

INFORMATICS EUROPE

ECSS 2026

Education Research Workshop

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DEI DEPARTAMENTO DE ENGENHARIA INFORMÁTICA



Agenda

1. Introduction
2. Academia-Industry Collaboration: B.Sc. / M.Sc. Theses
3. Academia-Industry Collaboration: Capstone Projects
4. Summary: Next Steps?



10.5281/zenodo.23477780



10.5281/zenodo.23497468

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Tackling shared challenges. Supporting policy-making.
Shaping the future of our discipline

Academia-Industry Collaboration

B.Sc. / M.Sc. Theses

Simona Motogna
Babeş-Bolyai University (Romania)

Joint work with Kim Mens, UC Louvain (Belgium)
and Andrei Arusoaie (Romania)

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Tackling shared challenges. Supporting policy-making.
Shaping the future of our discipline

Academia-Industry Collaboration

Capstone Projects

Enrico Nardelli
University of Rome "Tor Vergata" (Italy)

Jan Vahrenhold
University of Münster (Germany)



10.5281/zenodo.23497468

Joint work with Abuzer Yakaryılmaz, Univesity of Latvia, Riga (Latvia)

Introduction

Scope

- What is a “capstone project”?
  - Capstone projects are projects in an **informatics-related** curriculum in which students at the **end of their B.Sc. degree** work **in groups** towards creating some kind of **software artifact**. The topic of said project should be defined by or in collaboration with some **customer** which may be external to the university or at least the instructor’s group.

- Body of literature, especially from Software Engineering Education, e.g. Tenhunen et al. (Information and Software Technology 159:107191, 2023).
- Mostly research papers, less so discussing “best practices”.

Introduction

Motivation

- At first sight:
  - "Collaboration with industry is good for everyone, so let's have capstone projects because they reflect the 'real world' and everyone will be happy."
- What about resources? What about "instructor voice"?
  - Also: What about student voice? What about industry voice?
- Decision (at ECSS 2024): Form subgroup of IE Education Research WG to investigate this further and write an IE Report.
  - Within IE, we can reach departments and instructors, less so industry and students – but there is work on these perspectives as well – see our report.

Introduction

Data Collection (I)

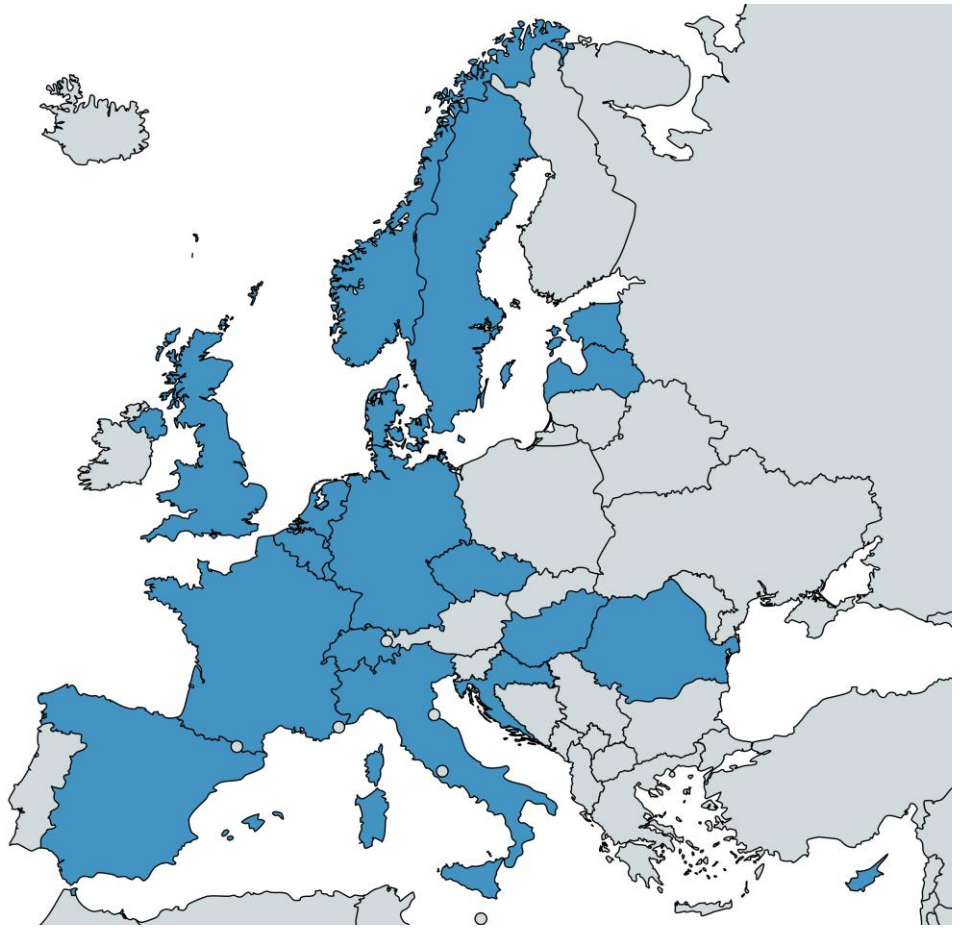
- At ECSS 2025: Distribute call for participation in an online survey
- Quantitative Data
  - Where in the curriculum "sits" a capstone project? How many ECTS credits is it worth?
  - Is a capstone project mandatory? Is it tied to another course?
- Qualitative Data
  - From a departmental perspective: What are challenges and benefits?
  - From an instructors' perspective: What are challenges and benefits?

Introduction

Data Collection (II)

- In total: 50 complete responses from 19 European countries/nations.

- Belgium (2), Croatia, Cyprus, Czech Republic, Denmark (2), Estonia, France, Germany (11), Hungary, Italy (4), Latvia, Luxembourg, Netherlands (6), Norway, Romania (4), Spain (9), Sweden, Switzerland, United Kingdom.



