Low Degree of Separation Does Not Guarantee Easy Coordination

Zane Galviņa and Darja Šmite
Euromicro 2012 | Turkey
Context

Complexities of distributed work

Collaboration models

<table>
<thead>
<tr>
<th>Same country</th>
<th>Onshore insourcing</th>
<th>Onshore outsourcing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Different country</td>
<td>Offshore insourcing</td>
<td>Offshore outsourcing</td>
</tr>
</tbody>
</table>

(Siemens Global Studio Project – 05/06; I.Richardson)

Zane Galviņa and Darja Šmite | Euromicro 2012 | Turkey
Context

Traditional coordination models
- Coordination is the act of coordinating activities toward a common goal

Modern coordination models
- Coordination is the act of coordinating dependencies between activities toward a common goal
System Design Organization

HOW DO COMMITTEES INVENT?
by MELVIN E. CONWAY

Organization that designs systems are constrained to produce designs which are copies of the communication structures of these organizations.
Related work

Does a congruence or non-congruence have any impact?

Impact on

Productivity
Scalability of development work
Quality
Standardization of work processes
Effects of non-congruence

- Misalignment often has a negative impact on productivity and quality
  (by Herbsleb and Grinter)

- Architectural dependencies can be used to structure tasks, and distribute, allocate, and coordinate work across teams and locations so that communication, coordination, and synchronization needs are minimized and communication breakdowns reduced
  (by Herbsleb and Grinter, Cataldo et al. Herbsleb and Mockus)
Research questions

RQ1 How unclear organizational structure affects task flows in a highly distributed software project?

RQ2 What is the mean time of cross-organizational task coordination delays?
Study overview

**Empirical context:**
Collaboration between four Latvian software organizations

- **D1:** Prime contractor
  Customers acquired the system development from D1

- **D2 and D3:** Direct sub-contractors
  D1 sub-contracted parts of the system development to D2 and D3

- **D4:** Hidden sub-contractor
  D3 sub-contracted parts of their work to D4; the relationship is hidden from the other organizations

**Research method:** Participant observation
## Data collection

<table>
<thead>
<tr>
<th>Requirements analysis and design</th>
<th>Artifacts collected</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Project Management Plan</td>
<td></td>
<td>• Interviews with the users</td>
</tr>
<tr>
<td>• Software Requirement Specification</td>
<td></td>
<td>• Weekly meetings with D4 and D3</td>
</tr>
<tr>
<td>• Software Design Specification</td>
<td></td>
<td>• Participation in two meetings among D1, D3, D4 to finalize the requirements and design documentation</td>
</tr>
<tr>
<td>• Problem Reports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 38 emails with task assignments</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Product structure

**System level**
The system has external interface

**Sub-system level**
The system consists of two interrelated sub-systems (1 and 2). Both sub-systems have external interfaces

**Component level**
Sub-system 1 consists of four components. Some of these components are interrelated. External and internal interfaces with sub-system 2 exist through component 1
Project failure

• The project started in the beginning of 2011
• Planned to finish by January 2012
• The project is still not finalized!!!
• Delays in completion of sub-system 1
Task allocation

Misalignment of the product structure and project organization

Expected coordination complexity and inefficiency involving the hidden organization

Exploratory focus: coordination flows
Findings: coordination flows

Dotted lines indicate problematic flows

Zane Galviņa and Darja Šmite | Euromicro 2012 | Turkey
Stages

• **Stage 1:**
  – Work assigned by D1 to D3 is further forwarded to D4
  – D4 does not have an account in Jira and tasks are sent via email

• **Stage 2:**
  – D4 gained access to Jira
  – D4 employees were acknowledged as official participants
  – Roles and responsibilities between D3 and D4 are still unclear

• **Stage 3:**
  – D1 started to reassign delayed tasks from D3 to D4
  – D4 affiliation is still hidden, coordination is based on assumptions
  – D3 realized that many of the reassigned tasks are false and 16 assignments were sent back to D1

• **Stage 4:**
  – Resulting coordination flows and initial task allocation do not match
Coordination problems

- Evolution of coordination patterns changed dramatically and contained several problems:
  - Redundant flows
  - Cycles
  - Lack of necessary flows
Coordination delays

<table>
<thead>
<tr>
<th>Flow 1</th>
<th>Flow 2</th>
<th>Flow 3</th>
<th>Flow 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>15d 20h</td>
<td>Min</td>
<td>0h</td>
</tr>
<tr>
<td>Max</td>
<td>138d 2h</td>
<td>Max</td>
<td>74d 21h</td>
</tr>
<tr>
<td>Median</td>
<td>40d 22h</td>
<td>Median</td>
<td>18h</td>
</tr>
</tbody>
</table>
Components 1 and 2

- 4 incorrectly assigned tasks
- The loss reached median time of 40 days

Zane Galviņa and Darja Šmite | Euromicro 2012 | Turkey
Components 3

Jira is unavailable, tasks are tunneled through email

Access to Jira granted

Coordination breakdown

- 35 task assignments
- Max delay reached 74 days 21 h

Coordination breakdown

- 16 misallocated assignments
- Min time took 3 h, max - 104 days 20 h

No delays

Zane Galviņa and Darja Šmite | Euromicro 2012 | Turkey
Components 4: most complex

**Poorly communicated responsibilities**
- 16 task assignments
- Reassigned in the next stage

**Misunderstood responsibilities**
- 16 misallocated assignments
- Reassigned to D4 at the next stage

**Coordination breakdown**
- Delay of 138 days
- 16 h (4 months+)

Zane Galviņa and Darja Šmite | Euromicro 2012 | Turkey
In retrospect

Guidelines

Clear component structure

Clear interfaces supported by communication and coordination mechanisms

Homomorphic principle for task allocation
In retrospect

- Clear component structure
- Clear interfaces supported by communication and coordination mechanisms
- Homomorphic principle for task allocation
Conclusions

• We expect that a task allocation strategy that is compliant with the Conway’s proposition is more likely to minimize similar problems

• Onshore collaborations and thus low separation do not really ensure coordination success

• The true organizational structure might be hidden
Thank you for your attention!
Questions?