Unit 9:
Project Management and Project Management Tools

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Includes…

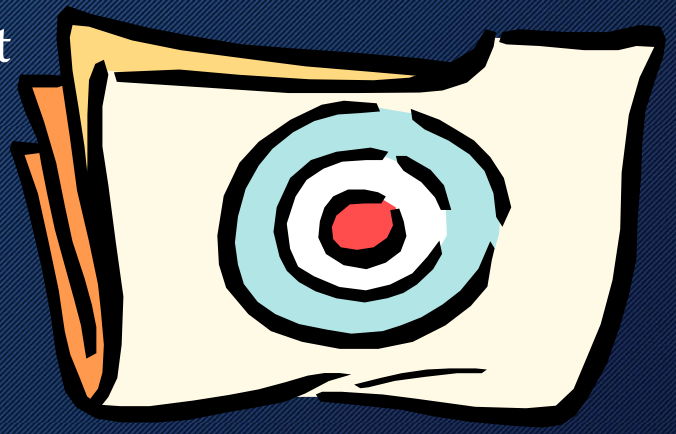
1. Software configuration management
2. SCM tasks and roles
3. Risk Management
4. Risk Management Process
5. SPM Tools

Software Configuration Management

The 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."

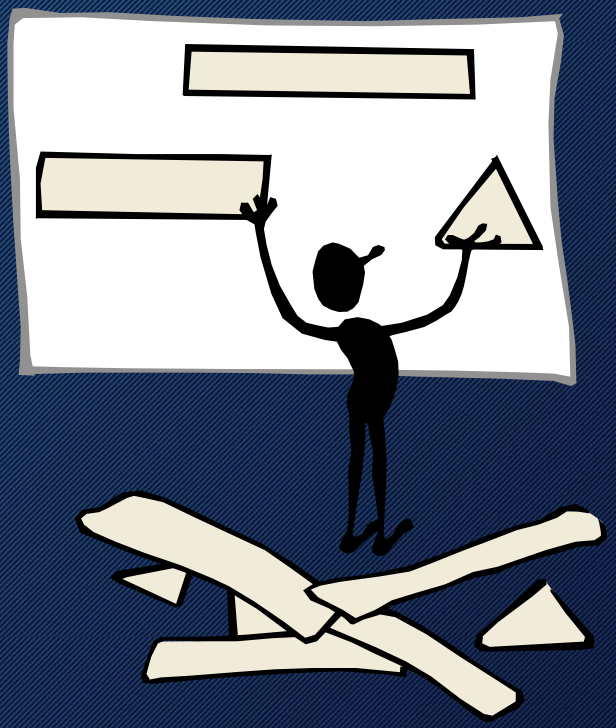
- Ideal
  - Software is developed from stable/frozen requirements
  - The concept is that it is easier to hit a stationary target than a moving target
- Reality
  - Not applicable for most real-world systems
- The only constant is "CHANGE"
  - An effective software project need to have a strategy to tackle "CHANGE"



How software changes….

- The four aspects of software evolution are:

1. Corrective changes
2. Adaptive changes
3. Perfective changes
4. Preventive changes



Corrective Changes

- Required to maintain control over the system's day-to-day functions
- These changes are made as faults (or) bugs are found during the development time
- Some changes may be long-term and fundamental, some may be patches to keep the system in operation (emergency fixes)

Adaptive Changes

- Essentially maintaining control over system modifications
- As one part of the system changes, other impacted areas will need to be updated
- Examples
  - Database upgrades
  - Use of a new compiler or development tool

Perfective Changes

- Perfecting existing acceptable functions
- The domain of Refactoring designs falls into this category
- Perfective changes are done to increase the long-term maintainability or elegance of the solution
  - Involves changes to design or data structures for better efficiency
  - Updates to documentation to improve their quality
  - Enhancing the code to make it more readable