Created with mapchart.net

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The European Voice of Informatics Research and Education

Quantitative Results

Informatics Europe Education Research Working Group

Quantitative Data

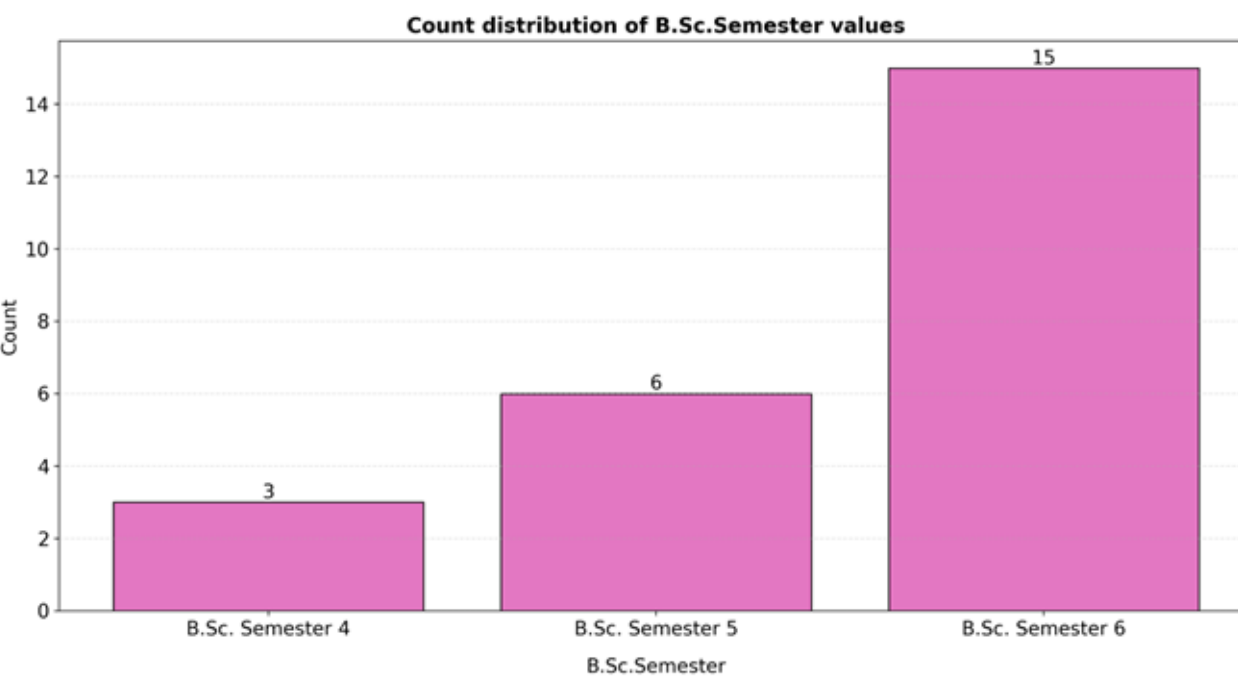
Mandatory status

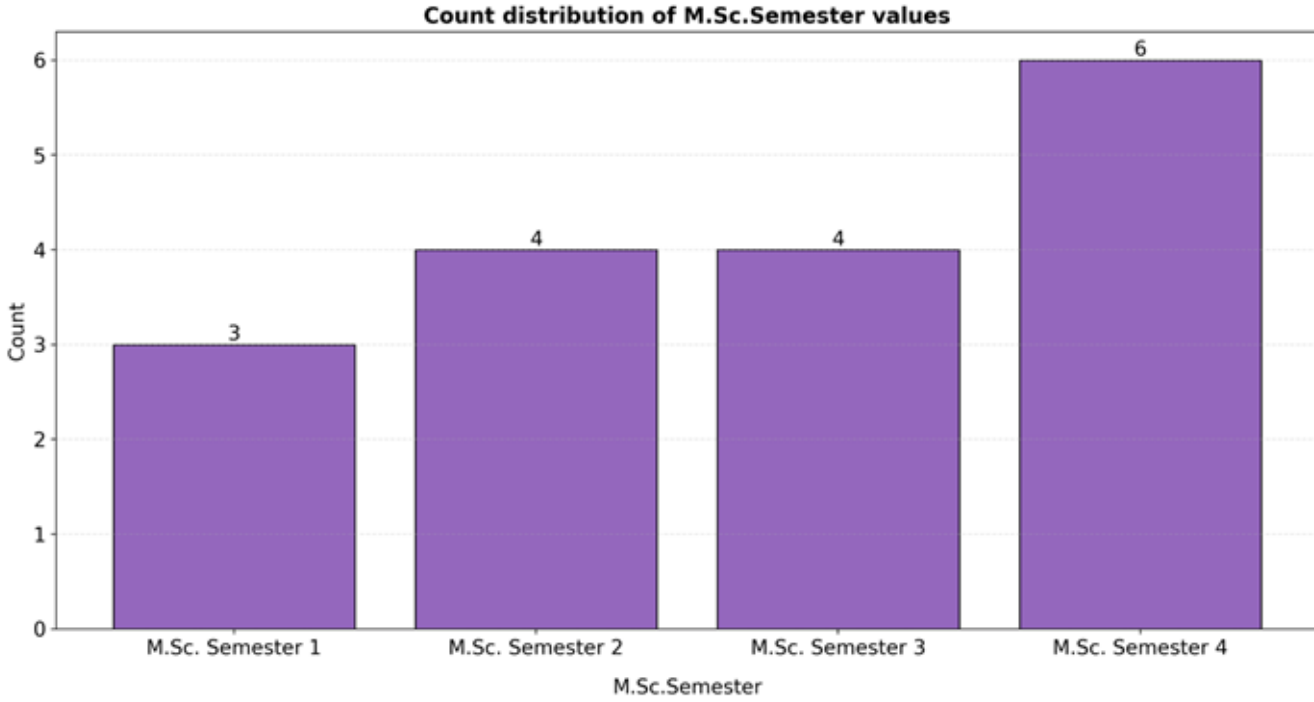
- 9 out of the 50 overall responses did not specify allocation to B.Sc./M.Sc.
- Projects are mandatory for 75% of respondents
- However:
  - 100% in Spain (9 answers) / 90.9% in Germany (11 answers) / Self-selection bias?
- Focus on Spain
  - 5 in Bachelor Sc.
  - 4 B.Sc./M.Sc. allocation not specified
- Focus on Germany
  - 3 mandatory in B.Sc., 1 other
  - 6 mandatory in Master Sc.
  - 1 B.Sc./M.Sc. not specified

