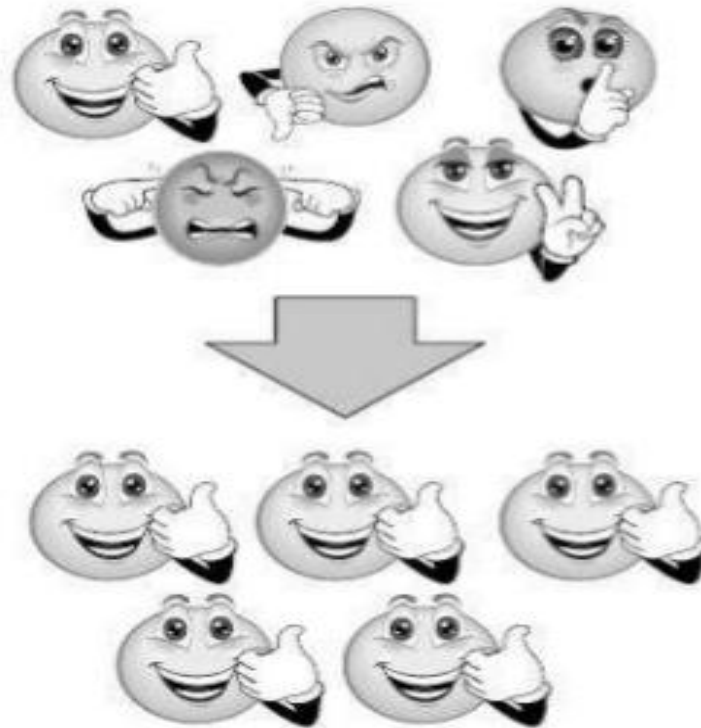
2.4.2 CHANGE REQUEST

❑   First level of approval for CR

By senior manager or PM

❑   Second level of approval for CR

Given by CCB

❑   Implications

1.   Must have budget for this

2.   Benefits may include cost avoidance

❑   CR comes from

1.   Team member

2.   project manage

3.   Sponsor

4.   customer

❑ Approved changes are documented and then added to the Project plan

1. Scope

2. Schedule

3. Cost

2.4.4 RECOVERY ACTIONS

❑ Re-schedule precedence requirements

❑ Make more resources available

❑ Redefine scope

❑ Modify quality requirements

❑ Enhance productivity through training tools

2.5 EARNED VALUE TERMINOLOGY

❏ Earned value analysis

  ➢ A quantitative technique.

  ➢ A cost cutting tool for Project management.

❏ Earned value management

  ➢ A technique for measuring project performance and progress in an objective manner.

2.5.1 EARNED VALUE ANALYSIS

❑ Earned value analysis is a method of performance measurement.

❑ Earned value analysis is an approach for measuring how much 'work' has been completed in a project at given point of time and performance

❑ Earned value analysis includes

➢ Schedule Performance

➢ Budget Performance

➢ Completion Performance

❑ Compares planned and completed work

❑ Determines if cost, schedule and work accomplished according to plan

2.5.2 METRICS

❑ BCWS : Budgeted Cost of Work Scheduled

  ➢ The approved budget for the work scheduled to be completed by a specified date.

❑ ACWP : Actual Cost of Work Performed

  ➢ The cost subjected to perform the work by specified date.

❑ BCWP : Budgeted Cost of Work Performed

  ➢ The approved budget for the work actually completed by specified date.

❑ Schedule Variance ($SV = BCWP\text{-}BCWS$)

➢ The difference between amount of work performed and what is scheduled to be performed.

➢ Negative variance means project is behind schedule

❑ Cost Variance ($CV = BCWP\text{-}ACWP$)

➢ The difference between the amount budgeted and what is actually spent for the work performed.

➢ Negative means project is over budget.

2.5.4 MORE DERIVED METRICS

❑ SPI : (Schedule Performance Index)

➢ A measure of schedule efficiency on a project.

