Models of Software Development

Jonathan Lung – CSC207H: Software Design

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Models of Software Development

- In many computer science courses, software is submitted once, graded, and “thrown away”.
- In real life, software development is an _____ process.
- Some attempts to codify or describe the different ways that software is built are described in these slides.
## Common elements

<table>
<thead>
<tr>
<th>Requirements elicitation</th>
<th>Determining what needs to be built</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements specification</td>
<td>Formalizing what needs to be built</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design &amp; Architecture</th>
<th>Figuring out how the requirements can be met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation</td>
<td>Make it so</td>
</tr>
<tr>
<td>Testing</td>
<td>Did we make it so?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Deployment</th>
<th>Delivery and installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance</td>
<td>Fixing/adding/changing features</td>
</tr>
</tbody>
</table>

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Verification & Validation (V&V)

**Validation**

- Testing the specification – does the described software meet the user’s needs?
- “Are we building the right thing?”

**Verification**

- Testing the software – does the software work as intended, fulfilling the specification?
- “Are we building the thing right?”
Waterfall model

- Requirements
- Design
- Implementation
- Verification
- Maintenance

Adapted from Royce, 1970
Spiral model

Determine objectives

Identify & resolve risk

Plan next iteration

Release

Develop & Test

Adapted from Boehm, 1988
Introduction to agile methods

Agile methods are developed in recognition that...

- Software does not exist in a vacuum.
- Requirements ______.
- Incomplete software is sometimes better than no software.
Features of agile methods

Agile methods often make use of the following:

- User stories instead of formal requirements,
- _________ unit testing,
- Pair programming,
- Lightweight design, and
- Continuous refactoring to accommodate _______.
Agile suitability

Agile methods are generally _________ for projects that have
- Small teams of experts,
- Low cost of failure, and
- Frequently changing requirements.

Agile methods are generally _________ for projects that have
- Large teams,
- Inexperienced developers,
- High cost of failure, and
- Relatively static requirements.
### The Scrum method

<table>
<thead>
<tr>
<th>Product backlog</th>
<th>List of features for the product. . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprint backlog</td>
<td>. . of which a subset is chosen for sprints. . .</td>
</tr>
<tr>
<td>Code sprint</td>
<td>. . which takes place over _____ weeks. . .</td>
</tr>
<tr>
<td>Daily scrum</td>
<td>. . with short daily meetings. . .</td>
</tr>
<tr>
<td>Final product</td>
<td>. . until a final product is produced.</td>
</tr>
</tbody>
</table>
Daily scrum

- Meeting in which each team member answers the following:
  - What did you do yesterday?
  - What will you do today?
  - __________
- Time limits of around 15 minutes are set on meetings.
### Other meetings

<table>
<thead>
<tr>
<th><strong>Sprint planning</strong></th>
<th>Select items for sprint backlog</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Delegate from each team attends after daily scrum</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Sprint review</strong></td>
<td>Review work completed and incomplete; show demo</td>
</tr>
<tr>
<td><strong>Sprint retrospective</strong></td>
<td>Improving process through post-sprint reflection</td>
</tr>
</tbody>
</table>
User stories

• Users usually do not use the same terms as software developers.
• One way to elicit requirements is to have users describe situations in which the software developed is to come into play.
• These help to clarify requirements and can be used for clarification when communicating with a client.
• These user stories can also be used to identify the different types of users of a system.
• Traditionally of the form “As a ______, I want ______ so that ________.”
Examples of user stories

- As a cashier, I want to select the type and quantity of items being purchased so that the total can be calculated.
- As a cashier, I want to cancel transactions so that customers can change their minds.
- As a cashier, I want to select the payment type so that customers have payment options.
- As a store manager, I want to view a list of inventory so that I can plan future orders.
- As a store manager, I want to edit the inventory list so that discrepancies can be corrected.
- As a store customer, I want to see if an item is in stock so that I am not disappointed when a store is sold out.
- As a store customer, I want to check the price of items that are on sale so that I can save money.
Product backlog

- A list of things to be done including
  - User stories,
  - __
  - __
  - Issues, and
  - Questions.

- Each of these items has a priority and a “size” estimate of how long it will take to complete.
- Size estimates are given as a __________.