Eiropas Sociālā fonda projekts Nr.2009/0216/1DP/1.1.1.2.0/09/APIA/044
"Datorzinātnes pielietojumi un tās saiknes ar kvantu fiziku"

ESF
EIROPAS SOCIĀLAIS FONDS

EIROPAS SAVIENĪBA

IEGULDĪJUMS TAVĀ NĀKOTNĒ

Socio-Technical Congruence Sabotaged by a Hidden Onshore Outsourcing Relationship

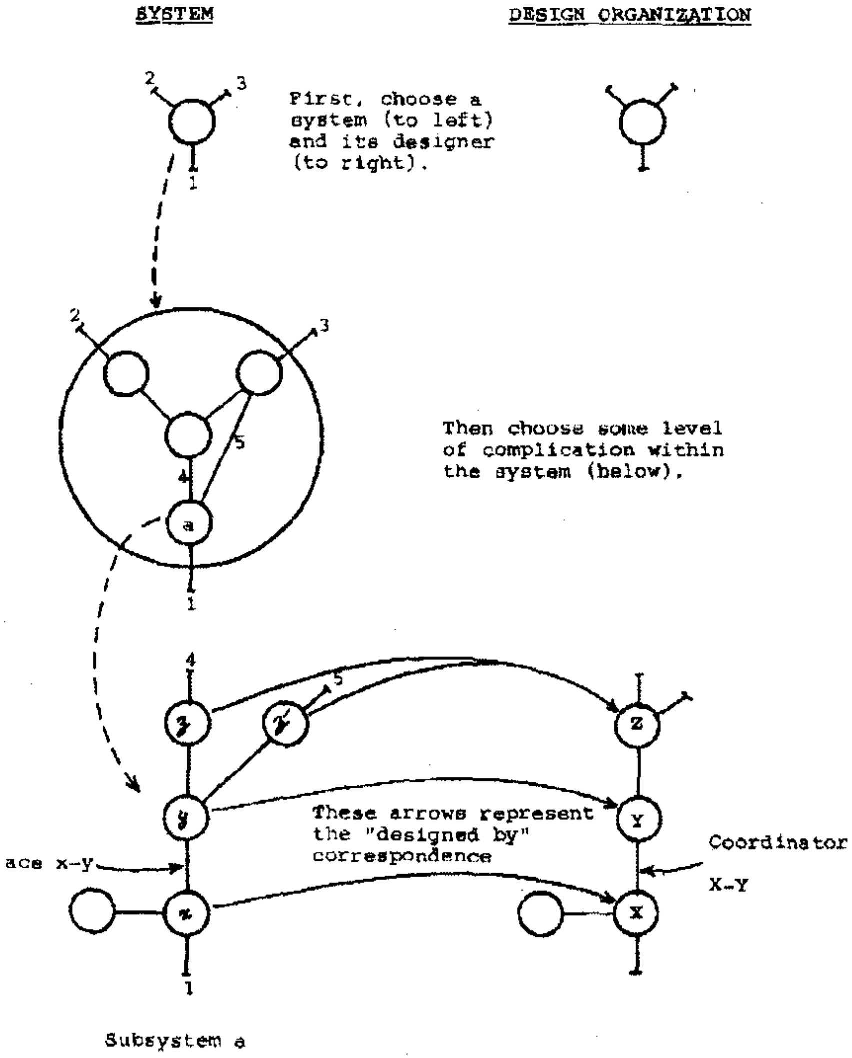
Darja Šmite and Zane Galviņa

Blekinge Institute of Technology

University of Latvia

PROFES 2012 | Madrid, Spain

System Design Organization



First, choose a system (to left) and its designer (to right).

Then choose some level of complication within the system (below).

