Software Process Improvement (3C05/D22)

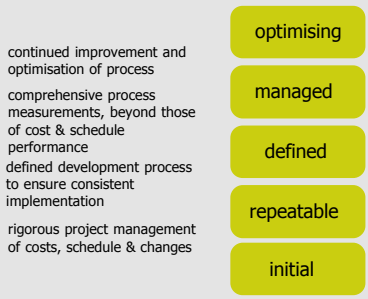
Unit 9: Software Process Improvement

- Objectives
  - To provide a framework for software process assessment and improvement
  - To introduce the Capability Maturity Model (CMM) of the Software Engineering Institute

Background

- A framework to help the US DoD pick software vendors more cleverly and hence obtain a quick and relatively inexpensive "productivity boost".
- Work at the CMU Software Engineering Institute, 1986 onwards.
  - Humphrey, W.S. (1988); Characterizing the Software Process: a maturity framework; IEEE Software; 5, 2, pp 73-79.
  - Humphrey W.S.; Kitson D.H. & Kasse T.C. (1989); The State of Software Engineering Practice: a preliminary report; Proc. IEEE 11th International Conference on Software Engineering; pp 277-288, IEEE CS Press.

5 Level Process Maturity Framework



Approach

- An effective software process is predictable, cost estimates and schedule commitments are met with reasonable consistency. The resulting products generally meet user needs.
- The key requirements for this to be achieved are:
  - measurement
  - statistical control

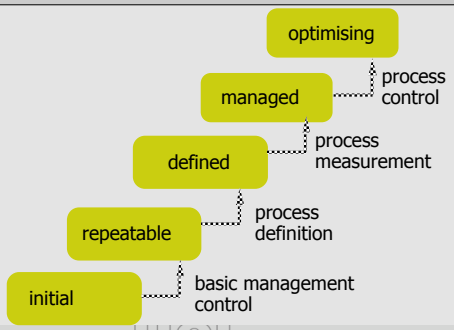
Development Process Improvement

- FIVE STEPS
  (1) understand the current status of their development process or processes;
  (2) develop a vision of the desired process;
  (3) establish a list of required process improvement actions in order of priority;
  (4) produce a plan to accomplish these actions;
  (5) commit the resources to execute the plan.

Levels

- Levels are chosen because:
  - reasonably represent historical phases of evolutionary improvement of real software development organisations;
  - represent a measure of improvement that it is reasonable to achieve from the prior level;
  - suggest interim improvement goals and progress measures;
  - makes obvious a set of immediate improvement priorities.

How to Move Between Levels



Initial to Repeatable

- To get from initial to repeatable, you need:
  - project management;
  - management oversight;
  - quality assurance;
  - change control.
- You need "commitment control".

Repeatable to Defined

- To get from repeatable to defined, you need:
  - to establish a "process group";
  - a software development process architecture;
  - to introduce a family of software engineering methods and technologies.

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Defined to Managed

- To get from defined to managed, you need:
  - to establish a minimum, basic set of process measurements;
  - to establish a process database with the resources to manage and maintain it;
  - to provide sufficient process resources to gather and maintain this data;
  - assess the relative quality of each product and inform management where quality targets are not being met.

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Managed to Optimising

- To get from managed to optimising, you need:
  - to support automatic gathering of process data;
  - to use this data to both analyse and modify the process to prevent problems and improve efficiency.

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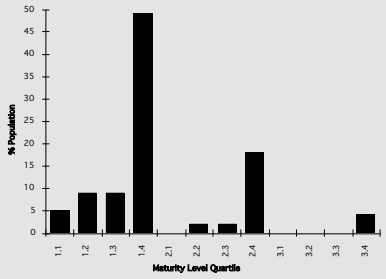
Results of SEI Assisted Assessment



Key Questions for Level 2

- Does the Software Quality Assurance (SQA) function have a management reporting channel separate from the software development project management?
- Is there a software configuration control function for each project that involves software development?
- Is a formal procedure used in the management review of each software development prior to making contractual commitments?
- Is a formal procedure used to make estimates of software size?

Key Questions for Level 2

- Is a formal procedure used to produce software development schedules?
- Are formal procedures applied to estimating software development cost?
- Are profiles of software size maintained for each software configuration item, over time?
- Are statistics on software code and test errors gathered?
- Does senior management have a mechanism for the regular review of the status of software development projects?

Key Questions for Level 3

- Is there a software engineering process group function?
- Is there a required software engineering training programme for software developers?
- Is a formal training programme required for design and code review leaders?
- Does the software development organisation use a standardised software development process?

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Key Questions for Level 3

- Does the software development organisation use a standardised and documented software development process on each project?
- Are statistics on software design errors gathered?
- Are internal software design reviews conducted?
- Is a mechanism used for controlling changes to the software design?
- Are software code reviews conducted?

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Key Questions for Level 3

- Are the action items resulting from design reviews tracked to closure?
- Are the action items resulting from code reviews tracked to closure?
- Is a mechanism for used for ensuring compliance with software engineering standards?
- Is a mechanism used for verifying that the samples examined by Software Quality Assurance are truly representative of the work performed?

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LEVEL	CHARACTERISTIC	KEY PROBLEM AREAS
optimising	improvement fed back into process	automation
managed	quantitative measured process	changing technology problem analysis problem prevention
defined	process defined & institutionalised	process measurement process analysis quantitative quality plans
repeatable	process dependent on individuals	training technical practices process focus
initial	ad hoc/chaotic	project management project planning configuration management software quality assurance

Key Points

- In order to improve the software process in an organisation you must first understand it. Your improvements must be appropriate to the maturity level you discover. You cannot have a technical fix to fundamental management problems. You cannot skip a stage, any attempt to move directly from 1 to 5 is doomed to failure.