Preventive Changes

- Preventing the system performance from degrading to unacceptable levels
- Involves alterations made to ensure that the system has a defense against potential failures
- Example:
  - Adding extra redundancy modules to ensure that all transactions are properly logged

Types of Changes

- The typical distribution of these changes is (from Lientz & Swanson 1981):
  - Perfective (50%)
  - Adaptive (25%)
  - Corrective (21%)
  - Preventive (4%)
- These figures will change depending on the system and project

Changes and Control

- If changes are not controlled in a project – things can and will get out of hand
- The issue of change management is even more important when multiple people work on a project as well as on the same deliverable
- Without proper strategies and mechanisms to control changes – one can never revert back to an older more stable copy of the software
  - Important as every change introduces risk into the project

So what is the answer??

- The facts:
  - Change is unavoidable in software
  - Changes needs to be controlled
  - Changes need to be managed
- The solution
  - Software configuration management (SCM)

New Version

Significant change in functionality, technology, hardware and software requirements

New Release

Only a bug fix, minor enhancement in functionality

Configuration Management…

- This is the discipline that applies a rigorous approach to ensure
  - Different items produced in software systems are all identified and tracked
  - Changes to the various items are recorded and tracked
  - Completion and proper integration of all the various modules
- SCM can help determine the impact of change as well as control parallel development
- It can track and control changes in all aspects of software development
  - Requirements
  - Design
  - Code
  - Tests
  - Documentation

Need for SCM…

- As software evolves – many resources make changes to the system
  - CM prevents avoidable errors that arise from conflicting changes
- Often many versions of the software are released and require support
  - CM allows a team to support many versions.
  - CM allows changes in sequential versions to be propagated
- CM allows developers to track changes and reverse any fatal changes to take a software system back to its last known safe state

Need for SCM…

- Good SCM increases confidence that we are:
  - Building the right system
  - Testing the system enough
  - Changing it correctly and carefully
- It also:
  - Restrains non-essential changes
  - Ensures that decisions and changes are traceable
  - Increases accountability
  - Improves overall software quality
  - Provides a fall back position when things do not work

Significance of SCM

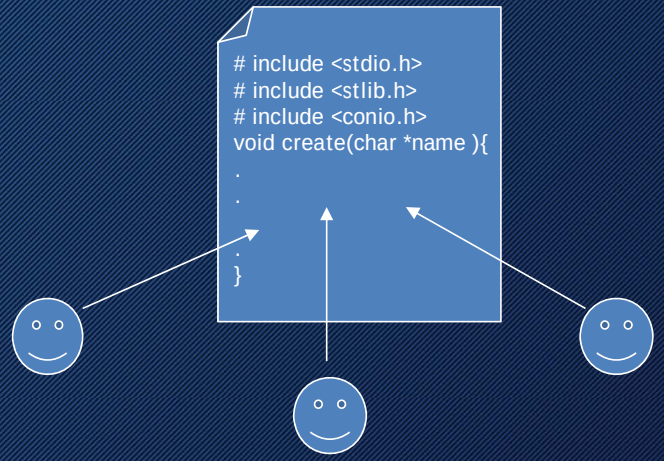
Because change can occur at any time, SCM activities are developed to

- Identify Change
- Control Change
- Ensure that change is being properly implemented
- Report changes to others who may have an interest.
- Control access to deliverables of software project

The need of SCM

Concurrent Access:

- Single copy of program
- Many working on it
- Carry out changes simultaneously
- Overwrite each other while saving



