An Empirical Study on Decision Making in Off-the-Shelf Component-Based Development

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Research Motivation

• Answer this question:

Why do I use COTS (Commercial-off-the-shelf) instead of OSS (Open Source Software) components, or vice versa?
Research Questions (RQs)

• RQ1: What are the commonalities and differences in profiles of projects using COTS components vs. those using OSS components?

• RQ2: What are the commonalities and differences in the motivation of projects using COTS components vs. those using OSS components?

• RQ3: What are the commonalities and differences in possible risk (problems) of projects using COTS components vs. those using OSS components?
Research methods

- A joint industrial survey in Norway, Italy, and Germany
- Results from 133 projects are collected (47 from Norway, 48 from Germany, and 38 from Italy)
- 83 projects used only COTS components
- 44 projects used only OSS components
- Six used both COTS and OSS components (discarded for analysis)
Results of profiles of projects/systems

System emphasize on: Time-to-market, reliability and performance
System does not emphasize on: Security

COTS projects

OSS projects
Results\textsubscript{2} - motivations of using COTS and OSS

General motivations of using either COTS or OSS component:

*Shorten the time-to-market and save development cost*
Results - motivations of using COTS vs. OSS

Motivations of using COTS components:
- COTS software is reliable
- COTS software will follow the market trend
- COTS vendor will provide good support

Motivations of using OSS components:
- Code could be acquired for free
- Source code is available for change

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COTS projects

OSS projects
Problems reported from various case studies or industrial practices

<table>
<thead>
<tr>
<th>R1</th>
<th>The project was delivered long after schedule</th>
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<tbody>
<tr>
<td>R2</td>
<td>Effort to select OTS components was not satisfactorily estimated</td>
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<tr>
<td>R3</td>
<td>Effort to integrate OTS components was not satisfactorily estimated</td>
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<tr>
<td>R4</td>
<td>OTS components negatively affected system reliability</td>
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<tr>
<td>R5</td>
<td>OTS components negatively affected system security</td>
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<tr>
<td>R6</td>
<td>OTS components negatively affected system performance</td>
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<tr>
<td>R7</td>
<td>Requirements were changed a lot</td>
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<td>R8</td>
<td>OTS components could not be sufficiently adapted to changing requirements</td>
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<td>R9</td>
<td>Project could not (re) negotiate requirements with the customer, if OTS components could not satisfy all requirements</td>
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<td>R10</td>
<td>It was difficult to identify whether defects were inside or outside the OTS components</td>
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<td>R11</td>
<td>It was difficult to plan system maintenance, e.g. because different OTS components had asynchronous release cycles</td>
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<td>R12</td>
<td>It was difficult to update the system with the last OTS component version</td>
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<td>R13</td>
<td>OTS components were not satisfactorily compatible with the production environment when the system was deployed</td>
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<td>R14</td>
<td>Information on the reputation and technical support ability of provider were inadequate</td>
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<td>R15</td>
<td>Provider did not provide enough technical support/ training</td>
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Results - possible problems of using COTS and/or OSS

• Common problems of using either COTS or OSS
  – Difficult to estimate the integration effort
  – Difficult to locate the defects

• The specific problem of using OSS component
  – More problems to get the information of the providers’ reputation

• The specific problem of using COTS components
  – More difficult to estimate the selection effort