These arrows represent the "designed by" correspondence

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

HOW DO COMMITTEES INVENT?

by MELVIN E. CONWAY

Background and motivation

2nd International Workshop on
Replication in Empirical
Software Engineering Research

RESER
21 September 2011

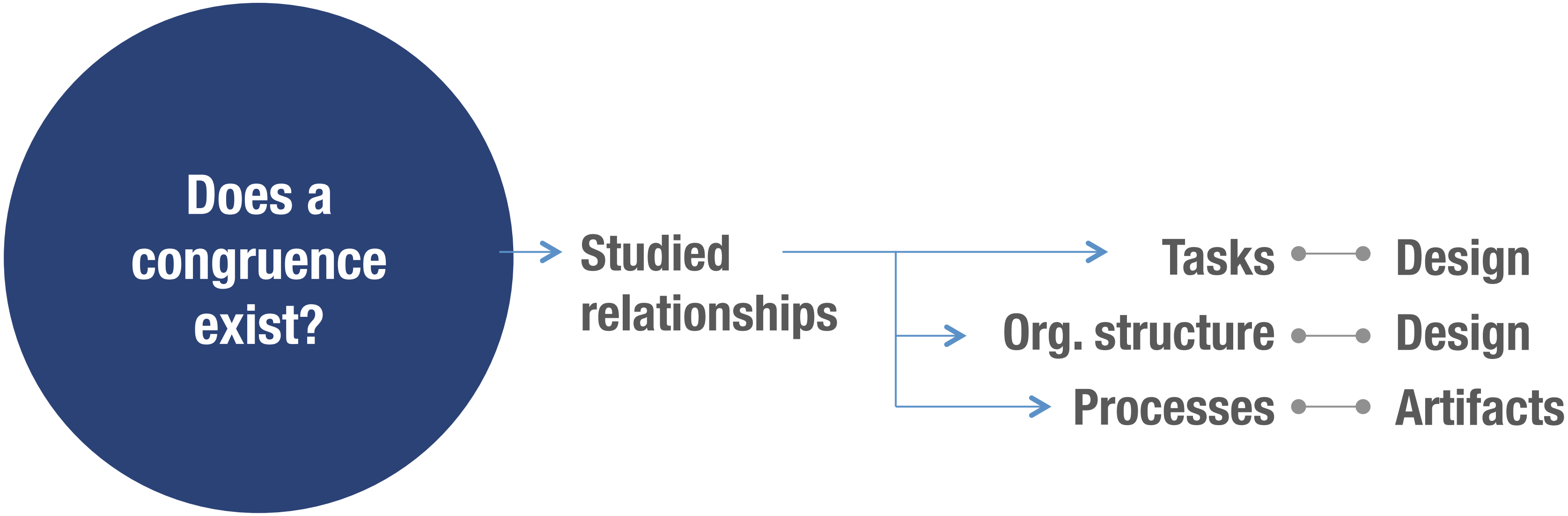
“Conway's law, the idea that a software system reflects the structure of the organization that built it, is one of the most well-known "laws" in software engineering. However, the seemingly straightforward phenomenon described by Conway appears to be subject to nuances of personal and organizational dynamics as well as contextual factors, most of which are neither well-understood nor well-studied”

Related work

Does a congruence exist?

Does a congruence or non-congruence have any impact?

Related work



Does a congruence exist?