SCM Activities

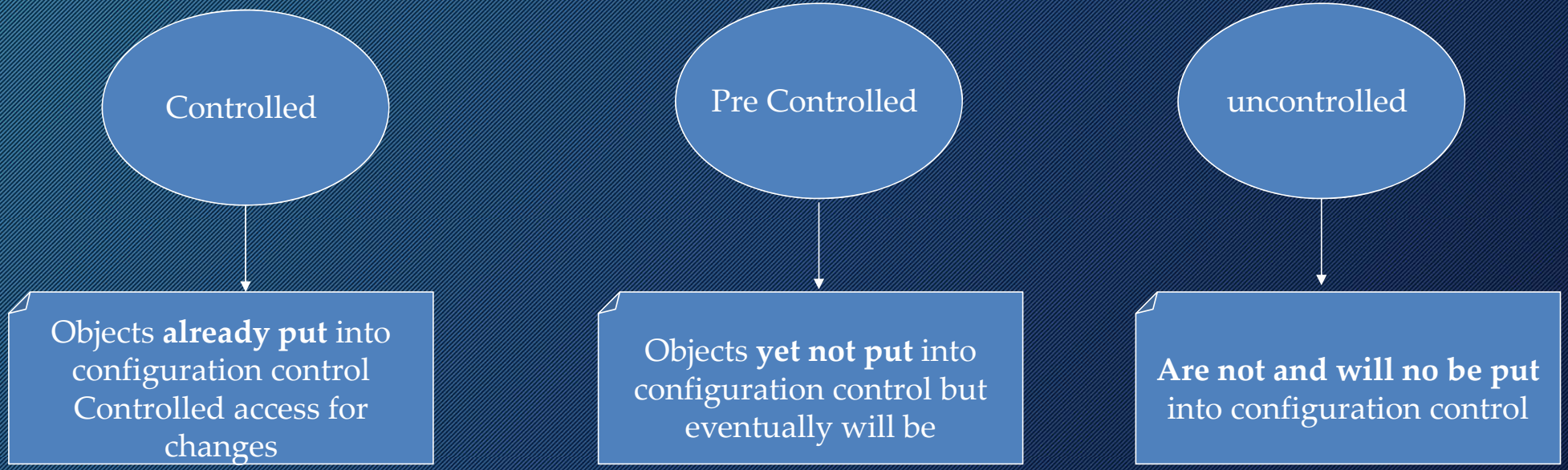
i. Configuration Identification

Which part of system to be kept record of ?

ii. Configuration Control

Ensures changes to a system happens smoothly!!

Configuration Identification



Configuration Control

- Process of managing changes to controlled objects
- Prevents unauthorized changes to any controlled object

A Baseline

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!!**

- Before a software configuration item becomes a baseline, change may be made quick and informal.
- However, once a baseline is established, we figuratively pass through a swinging one way door.
- Changes can be made, but a specific, formal procedure must be applied to evaluate and verify each change.

SCM Roles and Responsibilities…

- Configuration manager
  - Responsible for approving configuration items
  - Responsible for development and enforcement of procedures
  - Approves STM (ship to manufacture) level release
  - Responsible for monitoring entropy
- Change control board
  - Approves and prioritizes, or rejects change requests
- Software engineers
  - Responsible for identification and versioning of configuration items
  - Create promotions triggered by change requests or the normal activities of development.
  - Update the items to incorporate requested changes – they also resolve any merge conflicts

Risk Management

Project Risks

- Factors that cause a project to be delayed or over-budget

Nature of Project Risks

- Planning assumptions
- Estimation errors
- Eventualities (Possibilities)

Planning Assumptions

- Why assumptions
  - Uncertainties in early stage of the project
- Common assumption:
  - "Everything will go smoothly"
    - Environment is reliable and fixed
    - Design will be perfect first time
    - Coding will be 'nearly perfect'
- Guidelines
  - List all the assumptions
  - Identify the effects of these assumptions on the project if they are no longer valid

