Coping with Change and Risk

Chapter 2.3 & 2.4

CMPT 276
© Dr. B. Fraser
Based on slides from Software Engineering 9th ed, Sommerville.
Topics

• How can software projects manage change?
  – What is prototyping?
  – What is incremental development?
Coping with change

- Change is inevitable in all large software projects:
  - Business changes lead to new (or changed) system requirements.
  - open up new possibilities.

- Cost of change = Cost of reworking completed work (re-analyzing 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
(Throwaway) Software Prototyping
Throwaway 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:

1. [Rectangle]
2. [Rectangle]
3. [Rectangle]
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.
  - Ex: Accessing hardware, screen layouts, database access.
  - Ex: 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

The increment could fit into a larger system plan (BDUF), or be developed on the fly with evolutionary planning (Agile).

Final system delivered.
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...
Summary

• Processes should cope with change.
  – Change avoidance:
    • Throwaway prototyping helps avoid poor decisions on requirements and design.
  – Change tolerance:
    • Iterative development and delivery allows changes without disrupting whole system.