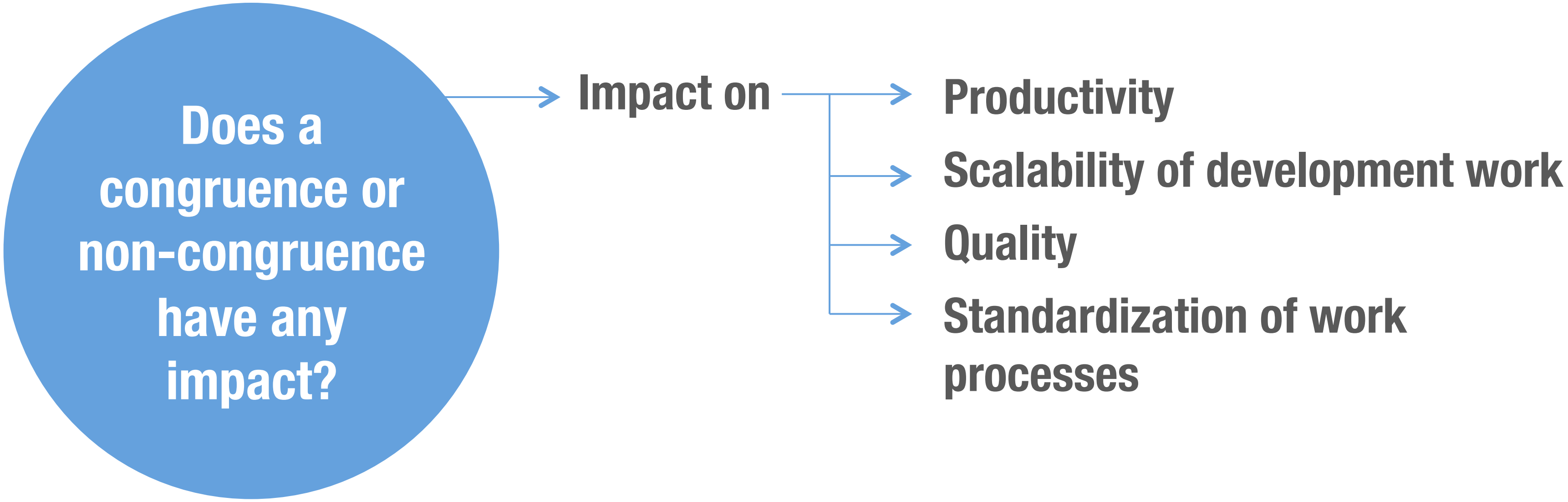
Studied relationships

Tasks — Design

Org. structure — Design

Processes — Artifacts

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

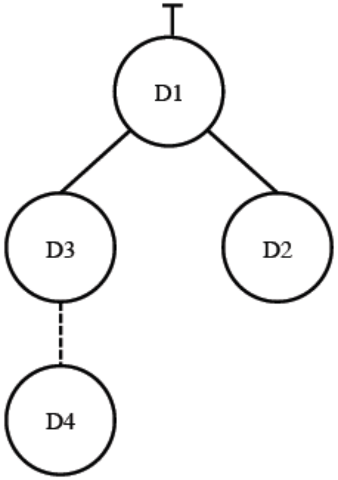
- Misalignment of the product architecture and development organization often has a negative impact on productivity and quality
  - Herbsleb and Grinter, "Architectures, coordination, and distance: Conway's law and beyond," IEEE Software

- 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
  - Herbsleb and Grinter, "Architectures, coordination, and distance: Conway's law and beyond," IEEE Software
  - Cataldo et al. "Socio-Technical Congruence: A Framework for Assessing the Impact of Technical and Work Dependencies on Software Development Productivity"
  - Herbsleb and Mockus, "An empirical study of speed and communication in globally distributed software development," IEEE TSE

- Modularization of work is the possibly best way to alleviate the challenges of distributed work, but work in isolation has many disadvantages such as redundant work, cheap and dirty architectural decisions, misplaced functionality and integration problems
  - Cataldo and Herbsleb. "Communication networks in geographically distributed software development". In: Proceedings of CSCW
  - Turecek et al. "Energy Project Story: From Waterfall to Distributed Agile". In: Proceedings of XP
  - Kwan et al. "Does Socio-Technical Congruence Have an Effect on Software Build Success? A Study of Coordination in a Software Project"

Our study: a highly distributed project

	One organization	Many organizations
Many countries	Offshore Insourcing	Offshore Outsourcing
One country	Onshore Insourcing	Onshore Outsourcing



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 questions

RQ1

Does the studied highly distributed project follow socio-technical congruence principles?

RQ2

What are the consequences of non-congruence?