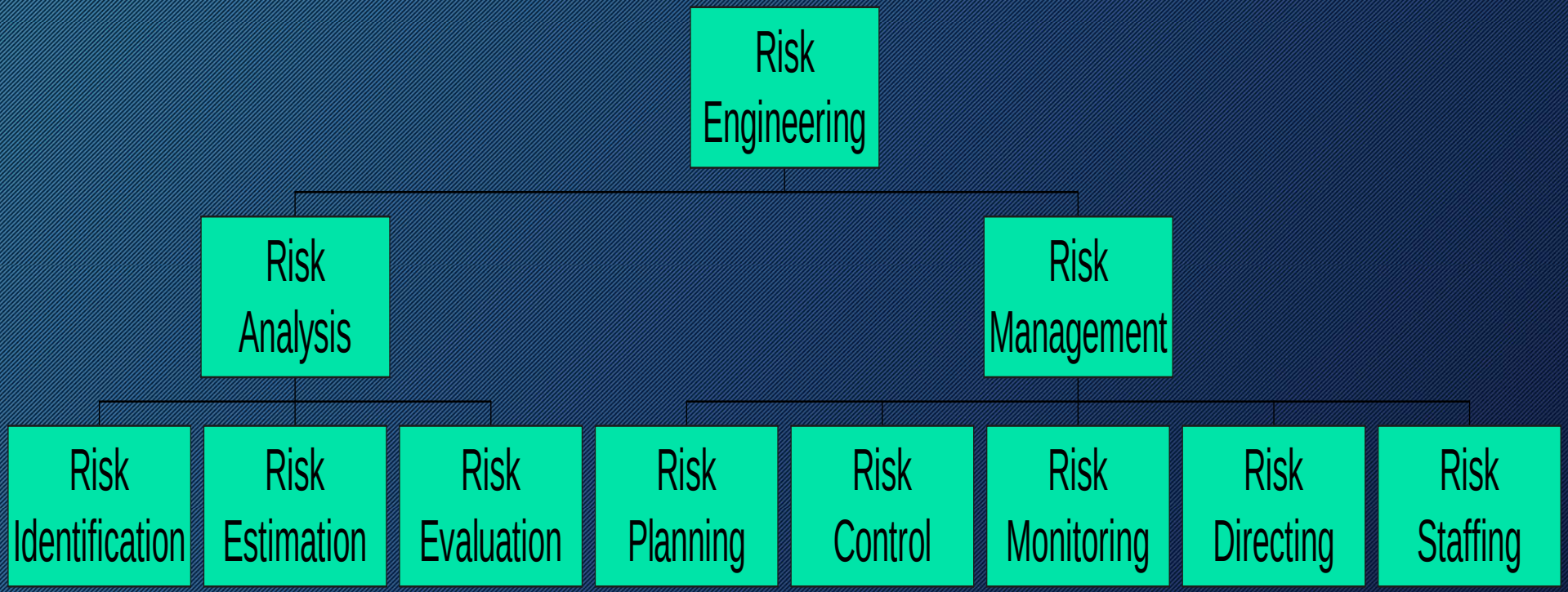
Estimation Errors

- Difficult to have accurate size or time estimations
  - Lack of experience of similar tasks
  - Lack of historical data
  - Nature of the task
- Estimation can be improved by analyzing historic data for similar tasks and similar projects
  - Keep historic data of your estimation and the actual performance
  - Compare your estimation and the actual value
  - Classify the tasks that are easy or difficult to give accurate estimation

Eventualities

- Unexpected and unimaginable events
- Common unexpected events
  - Hardware cannot be delivered on time
  - Requirements specification needs to be rewritten
  - Staffing problem

Boehm's Risk Engineering



Risk Identification

- Identify the hazards that might affect the duration or resource costs of the project

Hazard → Problem → Risk

- A *hazard* is an event that might occur and will create a problem for the successful completion of the project, if it does occur

Hazard, Problem, and Risk

- *Hazard*: Mary's baby may be born early
- *Problem*: Modules P and Q will have no coder
- *Risk*: Milestone 7 will be delayed, or extra budget will be needed to hire another coder

Risk Identification (cont'd)

