

Software Quality Assurance (SQA) & Software Configuration Management (SCM)

Software Quality Assurance (SQA)


Software Development Goal?

- The goal of software (in computer-based systems) development is to develop
 - High quality software that meets customers' real needs.
 - On time
 - On budget

High-Quality Software

- The important goal of SE is to produce high quality software!

✓ Software Quality Management?

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- Define software quality
 - Create **software quality assurance** (SQA) **activities** to ensure high quality
 - Perform the SQA activities on the project
 - Use metrics for improvement



"SQA Plan" or "SQ Plan"

as a reference for the SQA process!

Software Quality

- The capability of software product to satisfy stated and implied needs under specified conditions
- The degree to which a software product meets established requirements
- **Software quality** depends upon the degree to which those established requirements accurately represent stake- holder needs, wants, and expectations.

Software Quality

- Conformance to all explicitly and implicitly specified requirements!
 - Functionality
 - Usability
 - Performance
 - Reliability
 - Maintainability
 - Reusability
 - ...

Software Quality Assurance

- **Software quality assurance** is a planned and systematic pattern of all actions necessary to provide adequate confidence that the software and the delivered documentation conforms to established technical standards.
- Defines the activities and tasks employed to ensure that software developed for a specific product satisfies the project's established requirements and user needs.

SQA Activities

- A set of activities that define and assess the adequacy of software processes to provide evidence that establishes confidence that the software processes are appropriate and produce software products of suitable quality for their intended purposes.

SQA Activities

- SQA is an activity that is applied to at each step in the software development process.
 - Reviews software engineering activities to verify compliance with the defined software process.
 - Audits designated software work products to verify compliance with those defined as part of the software process.
 - Ensures that deviations in software work and work products are documented and handled according to a documented procedure.

✓ SQA Group

- Quality assurance planning, oversight, record keeping, analysis and reporting.
- The SQA group must look at software from the customer's perspective, as well as assessing its technical merits.

Software Reviews

- A meeting conducted by technical people for technical people.
- A technical assessment of a work product created during the software engineering process.
- A software quality assurance mechanism


Software Reviews

- To evaluate a software product by a team of qualified personnel to determine its suitability for its intended use and identify discrepancies from specifications and standards.

Technical Reviews

- Inspection
- Walkthrough

Software Reviews

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- Any work product (including documents) should be reviewed.
 - Conducting timely reviews of all work products can often eliminate 80% of the defects before any testing is conducted!

✓ SQA Plan (SQAP)

■ **SQAP:**

- The purpose and scope
- Description of all work products (source codes and documents/models) for SQA
- All applicable standards and practices
- SQA actions and tasks (reviews and audits)
- Tools and methods
- Software configuration management procedures
- Organizational roles and responsibilities

IEEE Standard 730-1998, Standard for Software Quality Assurance Plans

SQA Plan (SQAP)

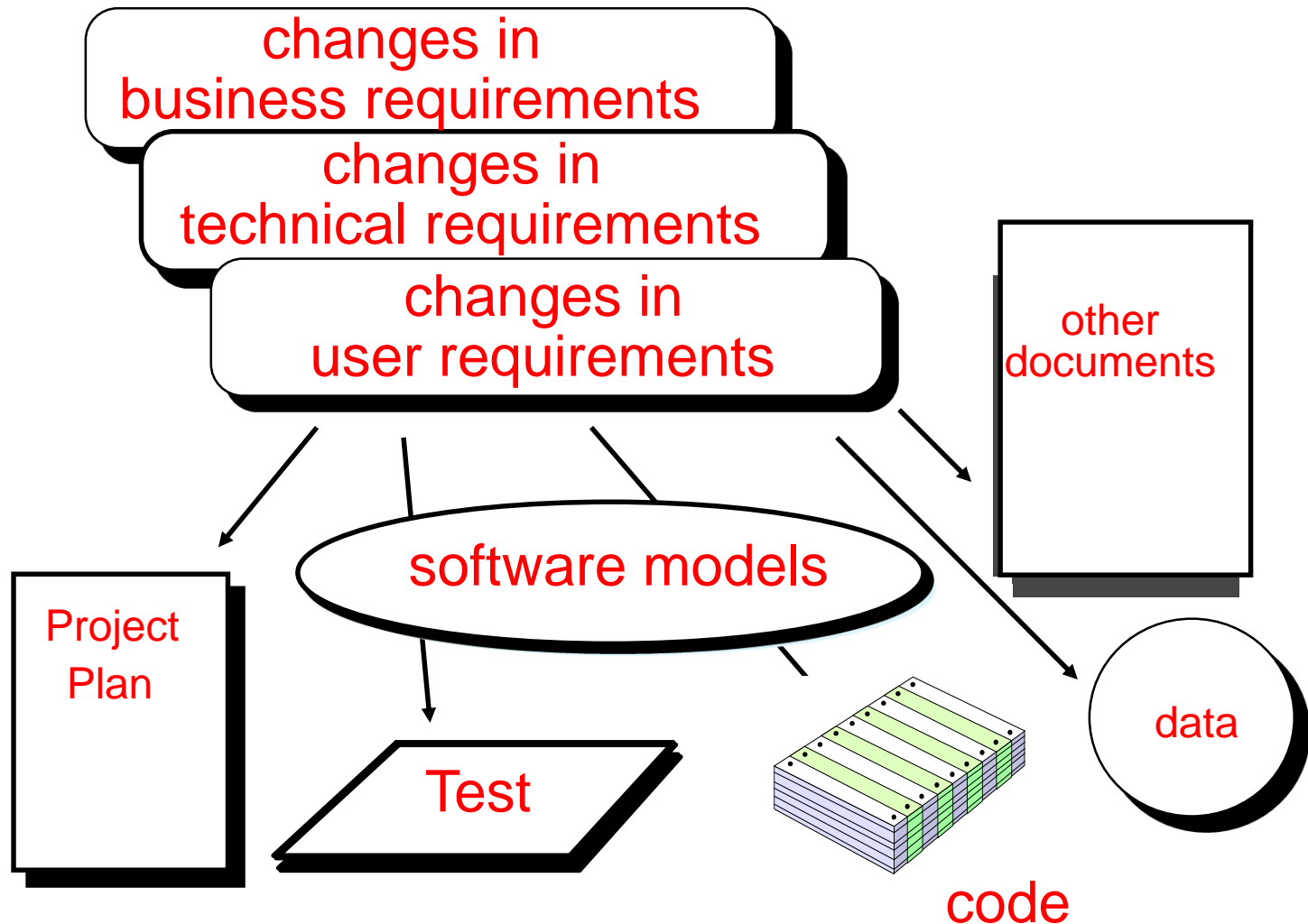
- A road map for instituting software quality assurance.
- Serves as a template for SQA activities for the project
- Developed by the SQA group or a developer team.