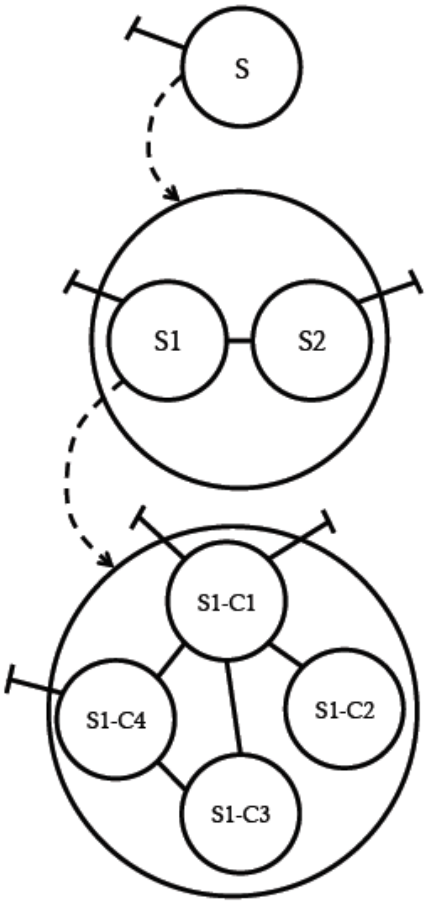
Data collection

Blekinge Institute of Technology

University Of Latvia

	Artifacts collected	*Observations*
Requirements analysis and design	• Project Management Plan • Software Requirement Specification • Software Design Specification • Problem Reports	• Interviews with users • Weekly meetings with D4 and D3 • Participation in two meetings among D1, D3, D4 to finalize the requirements and design documentation
Development	• Problem Reports	• Participation in the virtual weekly meetings at D4 • Participation in demo session at D1
Testing	• Problem Reports	• Participation in the weekly virtual meetings with D4 • Participation in demo sessions regarding fixes

Product structure



System level
The system has external interface

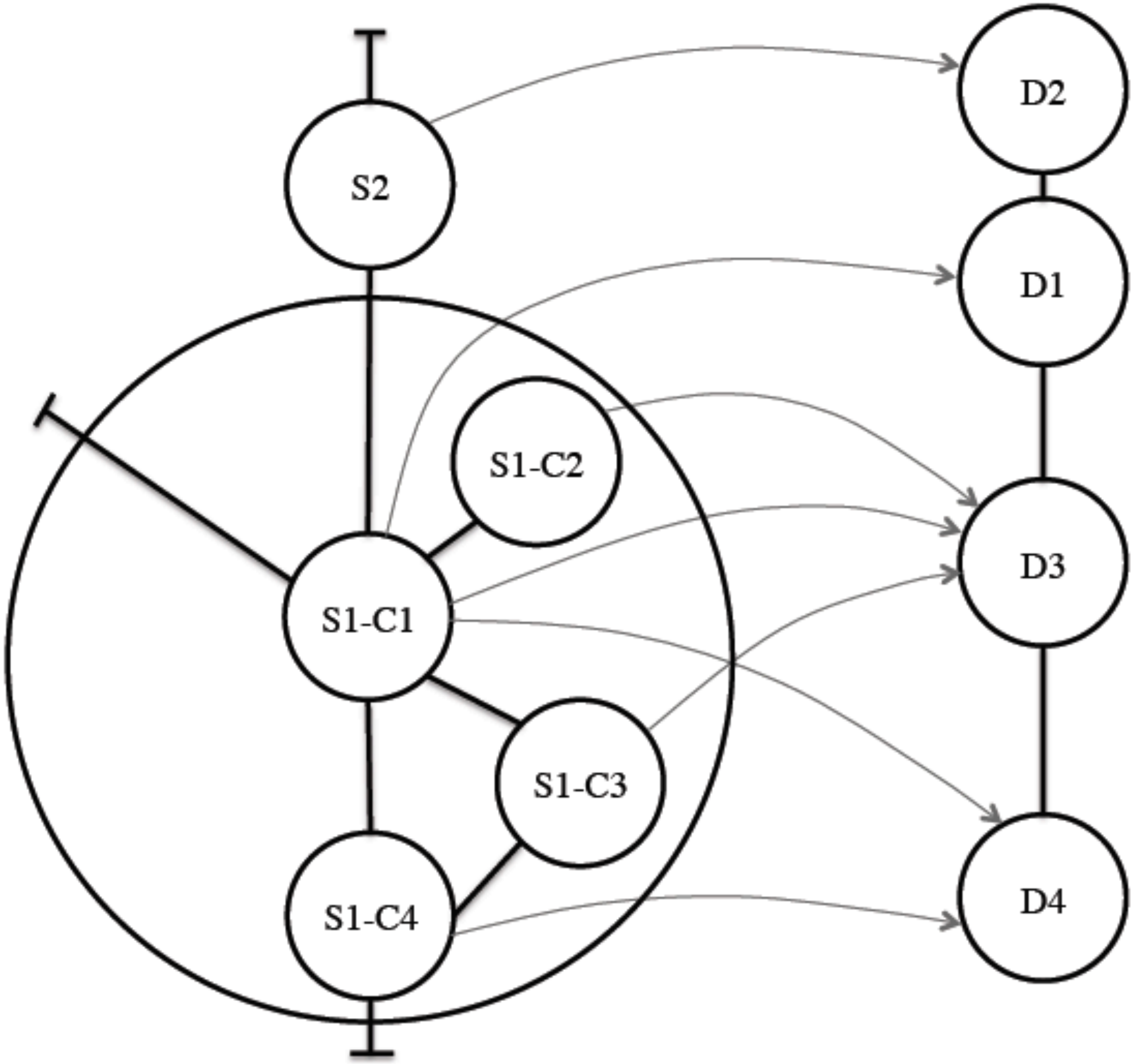
Sub-system level
The system consists of two interrelated sub-systems (1 and 2). Both sub-systems have external interfaces