- Type of risks
  - *Generic risk* (common to all projects)
    - Standard checklist can be modified based on the risk analysis of previous projects
  - *Specific risk* (only applies to individual projects)
    - More difficult to find
    - Need to involve project team members
    - Need an environment that encourages risk assessment

Risk Identification (cont'd)

- Guideline
  - Use checklist that lists the potential hazards and their corresponding factors
  - Maintain an updated checklist for future projects

Common Risk Factors

- Application factors
- Staff factors
- Project factors
- Hardware and software factors
- Changeover factors
- Supplier factors
- Environment factors
- Health and safety factors

Application Factors

- Nature of the application
  - A data processing application or a life-critical system (e.g. X-ray emission system)
- Expected size of the application
  - The larger is the size, the higher is the chance of errors, communication problems and management problems

Staff Factors

- Experience and skills
- Appropriateness of experience
- Staff satisfaction
- Staff turn-over rates

Project Factors

- Project objectives:
  - Ill defined
  - Unclear to every team member and user
- Project methods:
  - Ill specified methods
  - Unstructured methods

Hardware and Software Factors

- New hardware
  - Stability of the new hardware system??
- Cross platform development
  - Development platform is not the operation platform
  - Does the language used support cross platform development?

Changeover Factors

- 'All-in-one' changeover
  - The new system is put into operation
- Incremental or gradual changeover
  - Adding new components to the system by phases
- Parallel changeover
  - Both the existing system and the new system are used in parallel

Supplier Factors

- Late delivery of hardware
- Instability of hardware
- Late completion of building sites

Environment Factors

- Changes in environment such as hardware platforms
- Changes in government policies
- Changes in business rules
- Restructuring of organizations

Health and Safety Factors

- Health and safety of staff and environment
  - Staff sickness, death, pregnancy etc.
  - Any tragic accident to staff

Boehm's Top Ten Risk Items

- Personnel shortfalls
- Unrealistic schedules and budgets
- Developing the wrong software functions
- Developing the wrong user interface
- Gold plating
- Continuing stream of requirements changes
- Shortfalls in externally performed tasks
- Shortfalls in externally furnished components
- Real-time performance shortfalls
- Straining computer science capabilities

Risk Management

- Risk planning
- Risk control
- Risk monitoring
- Risk directing
- Risk staffing

Risk Planning

- Making contingency plans
- Where appropriate, adding these plans into the project's overall task structure

Risk Control

- Minimizing and reacting to problems arising from risks throughout the project

Risk Monitoring

- It is an ongoing activity throughout the whole project to monitor
  - the likelihood of a hazard; and
  - the impact of the problem caused.

Risk Directing and Staffing

- These concerns with the day-to-day management of risk.
- Risk aversion strategies and problem solving strategies frequently involve the use of additional staff and this must be planned for and should be considered.

Risk Reduction Strategies

- 5 different types in a generic sense
  - Hazard prevention
  - Likelihood reduction
  - Risk avoidance
  - Risk transfer
  - Contingency planning

Hazard prevention

- Prevent a hazard from occurring or reduce its likelihood to an insignificant level
  - Lack of skilled staff can be prevented by employing staff with appropriate skills
  - Unclear requirements specification can be prevented by using formal specification techniques

Likelihood reduction

- Reduce the likelihood of an unavoidable risk by prior planning
  - Late change to the requirements specification can be reduced by using prototyping

Risk avoidance

- Some hazards cannot be avoided but their risks may
  - A project can be protected from the risk of overrunning the schedule by increasing duration estimates.

Risk transfer

- The impact of the risk can be transferred away from the project by contracting out or taking out insurance
  - The risk of shortfalls in external supplied components can be transferred away by quality assurance procedures and certification, and contractual agreements.

Contingency planning

- Contingency plans are needed to reduce the impact of those risks that cannot be avoided
  - The impact of any unplanned absence of programming staff can be minimized by using agency programmers

Any Queries?

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