Software Configuration Management (SCM)

Software Changes!

- **Changes happen!!! – A Law!**
- No matter where you are in the system life cycle, the system will change.
- **Manage the changes!**
 - If not, ...

What Are These Changes?



Software Configuration Management

- The discipline of identifying the configuration of a system at distinct points in time for the purpose of systematically controlling changes to the configuration and maintaining the integrity and traceability of the configuration throughout the system life cycle

Software Configuration Management

- The purpose of SCM is to stop or reduce the **uncontrolled change** in software!
- SCM is responsible for inhibiting **unapproved changes** to the software system!
- SCM is **an important supporting process** in the software development environment!

Why Software Configuration Management?

- The impact of changes can have a negative ripple affect throughout a project, if they are not controlled properly.
- Uncontrolled changes lead to chaos.
- Need to control changes effectively!

✓ Software Configuration Management?

- A set of activities to control change
 - By identifying the work products that are likely to change.
 - By establishing relationships
 - By defining mechanisms for managing different versions
 - By controlling the changes imposed
 - By auditing the changes made.
 - By reporting on the changes made.



"SCM Plan"

as a reference for the SCM process!

The SCM Process

- Identify and define software items in a system
 - Software configuration identification
- Control modifications and releases of the items
 - Software configuration control
- Record and report the status of the items and modification requests
 - Software configuration status accounting

The SCM Process

- Ensure the completeness, consistency, and correctness of the items
 - Software configuration auditing
- Control storage, handling, and delivery of the items
 - Software release management and delivery