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

Task allocation

Blekinge Institute of Technology

University Of Latvia

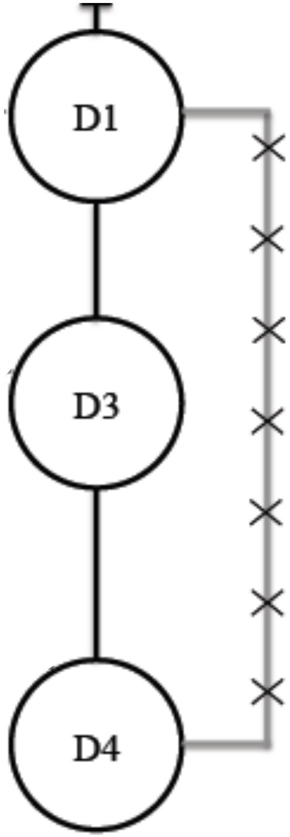


Requirement analysis and design

Blekinge Institute of Technology

University Of Latvia

- Dissatisfied customer due to redundant inquiries
- Difficult coordination of work for specifying joint components
- Poorly documented integration part



Testing

Blekinge Institute of Technology

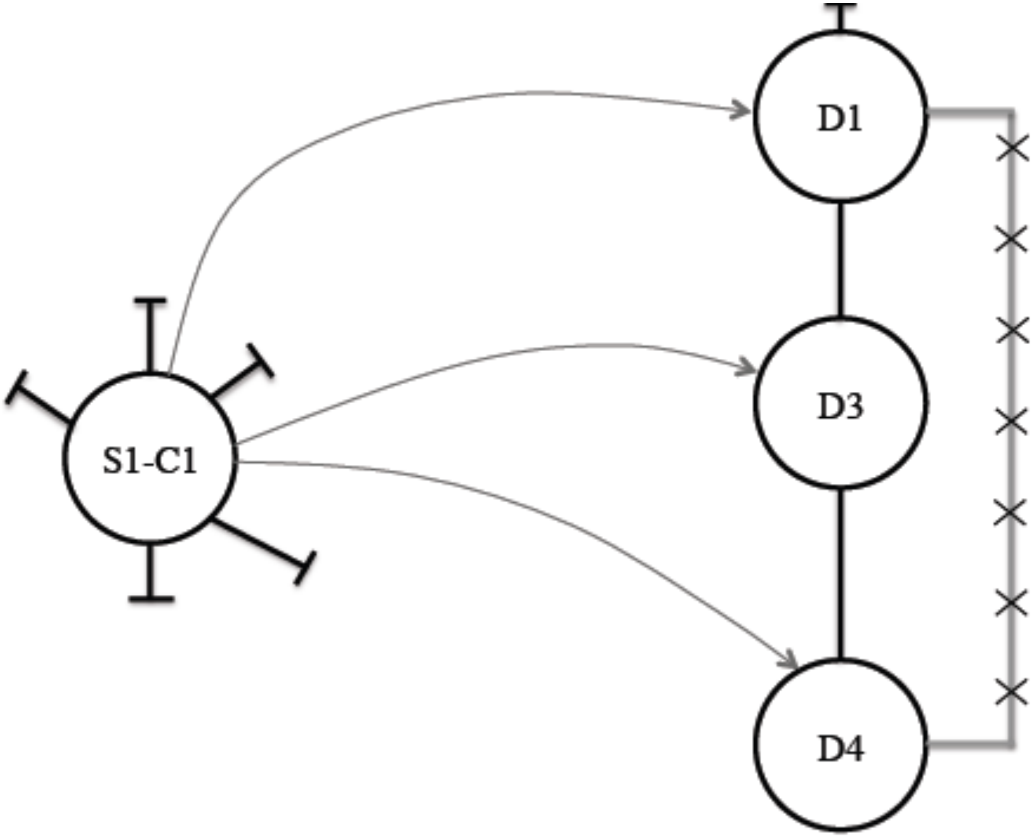
University Of Latvia

- Isolated functionality testing
- Significant delays in problem turnover
- All work coordination problems surfaced during testing phase

After 6 months of acceptance testing, the project is still stuck in the testing phase

