Software Project Management

Week 13

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Today's Lecture

- Change Request
- Change Request Management
- Software Configuration Management (SCM)

Slides from R S Pressman's book – Software Engineering: A Practitioner's Approach and PMP Prep

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Problem Statement

- In any enterprise software project, managing the changes in requirements is a very difficult task
- It is due to the following facts:
  - Nature of change: a client may ask you to add a storey in a 25 storey building but at the ground floor
  - Frequency
- It could become chaotic.
- If it is not properly managed, consequences could be very costly to the project
  - it could ultimately result in the project's failure.

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Change Requests and Their Impact

- Project success means completing the project on time, within budget and with the originally agreed upon features and functionality,
- Only a selected few software projects are successful.
- The Standish Group estimates that
  - more than 30 percent of all projects are cancelled prior to completion,
  - over 70 percent of the remainder fail to deliver the expected features,
  - and the average project runs more than 180 percent over budget and misses schedules by more than 200 percent.

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Other Reasons for Failure

- **Poor requirements management:** We forge ahead with development without user input and a clear understanding of the problems we attempt to solve.
- **Inadequate change management:** Changes are inevitable; yet we rarely track them or understand their impact.
- **Poor resource allocation:** Resource allocation is not re-negotiated consistently with the accepted Change Requests

Not Enough

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Changing Requirements

- Software requirements are subjected to continuous changes for bad and good reasons.
- The real problem however, is not that software requirements change during the life of a project,
- But that they usually change out of a framework of disciplined planning and control processes.
- If adequately managed, Change Requests (CR) may represent precious opportunities to achieve a better customer satisfaction and profitability.
- If not managed, instead, CR represents threats for the project success.

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Origins of Software Change

- Errors detected in the software need to be corrected
- New business or market conditions dictate changes in product requirements or business rules
- New customer needs demand modifications of data produced by information systems, functionality delivered by products, or services delivered by a computer-based system
- Reorganization or business growth/downsizing causes changes in project priorities or software engineering team structure
- Budgetary or scheduling constraints cause a redefinition of the system or product

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Change Request

- A Change Request (CR) is a formally submitted artifact that is used to track all stakeholder requests
  - new features,
  - enhancement requests,
  - defects,
  - changed requirements
- with related status information throughout the project lifecycle.

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Manager's Requirement: Change Tracking

- Change Tracking describes
  - what is done to components
  - for what reason and
  - at what time.
- It serves as history and rationale of changes.
- It is quite separate from assessing the impact of proposed changes as described under 'Change Request Management'.

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Why control change across the lifecycle?

"Uncontrollable change is a common source of project chaos, schedule slips and quality problems."

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Traceability Requirement?

- Traceability provides a methodical and controlled process for managing the changes that inevitably occur during application development.
- Without tracing, every change would require reviewing documents on an ad-hoc basis to see if any other elements of the project need updating.

particular purpose as necessary

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Change Request Management (CRM)

CRM addresses the organizational infrastructure required to assess the cost, and schedule, impact of a requested change to the existing product. Change Request Management addresses the workings of a Change Review Team or Change Control Board.

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What is Change Request Management

- Also called software configuration management (SCM)
- It is an umbrella activity that is applied throughout the software process
- It's goal is to maximize productivity by minimizing mistakes caused by confusion when coordinating software development
- SCM identifies, organizes, and controls modifications to the software being built by a software development team
- SCM activities are formulated to identify change, control change, ensure that change is being properly implemented, and report changes to others who may have an interest

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What is Change Request Management

- SCM is initiated when the project begins and terminates when the software is taken out of operation
- View of SCM from various roles
  - Project manager -> an auditing mechanism
    SCM manager -> a controlling, tracking, and policy making mechanism
  - Software engineer -> a changing, building, and access control mechanism
  - Customer -> a quality assurance and product identification mechanism

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Establishing a Change Control Process

The following activities are required to establish CRM:

- Establish the Change Request Process
- Establish the Change Control Board
- Define Change Review Notification Protocols

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Change Request Process

- Identify in your Project Management Plan
  - Change Request Form
  - Initiation Mechanism
  - Roles and Responsibilities
  - Impact Analysis
  - Review and Approval Mechanism
  - Change Reflection
    - Update Project Plan, Design, Development …
    - Authorization
    - Baseline
    - etc.

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Impact analysis

- Impact analysis provides accurate understanding of the implications of a proposed change,
- Helps in making informed business decisions about which proposals to approve.
- The analysis examines the context of the proposed change to identify existing components that might have to be modified or discarded,
- Identify new work products to be created,
- Estimate the effort associated with each task."
- Establishes requirement of additional funds

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Change (or Configuration) Control Board (CCB)

- CCB is the board that oversees the change process
- Consists of representatives from all interested parties, including
  - customers,
  - developers,
  - users etc.
- In a small project, a single team member, such as the project manager or software architect, may play this role.

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CCB Review Meeting

- The function of this meeting is to review *Submitted* Change Requests.
- An initial review of the contents of the Change Request is done in the meeting to determine if it is a valid request.
- If so, then a determination is made if the change is in or out of scope for the current release(s), based on
  - priority,
  - schedule,
  - resources,
  - level-of-effort,
  - risk,
  - severity
  - and any other relevant criteria as determined by the group.