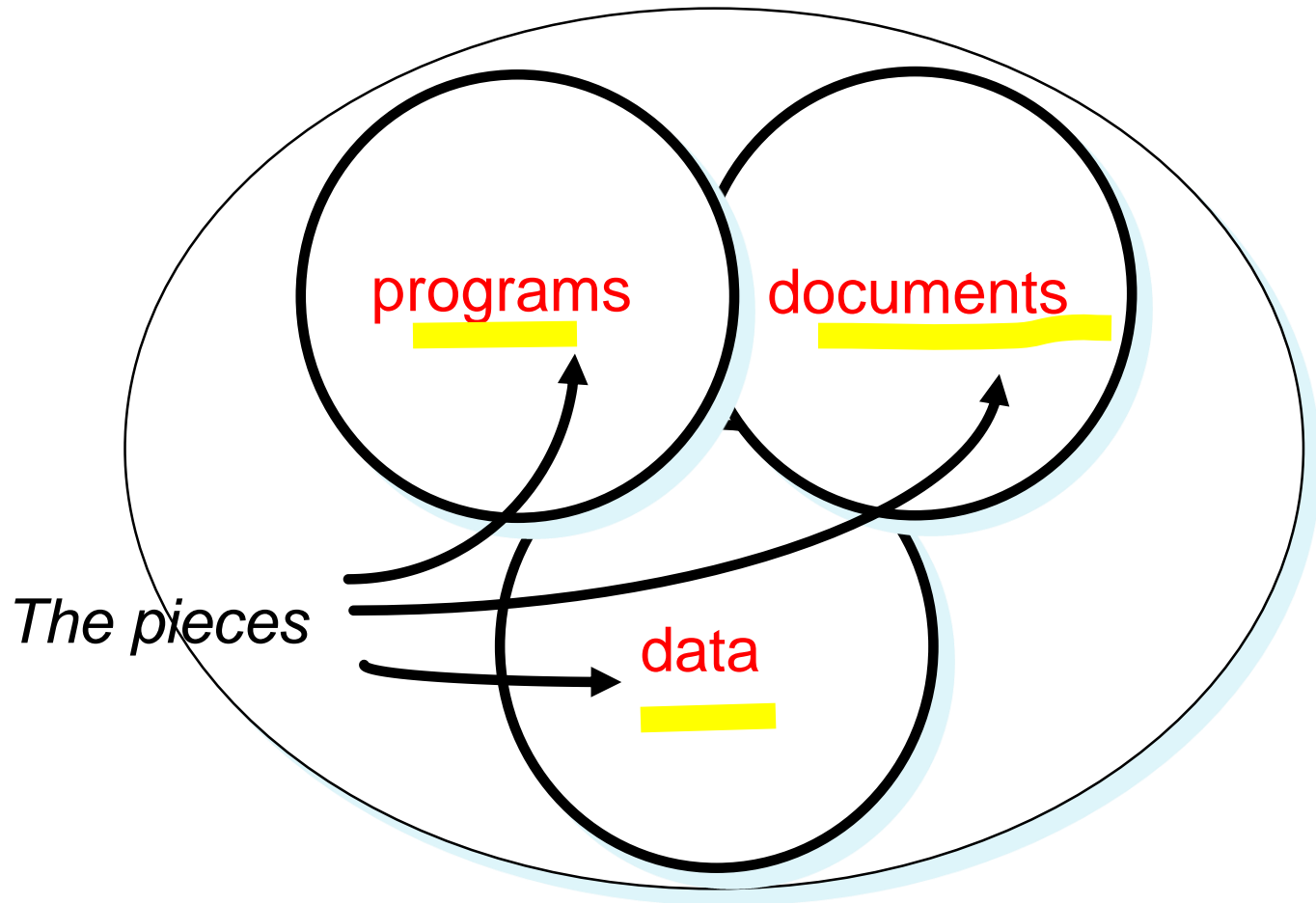
Software Configuration Identification

- The activities of identification, naming, and describing of the documented physical and functional characteristics of the code, specifications, design, and data elements to be controlled for the project.
- Individual SCI must be separately named and then organized.

Software Configuration

- Software configuration items as programs, documentation, and data.
- Changes can occur to any of these items during the course of a project.

Software Configuration



Software Configuration Items (SCIs)

- The **software configuration** is composed of a set of interrelated objects called **software configuration items** (SCIs) that are produced as a result of some software engineering activity.

✓ Baselines

- **IEEE:** A specification or product that has been formally reviewed and agreed upon, that thereafter serves as the basis for further development, and that **can be changed only through formal change control procedures.**
- A **software baseline** is a set of software configuration items formally designated and fixed at a specific time during the software life cycle.

Baselines

- A **baseline configuration** item as being something that has very tightly defined change procedures.
 - Once a configuration has been developed and reviewed, it becomes a baseline.
 - A baseline, together with all approved changes to the baseline, represents the current approved configuration.

Software Configuration Control

- The activities of requesting, evaluating, approving or disapproving, and implementing of changes to baselined configuration items.

Change Control

- A procedural activity that ensures quality and consistency as changes are made to a configuration object.
- Processing and controlling a software change request (SCR).

Configuration control board (CCB)

- A configuration control board is responsible for approving and controlling changes to baseline work products.
- The agency that controls the configuration is the **Configuration Control Board (CCB)**.
- The project manager is the CCB for internal configuration control.

✓ The Change Control Process

- A software change request (SCR)
- A change report
- A configuration control board (CCB)
- An engineering change order (ECO)
- ...

Software Configuration Status Accounting

- The activities of recording and reporting the status of project configuration items.
- Provides information about each change to those with a need to know.
 - What happened?
 - Who did it?
 - When did it happen?
 - What else will be affected?

Software Configuration Auditing

- The determining to what extent the actual configuration reflects the required physical and functional characteristics.
- An activity that helps to ensure that quality is maintained as changes are made.
 - Whether the change has been properly implemented?
 - Software configuration audit

Software Release Management and Delivery

- This activity encompasses the identification, packaging, and delivery of the elements of a product.
 - Release - The distribution of a software configuration item outside the development agency.
 - Delivery - To insure the correct version and supporting material and documentation is delivered to the correct customer.

SCM Plan (SCMP)

■ **SCMP:**

- Introduction
- SCM Management
- SCM Activities (configuration identification, configuration control, and so on)
- SCM Schedules
- SCM Resources
- SCMP Maintenance

- **IEEE Standard 828-1998 Standard for Software Configuration Management Plans**