Models of Software Development

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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>
<tr>
<td>Design &amp; Architecture</td>
<td>Figuring out how the requirements</td>
</tr>
<tr>
<td></td>
<td>can be met</td>
</tr>
<tr>
<td>Implementation</td>
<td>Make it so</td>
</tr>
<tr>
<td>Testing</td>
<td>Did we make it so?</td>
</tr>
<tr>
<td>Deployment</td>
<td>Delivery and installation</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Fixing/adding/changing features</td>
</tr>
</tbody>
</table>
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
- 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>Meeting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sprint planning</strong></td>
<td>Select items for sprint backlog</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Delegate from each team attends after daily scrum</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 __________.