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Software Configuration

- The Output from the software process makes up the software configuration
  - Computer programs (both source code files and executable files)
  - Work products that describe the computer programs (documents targeted at both technical practitioners and users)
  - Data (contained within the programs themselves or in external files)
- The major danger to a software configuration is change
  - First Law of System Engineering: "No matter where you are in the system life cycle, the system will change, and the desire to change it will persist throughout the life cycle"

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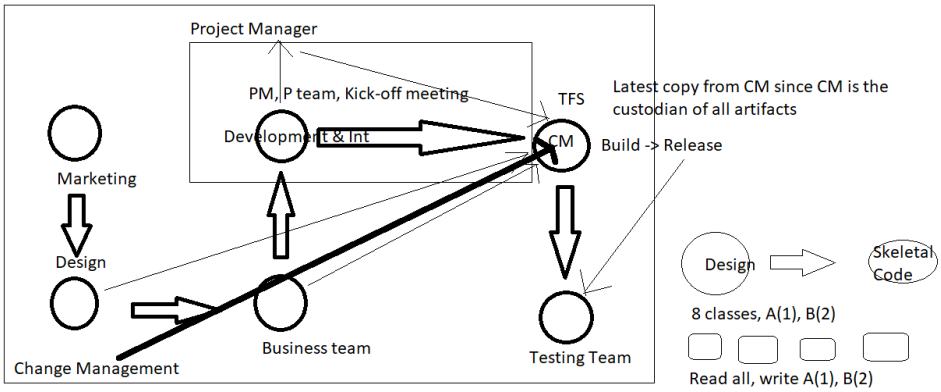
Configuration Management Procedure in a software house



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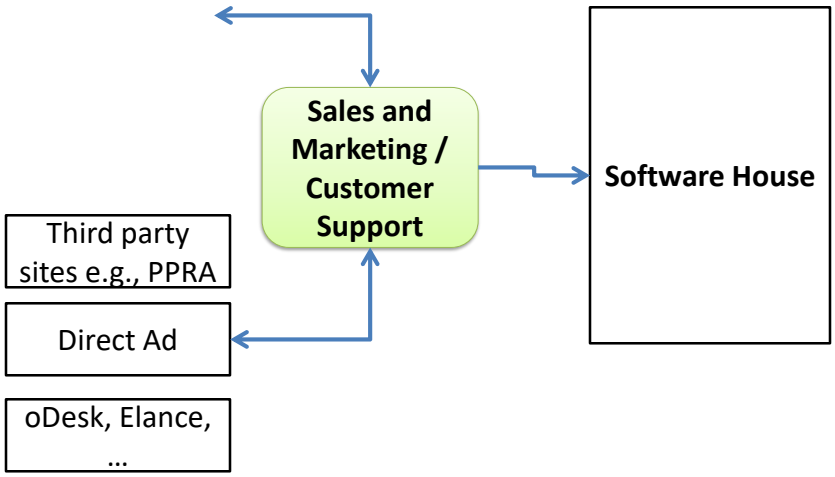
Software house at a glance



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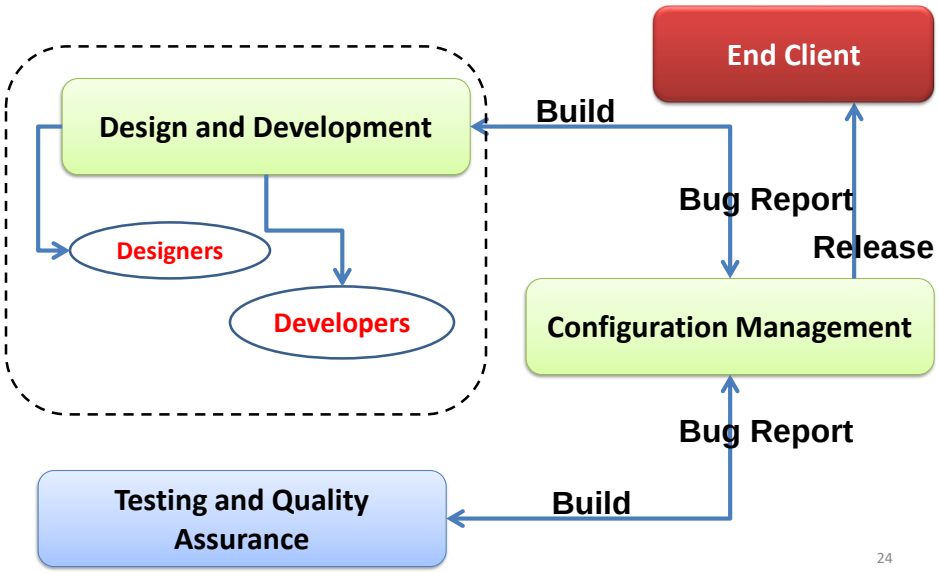
Software House at a glance…



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Elements of Configuration Management System

- Configuration elements
  - A set of tools coupled with a file management (e.g., database) system that enables access to and management of each software configuration item
- Process elements
  - A collection of procedures and tasks that define an effective approach to change management for all participants
- Construction elements
  - A set of tools that automate the construction of software by ensuring that the proper set of valid components (i.e., the correct version) is assembled
- Human elements
  - A set of tools and process features used by a software team to implement effective SCM

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Questions???

