Coping with Change and Risk

Chapter 2.3 & 2.4

CMPT 276
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Based on slides from Software Engineering 9th ed, Sommerville.

Topics

1) How can software projects manage change?
   a) What is prototyping?
   b) What is incremental development?

2) What is the Rational Unified Process?

Coping with change

- Change is inevitable in all large software projects:
  - lead to new (or changed) system requirements.
  - open up new possibilities.
- Cost of change =
  Cost of reworking completed work
  (re-analysing requirements, design, recoding)
  +
  Cost of..

Reducing the cost of rework

- Change avoidance:
  - software development process includes..

    before significant rework is required.
  - Example: develop a prototype system to show a key (uncertain?) features to customers.
- Change tolerance:
  - software development process is designed to..

  - Usually incremental development.
  - Changes may be in a future increment (no rework), or may have to alter part of the existing system.

Change avoidance with
Software Prototyping

Software prototyping

- Prototype:
  - used to try out options.
- "Throw-away" code:
  - Prototypes could ignore things like code quality, error-handling, or testability.
  - Built to answer a specific question, not to see if the whole system will work.

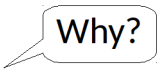
Software prototyping

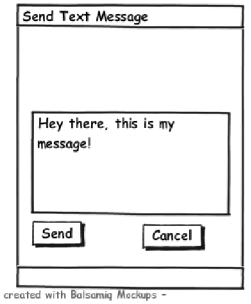
- A prototype can be used in:
  - to help with requirements elicitation and validation;
  - to explore options;
    - For example, a paper prototype of the UI.

Prototyping Process:

Benefits of prototyping

- Benefits of Prototyping:
  - Improved system usability.
  - A closer match to users' real needs.
  - Improved design quality.
  - Improved maintainability.
  - Reduced development effort.





Prototype development

-
  - Focus on poorly understood areas of the product;
  - Error checking and recovery may be omitted;
  - Focus on rather than requirements.

Accessing hardware, screen layouts, database access.

Security, performance, etc.

- Prototypes..
  not a good basis for a production system:
  - Very hard to tune it to meet non-functional requirements.
  - Normally undocumented;
  - Degraded structure from rapid change (no refactoring)
  - Likely below software quality standards.

Change tolerance with

Incremental Delivery

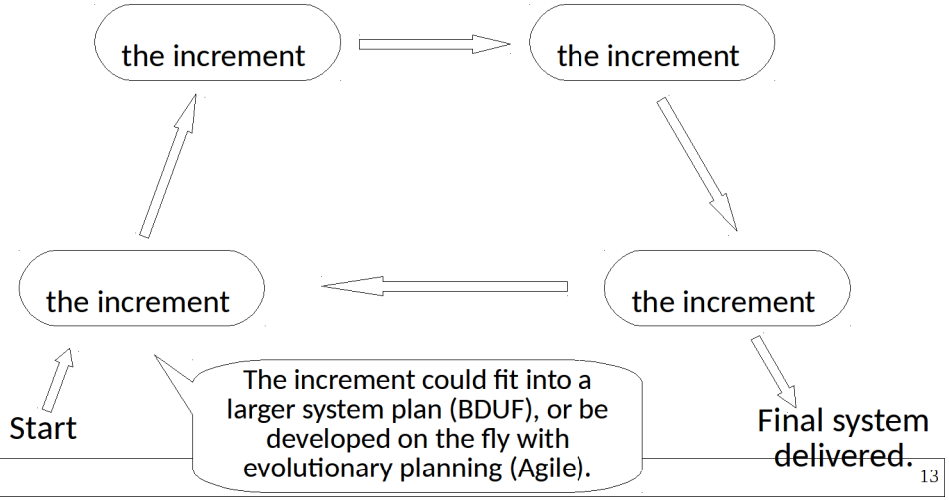
Incremental delivery

- Development and delivery are
  - Each increment delivers some required functionality.
- Prioritized user requirements
  - highest priority ones included in early increments.
- Requirement changes
  - Once the development of an increment is started,
  - Requirements for later increments continue to evolve.

Incremental development and delivery

- Incremental development
  - Develop the system in increments.
  - increment before proceeding to development of next increment;
  - Normal approach used in…
- Incremental delivery
  - Deploy an increment for..
  - More realistic evaluation because of..
  - Difficult to implement for replacement systems as increments have less functionality than old system.

Incremental Delivery



Incremental delivery advantages

- Benefits Include:
  - New functionality delivered with each increment so system functionality is available earlier.
  - Early increments act.. to help elicit requirements for later increments.
  - Lower risk of overall project failure.
  - Highest priority requirements implemented first and..

What is a difference between an early increment and a prototype?

Incremental delivery problems

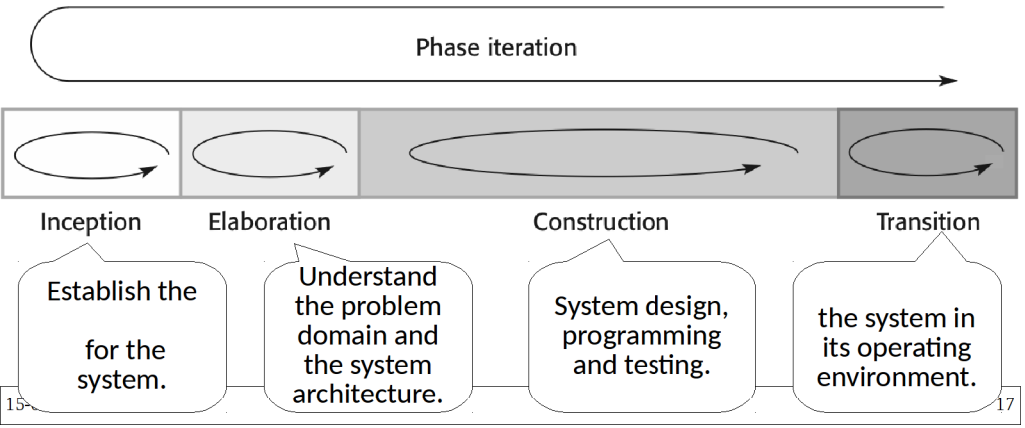
- Common Functionality:
  - Most systems require a set of basic facilities that are used by different parts of the system.
  - Hard to identify common facilities because requirements are not defined in detail until..
- Contracts:
  - Specification developed iteratively with the software.
  - Complete system specification can be needed as part of the...

The Rational Unified Process

Brings together aspects of..
1. Waterfall
2. Incremental Delivery
3. Reuse-oriented Software Engineeering

RUP phases

- (Small loops)
  - Multiple iterations within a phase to complete its work.
- (Big loop on top)
  - The whole set of phases be done incrementally



RUP good practices

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  - Plan increments based on customer priorities and deliver highest priority increments first.
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  - Document customer requirements and track its changes.
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  - Organize system architecture as reusable components.
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  - Use graphical UML models of the software.
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  - Enforce development quality standards.
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  - Manage changes using a change management system.

Summary

- Processes should cope with change.
  - Change avoidance:
    - Prototyping helps avoid poor decisions on requirements and design.
  - Change tolerance:
    - Iterative development and delivery allows changes without disrupting whole system.
- The Rational Unified Process:
  - generic process model
  - organized into phases (inception, elaboration, construction and transition)
  - separates activities within all phases. (requirements, analysis and design, etc.)