Coping with Change and Risk

Chapter 2.3 & 2.4

CMPT 276

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.
  - **new technologies** open up new possibilities.

- Cost of change =
  Cost of reworking completed work
  (re-analyzing requirements, design, recoding)
  +
  Cost of.. **implementing new functionality**

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..

    accomodate changes at a lower cost
  - 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

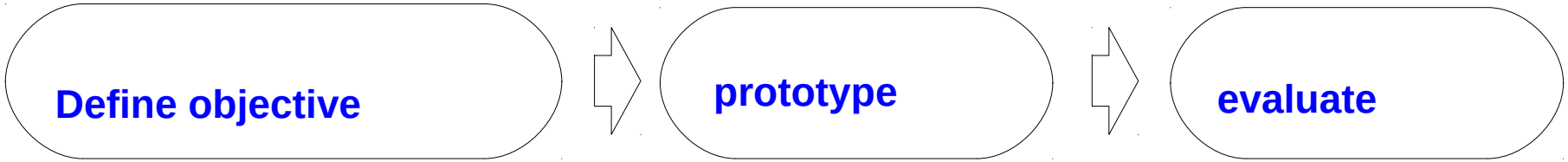
Throwaway Software Prototyping

- Prototype:
  - **a test implementation of the system** 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

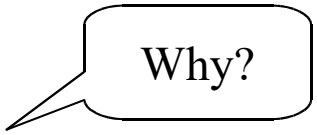
- A prototype can be used in:
  - .. **requirements engineering (specification)**
    to help with requirements elicitation and validation;
  - .. **Design processes** to explore options;
    - For example, a paper prototype of the UI.

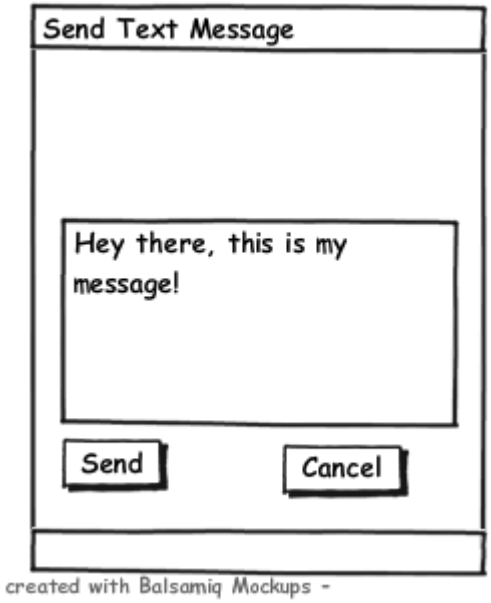
Prototyping Process:



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 **functional** requirements. rather than **non functional**

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

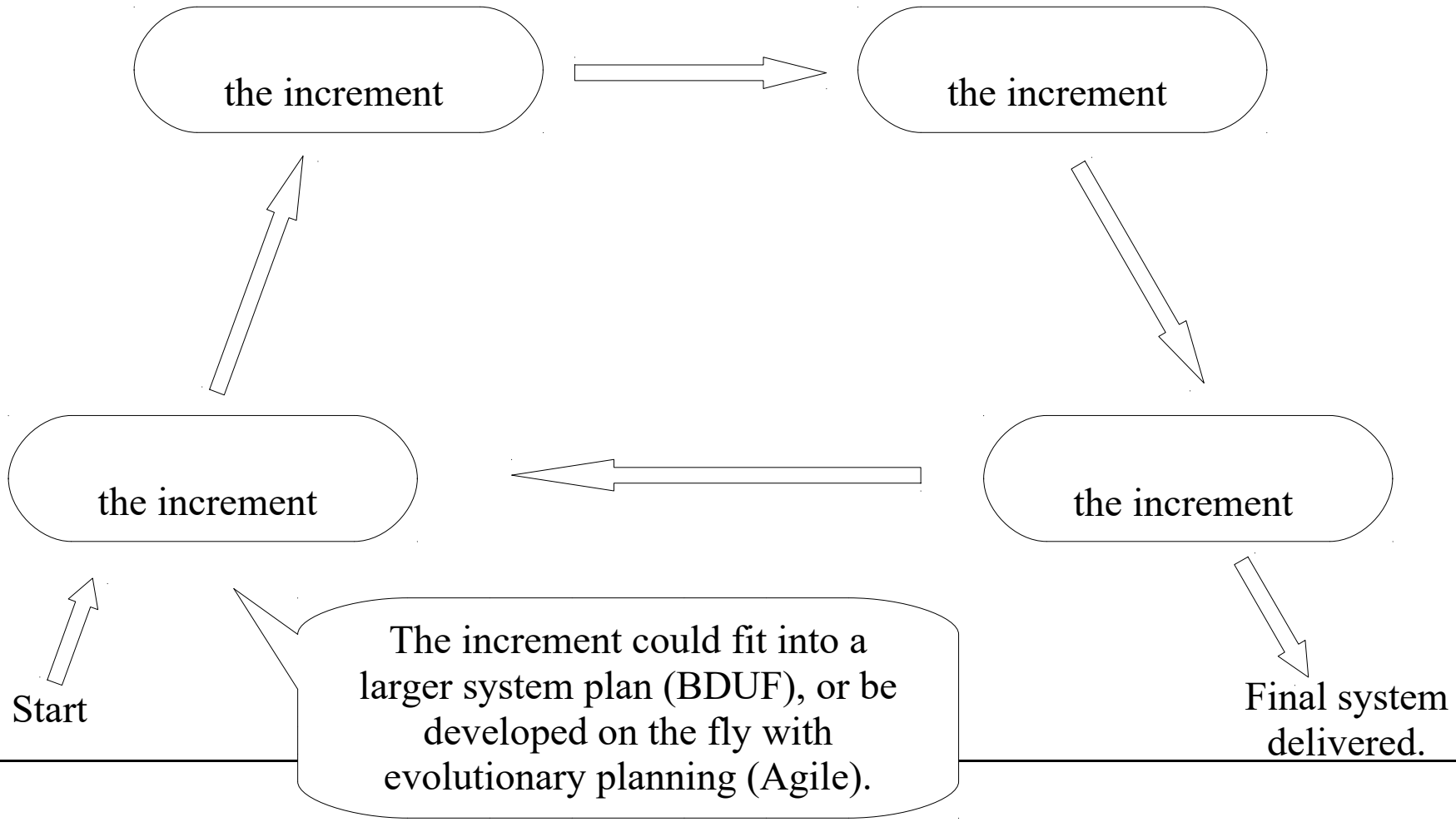
Incremental delivery

- Development and delivery are
  - **broken down into increments**
  - 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,
    - **the requirements are frozen**
  - 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.. **like a prototype** to help elicit requirements for later increments.
  - Lower risk of overall project failure.
  - Highest priority requirements implemented first and..

receive the most testing

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

***we plan to throw away the prototype**

reuse code from early increment

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..

    an increment is to be implemented

- Contracts:
  - Specification developed iteratively with the software.
  - Complete system specification can be needed as part of the... **system development contract**

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.