Quantitative Data

Most frequent **semester allocation** (only 41 responses):

final one for B.Sc., more uniform distribution for M.Sc.

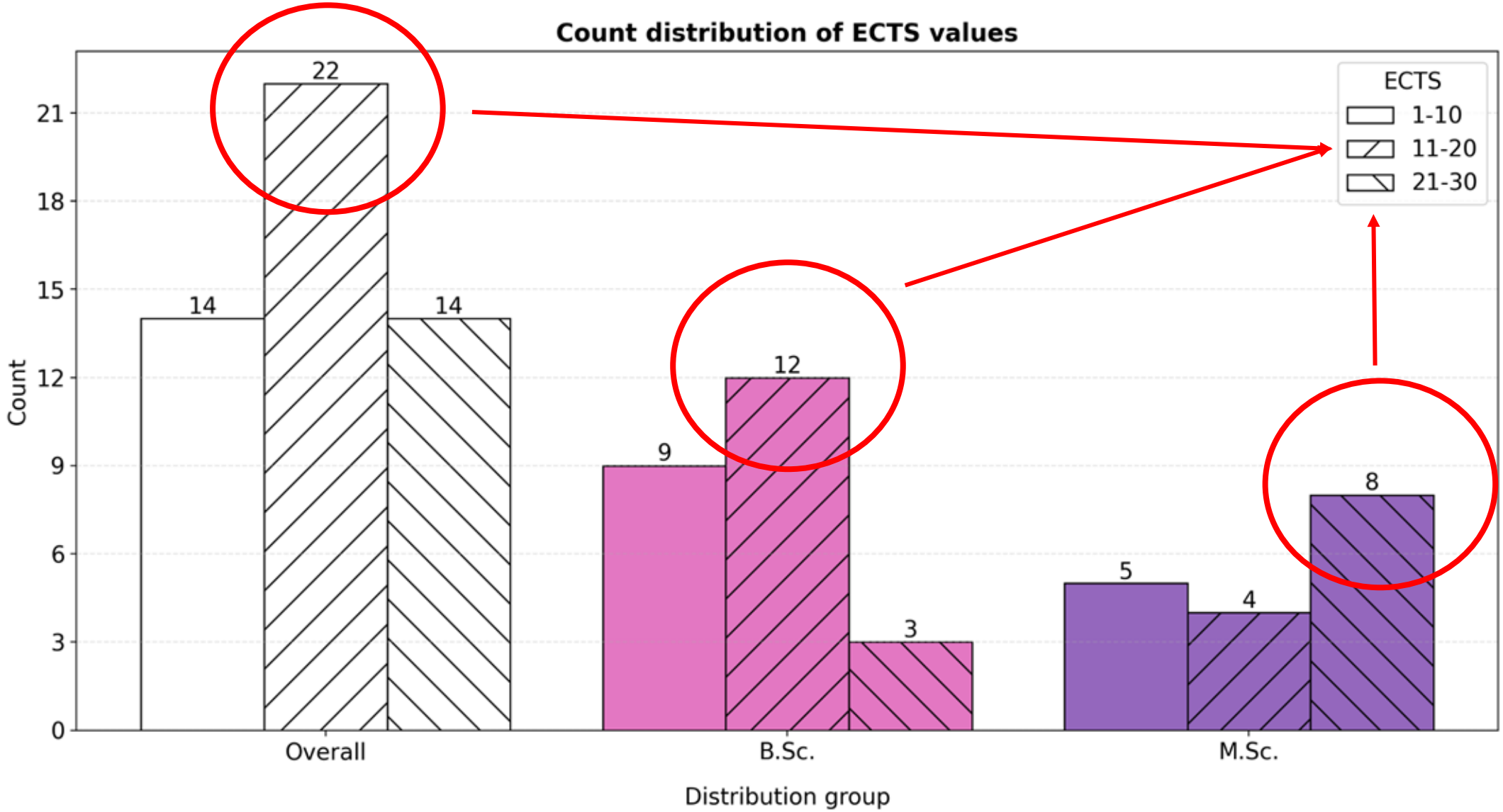




Quantitative Data

Most frequent **size of projects**: 11-20 ECTS overall and for B.Sc., 21-30 for M.Sc.

