CMPT 276 Class 05: How To Cope With Change And Risk

Dr. Jack Thomas

Simon Fraser University

Fall 2020

Today’s 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.

- This **cost of change** is equal to the **cost of reworking completed work** (re-analyzing requirements, design, recoding) plus the **cost of implementing new functionality.**

Reducing The Cost Of Rework

1. **Change Avoidance**
   - The software development process includes activities to **anticipate possible changes** before significant rework is required.
   - Example: develop a **Prototype** system to show a key (uncertain?) features to customers.
2. **Change Tolerance**
   - The software development process can be **designed to accommodate changes** at lower cost.
   - Usually through **Incremental Development**.
   - Changes may be in a future increment (no rework), or may have to alter part of the existing system.

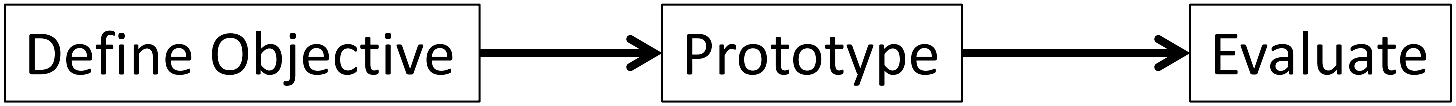
Throwaway Software Prototyping

- **Prototypes** are a test implementation of the system. Use them to try out different options.
- **"Throw-Away" Code**
  - **Not a basis** for the system.
  - 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** to help with requirements elicitation and validation.
  - **Design processes** to explore options. For example, a paper prototype of the UI.

Prototyping Process:

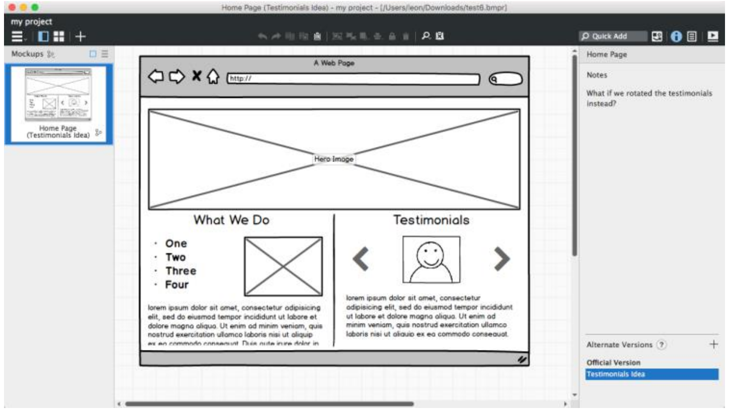


Define Objective → Prototype → Evaluate

Benefits of Prototyping

1. Improved **system usability**.
2. A **closer match** to users’ **real needs**.
3. Improved **design quality**.
4. Improved **maintainability**.
5. Reduced **development effort**.

Example UI prototyping tool: Balsamiq



What if we rotated the testimonials instead?

lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in

lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.

Image credit: https://blog.balsamiq.com/3-1/

Prototype Development

- Prototypes **leave out** some functionality.
  - Focus on **poorly understood areas** of the product;
  - **Error checking** and **recovery** may be **omitted**;
- Focus on **functional** rather than **non-functional** requirements.
- Prototypes should be **discarded after use**. They are deliberately 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.