- Which is the control document
- How it was accessed
- How the changes were made
- How can we track changes in future
- Version management
- How can we analyze impact of change
- The answer lies in
  - Software Configuration Management
  - Studied as a separate process already
  - We study its use for CRM in rest of this lecture

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Baseline

- An SCM concept that helps practitioners to control change without seriously impeding justifiable change
- IEEE Definition: A specification or product that has been formally reviewed and agreed upon, and that thereafter serves as the basis for further development, and that can be changed only through formal change control procedures
- It is a milestone in the development of software and is marked by the delivery of one or more computer software configuration items (CSCIs) that have been approved as a consequence of a formal technical review
- A CSCI may be such work products as a document (as listed in MIL-STD-498), a test suite, or a software component

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Baselining Process

1) A series of software engineering tasks produces a CSCI
2) The CSCI is reviewed and possibly approved
3) The approved CSCI is given a new version number and placed in a project database (i.e., software repository)
4) A copy of the CSCI is taken from the project database and examined/modified by a software engineer
5) The baselining of the modified CSCI goes back to Step #2

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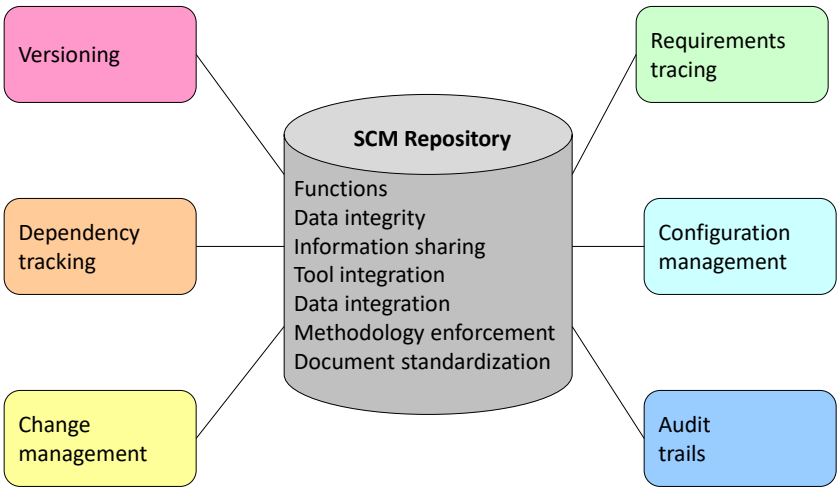
SCM Repository (Functions and Tools)



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Functions of an SCM Repository

- Data integrity
  - Validates entries, ensures consistency, cascades modifications
- Information sharing
  - Shares information among developers and tools, manages and controls multi-user access
- Tool integration
  - Establishes a data model that can be accessed by many software engineering tools, controls access to the data
- Data integration
  - Allows various SCM tasks to be performed on one or more CSCIs
- Methodology enforcement
  - Defines an entity-relationship model for the repository that implies a specific process model for software engineering
- Document standardization
  - Defines objects in the repository to guarantee a standard approach for creation of software engineering documents

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Toolset Used on a Repository

- Versioning
  - Save and retrieve all repository objects based on version number
- Dependency tracking and change management
  - Track and respond to the changes in the state and relationship of all objects in the repository
- Requirements tracing
  - (Forward tracing) Track the design and construction components and deliverables that result from a specific requirements specification
  - (Backward tracing) Identify which requirement generated any given work product
- Configuration management
  - Track a series of configurations representing specific project milestones or production releases
- Audit trails
  - Establish information about when, why, and by whom changes are made in the repository

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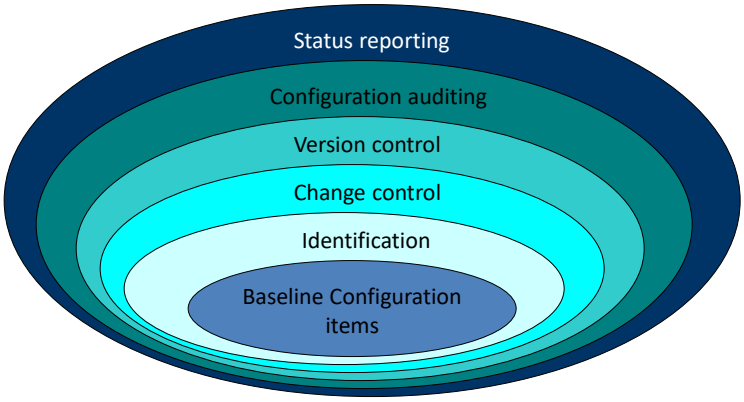
SCM Tasks



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CRM Tools

These are some of the CRM tools available:

- Rational Clear Quest
- PR Tracker
- PVCS Tracker

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Summary

- Origin of Change Requests
- Change Request Management
- Role of Software Configuration Management

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