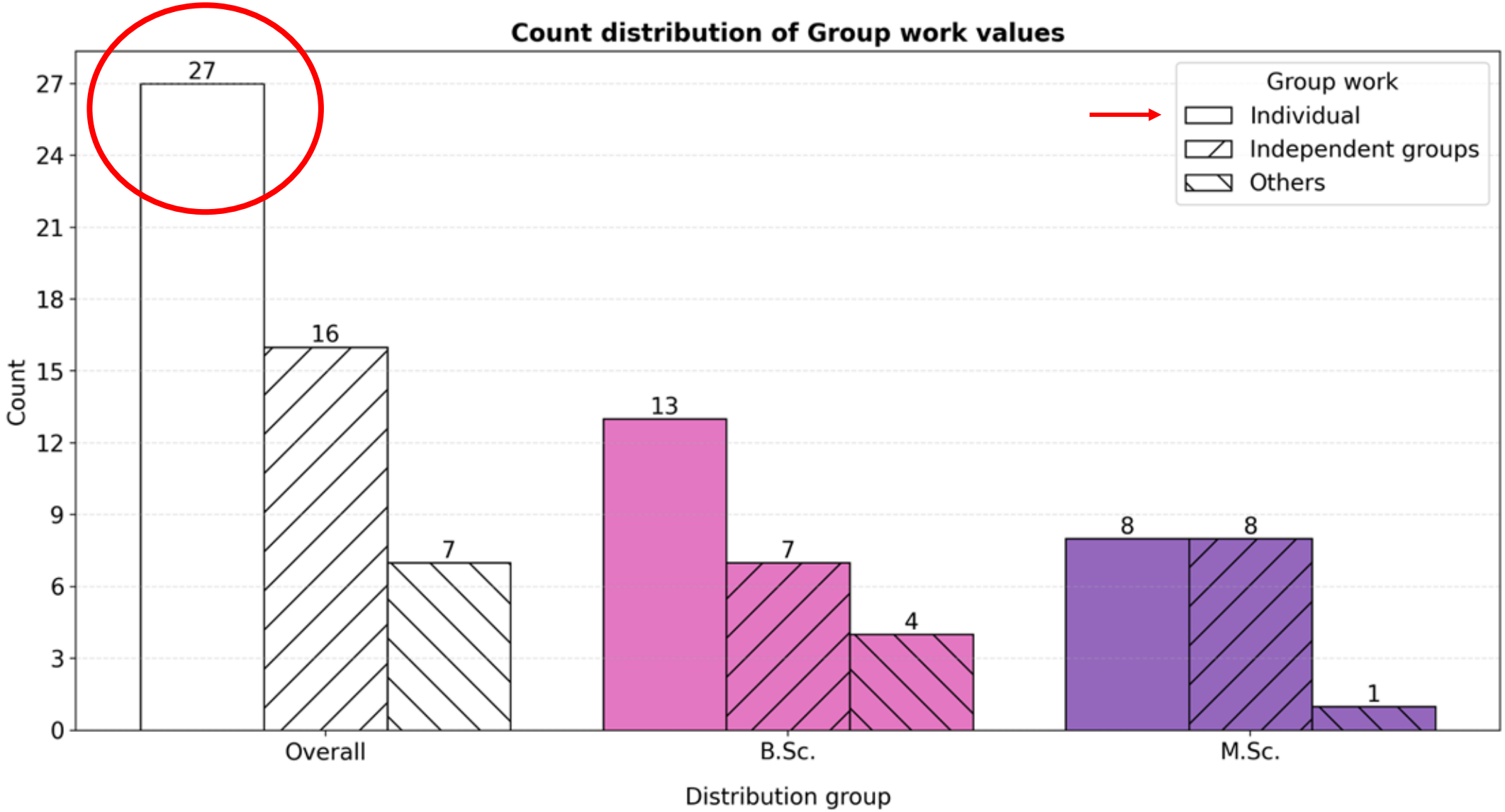
(Fig.10)



Quantitative Data

Most frequent **size of groups**: individual work

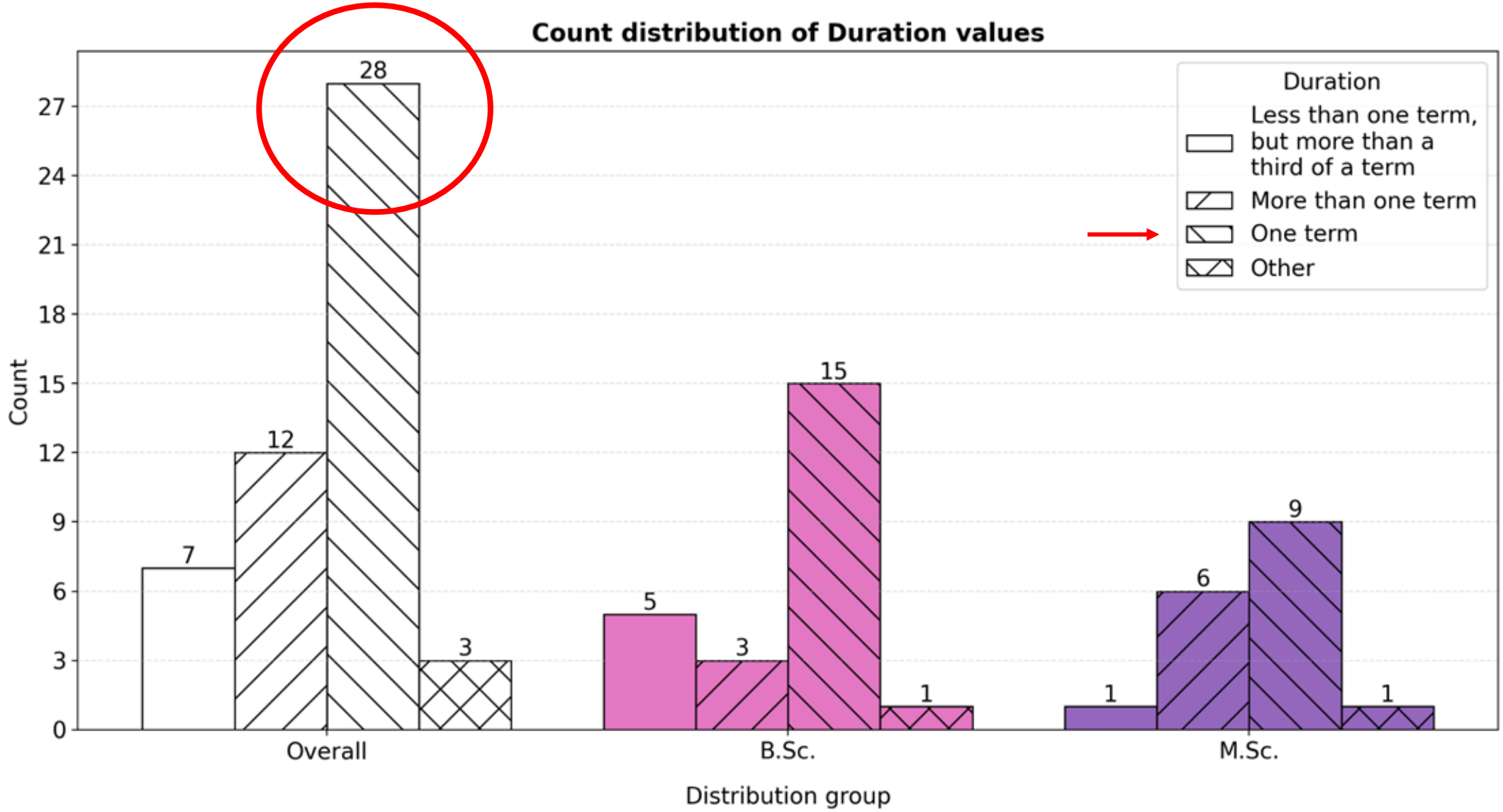
(Fig.19)