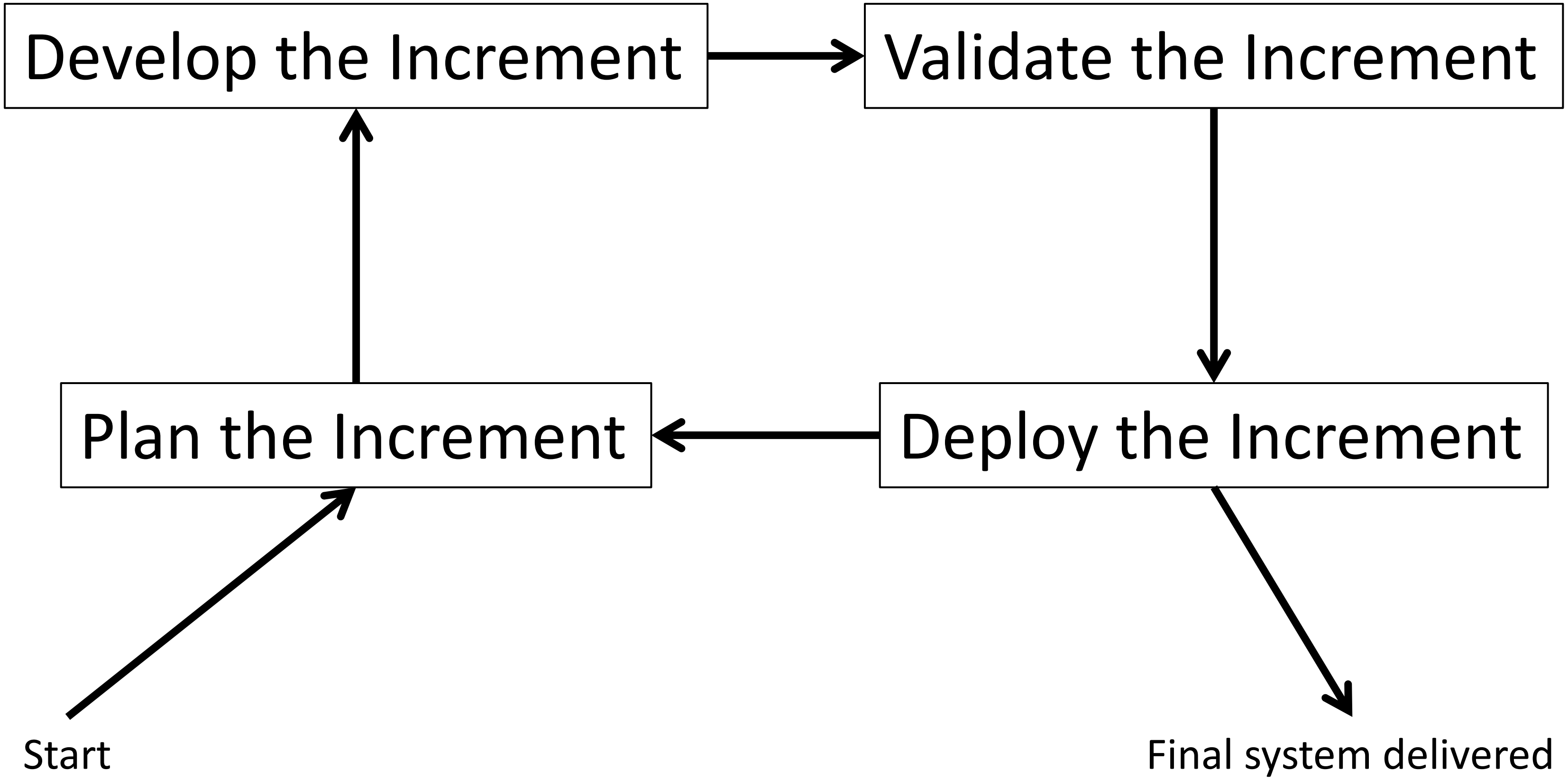
Incremental Delivery

- Development and delivery are broken down into **Increments**
  - Each increment delivers some required functionality.
- **User requirements** are **prioritized**, as they're the highest impact once delivery begins.
  - Highest priority ones included in early increments.
- 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**.
  - Customer evaluates increment before proceeding to development of next increment.
  - Normal approach used in **Agile mehods**.
- **Incremental Delivery**
  - **Deploy** an increment for use by **end-users**.
  - More realistic evaluation because of practical use.
  - Difficult to implement for replacement systems as increments have less functionality than old system.

Incremental Delivery



Develop the Increment

Validate the Increment

Plan the Increment

Deploy the Increment

Start

Final system delivered

Incremental Delivery Advantages

- 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**.

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**.

Recap – Learning To Cope

- **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.