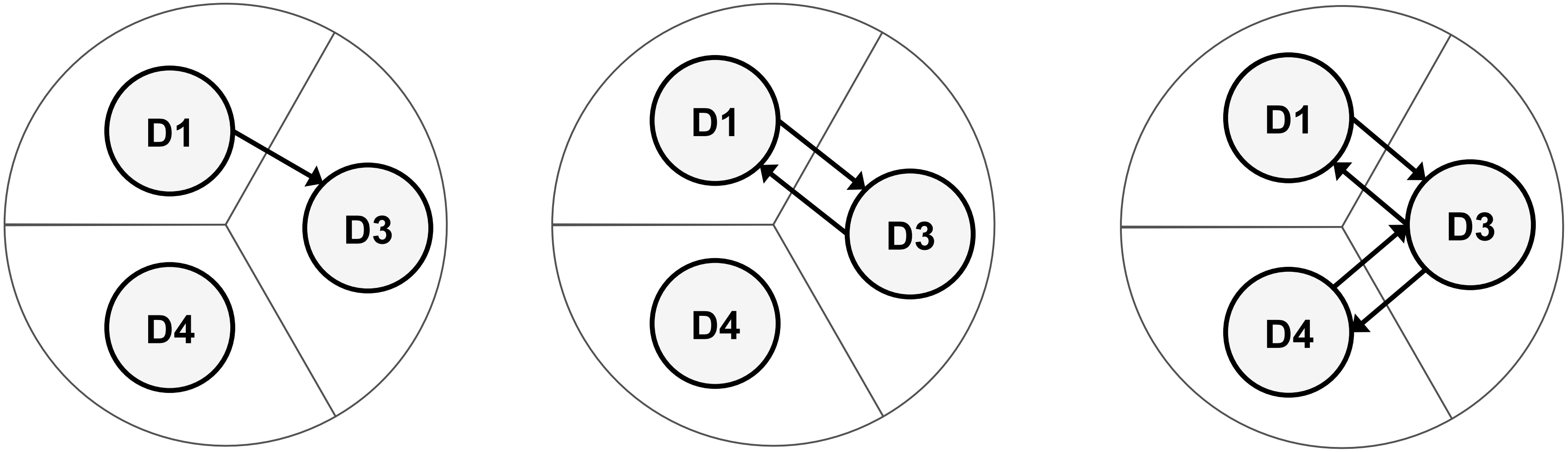
Problems

Missing relationship between organizational units working on Component 1



Problems

Lack of clarity about responsibility for development of Component 4

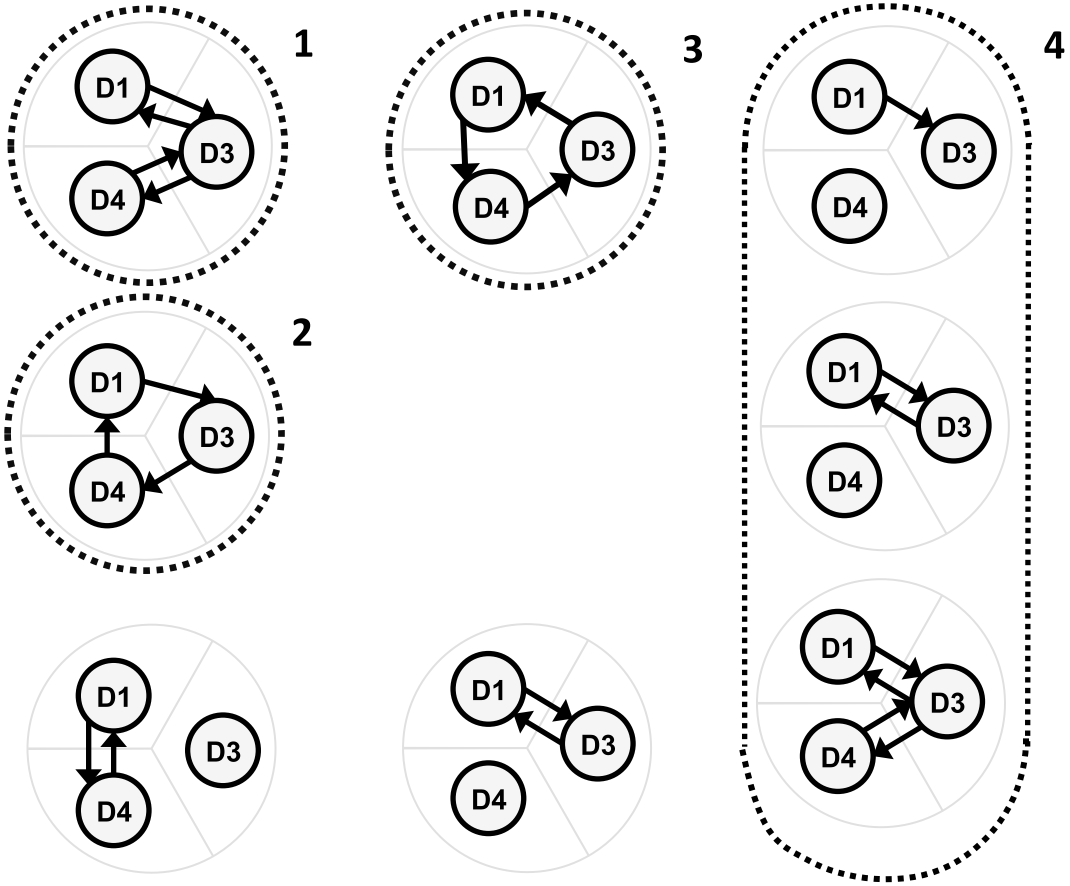


New

Task allocation delays

Blekinge Institute of Technology

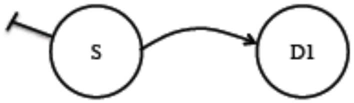
University Of Latvia



1. **0,8 days (18 h)**
   Min=0 h
   Max=1797 h
2. **18 days (439 h)**
   Min=3 h
   Max=2516 h
3. **41 days (982 h)**
   Min=380 h
   Max=3314 h
4. **139 days (3328 h)**
   Min=3328 h
   Max=4436 h