Quantitative Data

Most frequent **duration**: one term

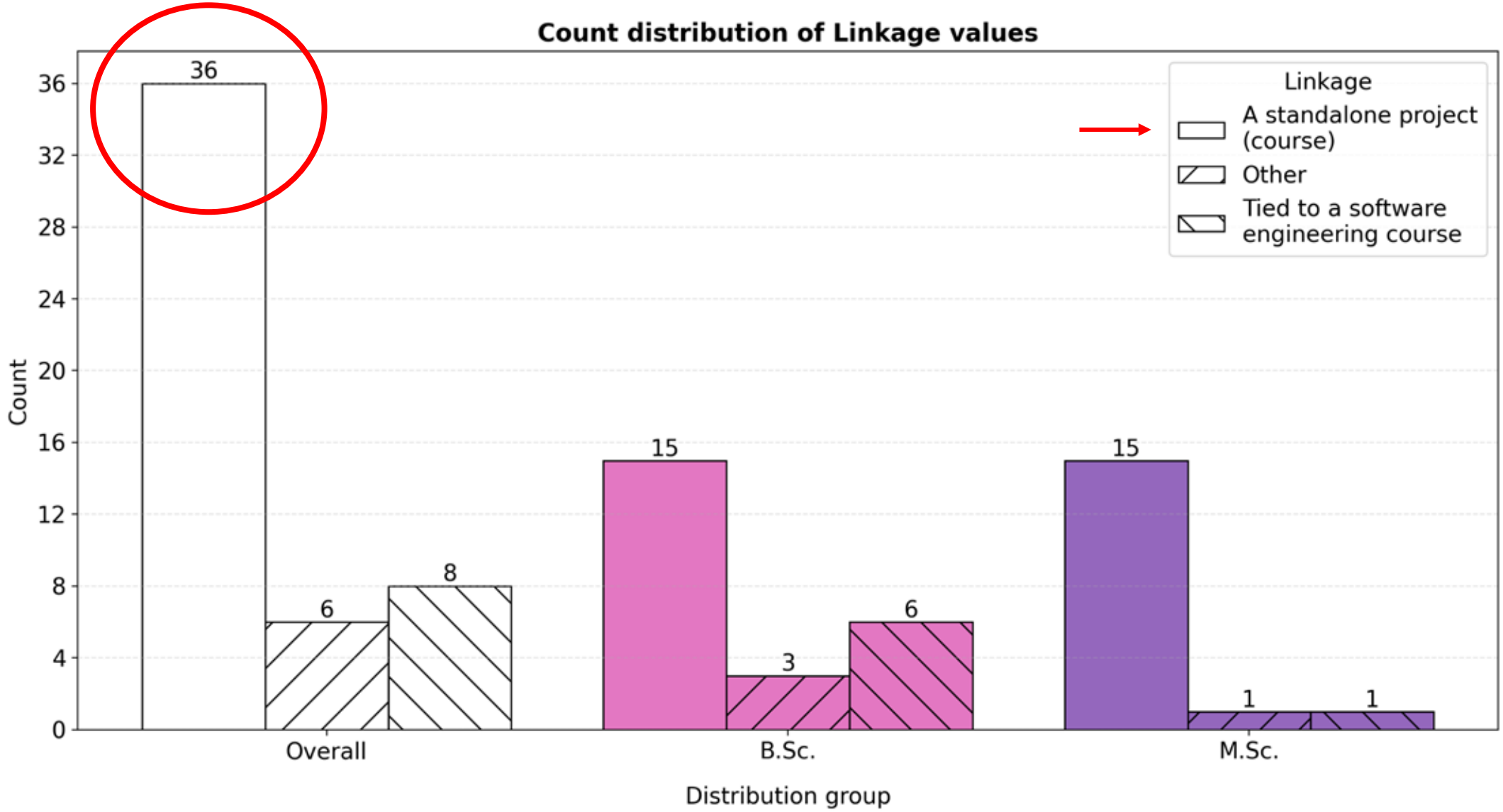
(Fig.13)