➢ SPI = BCWP/BCWS

➢ SPI < 1 : Project is behind Schedule

❑ CPI : (Cost Performance Index)
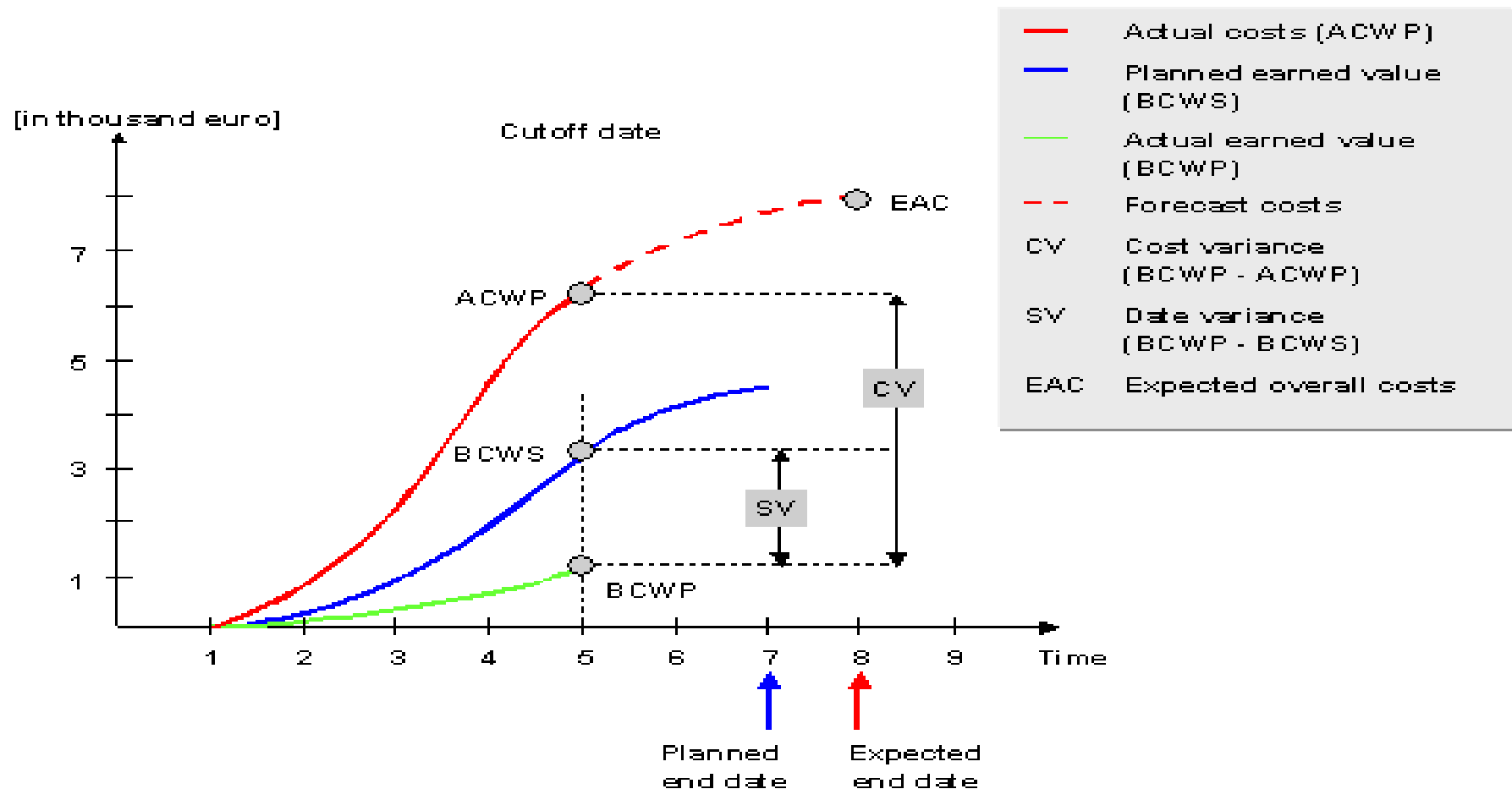
➢ A measure of the value of the work

➢ CPI = BCWP/ACWP

➢ CPI < 1 : Project is over budget

❑ CSI : (Cost Schedule Index)

➢ CSI measures the likelihood of recovery for project that is late and/or over budget.

➢ CSI = SPI * CPI

3.1 IBM 7030 STRETCH COMPUTER

❑ Supposed to be 100 times faster than IBM 704

❑ Only 30 times faster not 100.

❑ Issues discovered late.

❑ Produced systems sold for loss. No further production.

❑ Proper monitoring would have identified the issue earlier.

3.2 AIRBUS A380

❑ Wires were short in length.

❑ Issue reported in progress review meeting

❑ People were in denial

❑ Old software resulted in weak hardware.

❑ Twice the budget

❑ 2 years delay in delivery

4. A HAPPY STORY

4.1 BEIJING SHANGHAI HIGH SPEED RAILWAY

- ❑ Project split into small sub projects.

- ❑ Sub projects regularly monitored by Top Management.

- ❑ Stringent Quality standards were monitored.

- ❑ 1350km of railway line completed on time and budget.

- ❑ Journey time reduced from 11 hours to under 5 hours

4.2 MARS ORBITER MISSION MANGALYAAN

- ❑ Project was planned into phases

- ❑ Each phase was properly managed on timely basis for cost, schedule performance and weather conditions

- ❑ Identifying risk and improvisation with integration of the further development

- ❑ Adherence to schedule with continuous monitoring by top management

- ❑ Incorporating autonomous features to handle contingency situations

- ❑ Error correction actions where already planned for risks like

  ➤ Trajectory Correction Manoeuvres

5. CONCLUSION

❑ Regularly review the schedule

  ➢ Managers review the project regularly to avoid surprises.

  ➢ Minor adjustments to address potential problems.

❑ Regularly Review the Project Expenditures

  ➢ Managers regularly review expenditure and commitments.

  ➢ Always aware of money spent and remaining in the budget

❑ Manage the Scope – Avoid Scope Creep!

  ➢ Managers have clear idea of scope and not simply follow orders

  ➢ Stakeholders informed if CRs out of scope.

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