Different perspectives

Customer's perspective

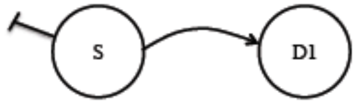


Different perspectives

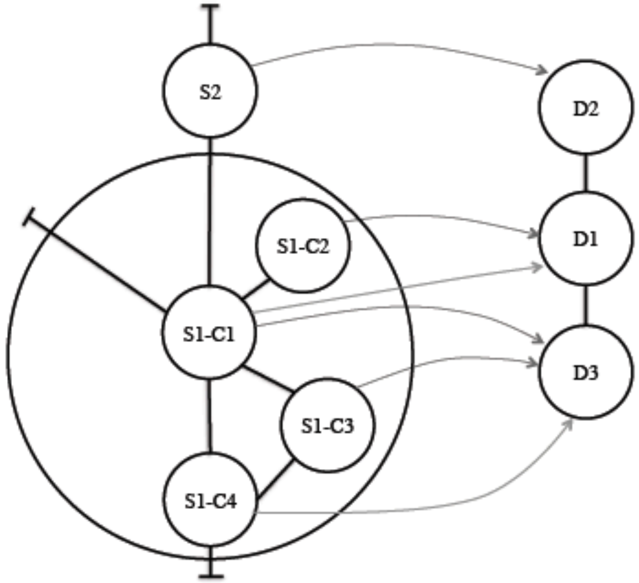
Blekinge Institute of Technology

University Of Latvia

Customer's perspective



Prime contractor's perspective

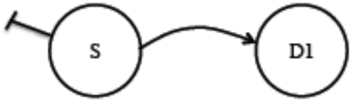


Different perspectives

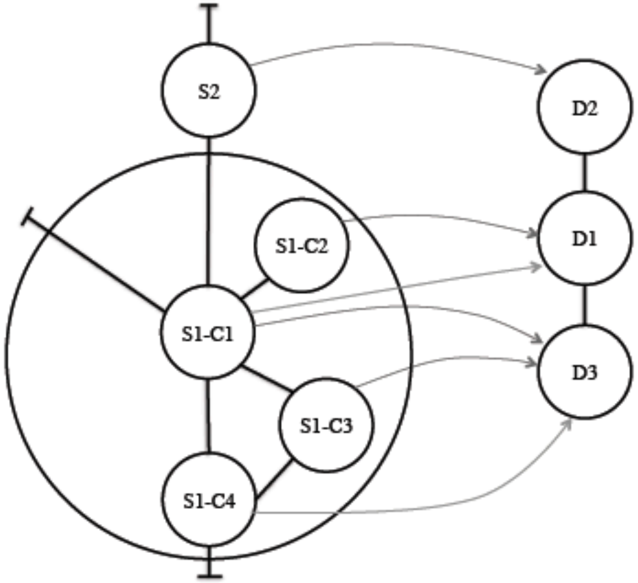
Blekinge Institute of Technology

University Of Latvia

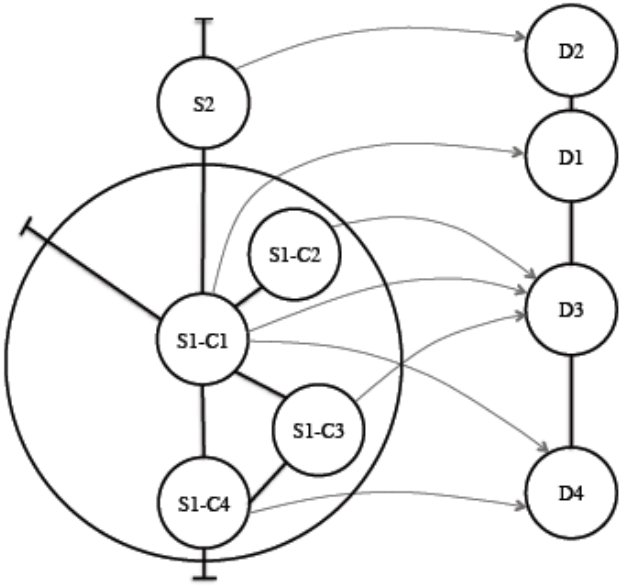
Customer's perspective



Prime contractor's perspective



In practice !



In retrospect

Blekinge Institute of Technology

University Of Latvia

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

Response to RQ1

Blekinge Institute of Technology

University Of Latvia

- The project was designed to comply with homomorphic principles, but in practice failed to follow the plan
- The congruence was sabotaged by the hidden onshore outsourcing relationship

Response to RQ2

Context:

- Unclear responsibilities regarding support for interfaces
- Missing communication links between parties involved

Consequences:

- Delays in problem turnaround
- Conflicts with change implementation
- Non-delivered parts

Conclusions

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

Limitations

- The focus of this exploratory study is to illustrate only one plausible challenge in coordinating work in a highly distributed project
- This does not imply that similar socio-technically non-congruent projects would suffer from the same consequences

Blekinge Institute of Technology

University Of Latvia

Thank you for your attention!

Eiropas Sociālā fonda projekts Nr.2009/0216/1DP/1.1.1.2.0/09/APIA/044
“Datorzinātnes pielietojumi un tās saiknes ar kvantu fiziku”

ESF
EIROPAS SOCIĀLAIS FONDS

EIROPAS SAVIENĪBA

IEGULDĪJUMS TAVĀ NĀKOTNĒ