Quantitative Data

Most frequent **linkage**: standalone

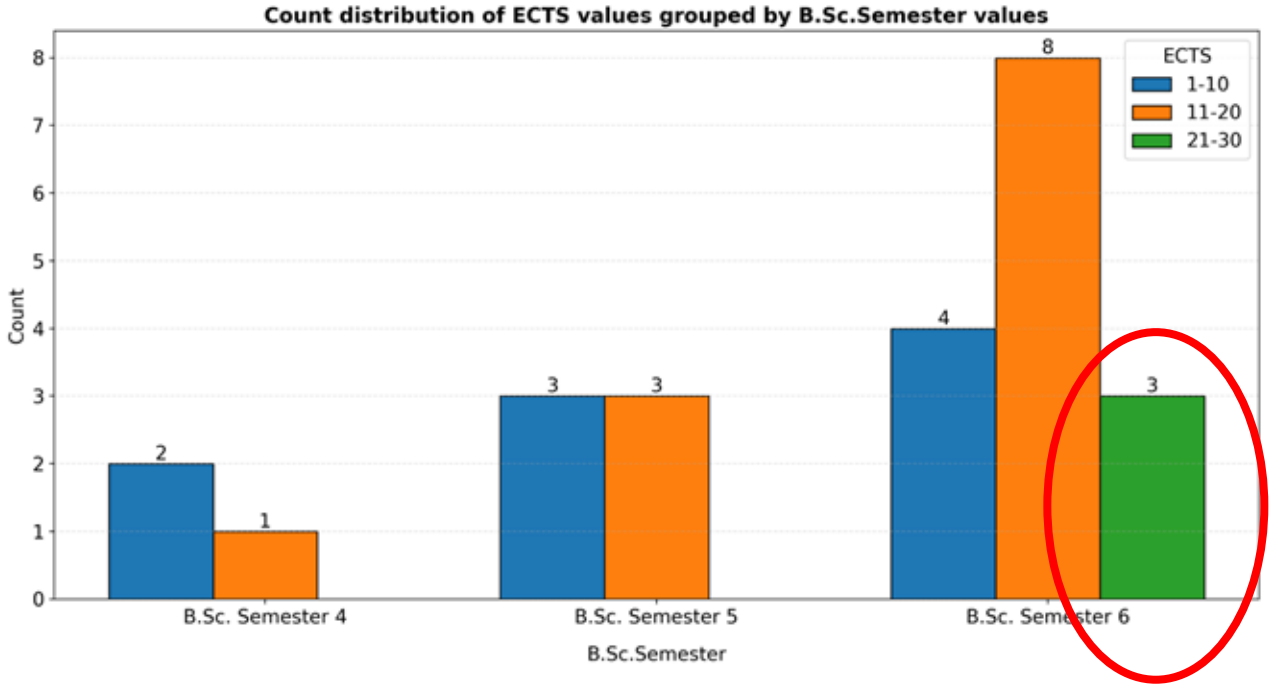
(Fig.7)

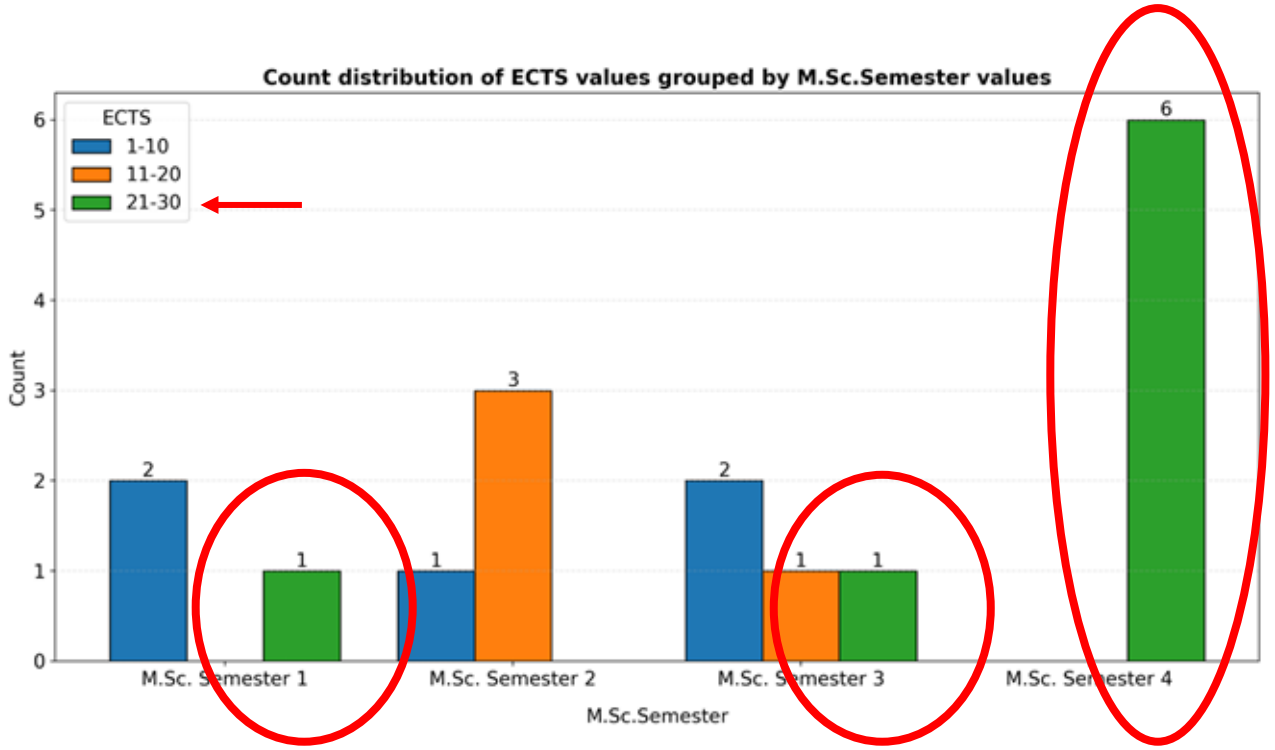


Quantitative Data

Some interesting correlations (1)

- Between “heavier” projects (21-30 ECTS) and the final semester

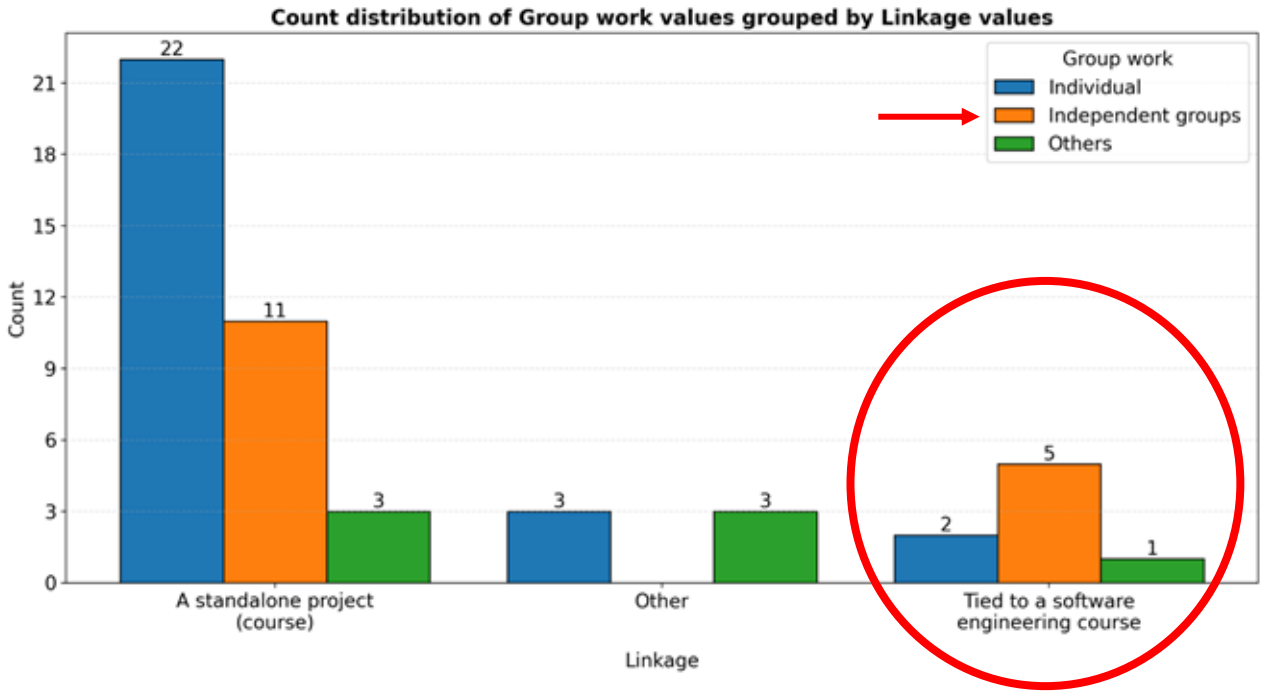


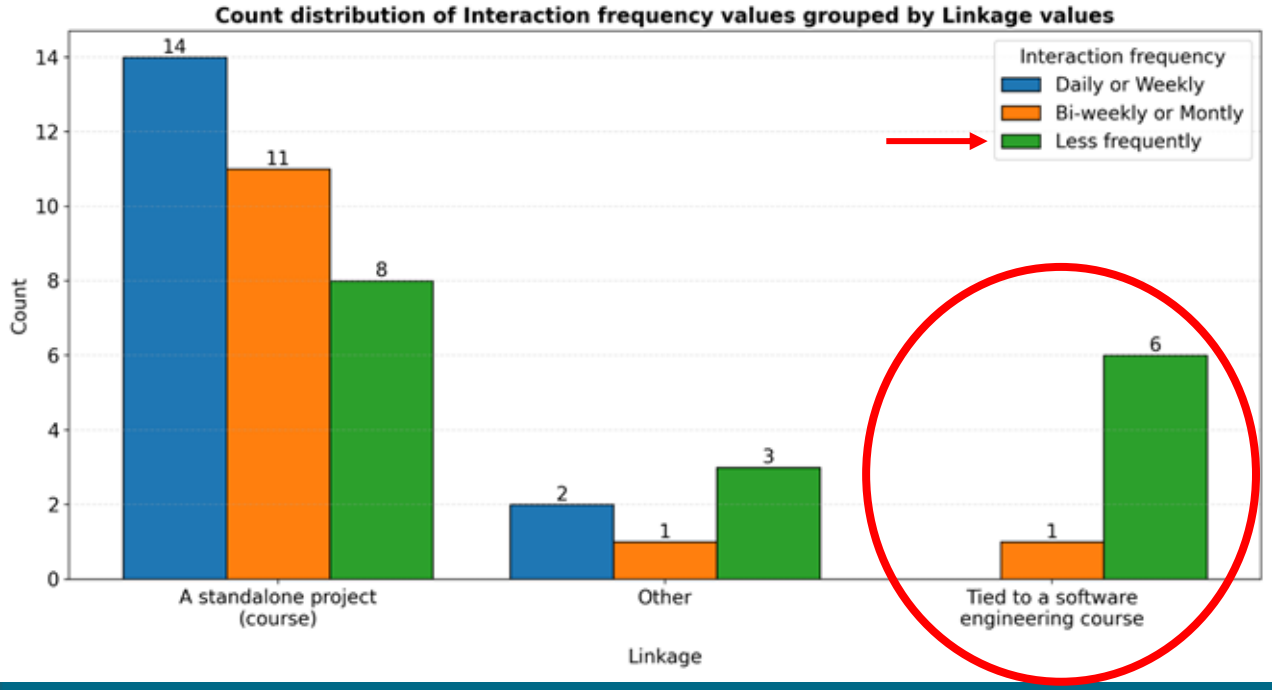


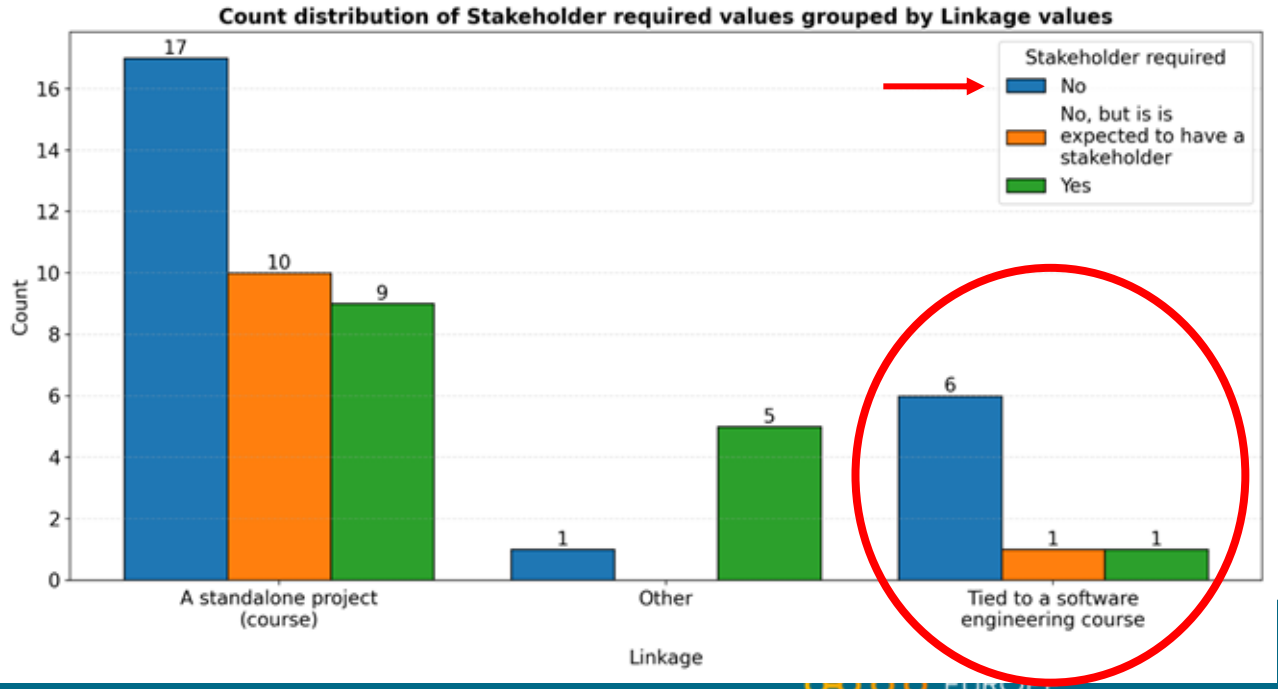
Quantitative Data

Some interesting correlations (2)

- Between projects tied to a software engineering course and: independent groups, less than monthly meetings, and not having a stakeholder



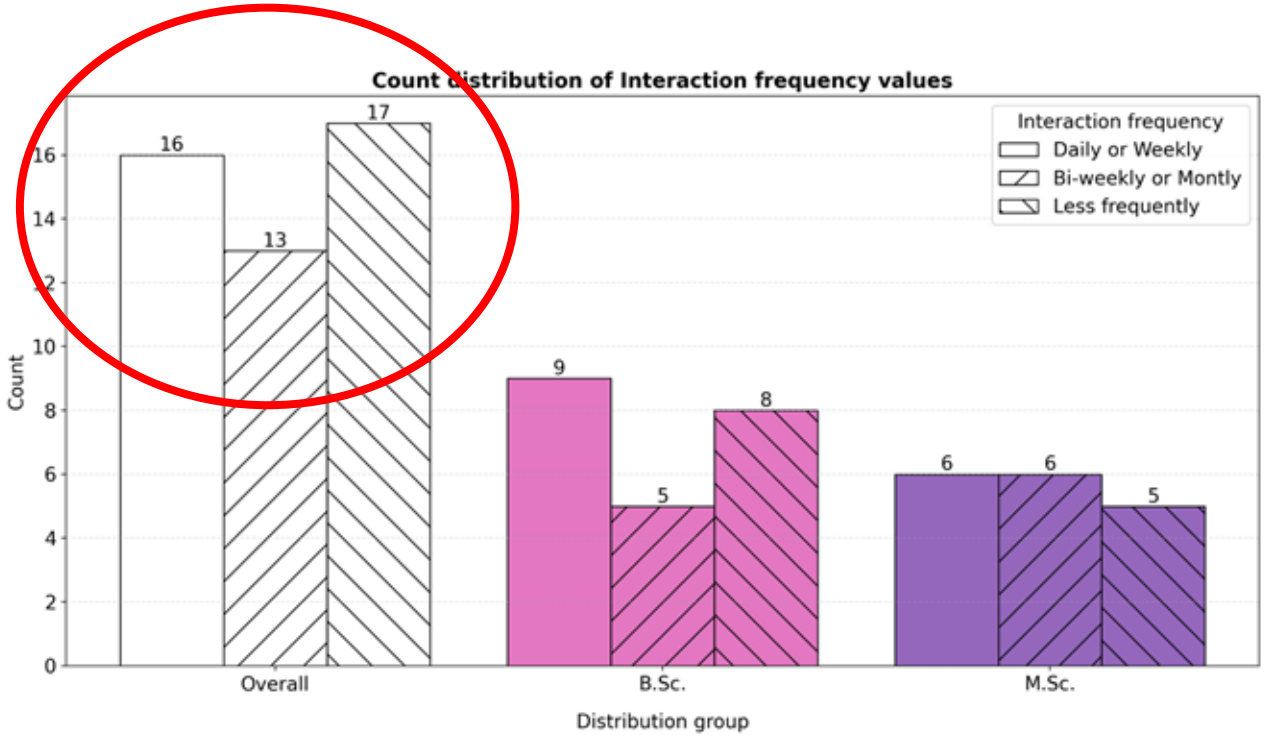




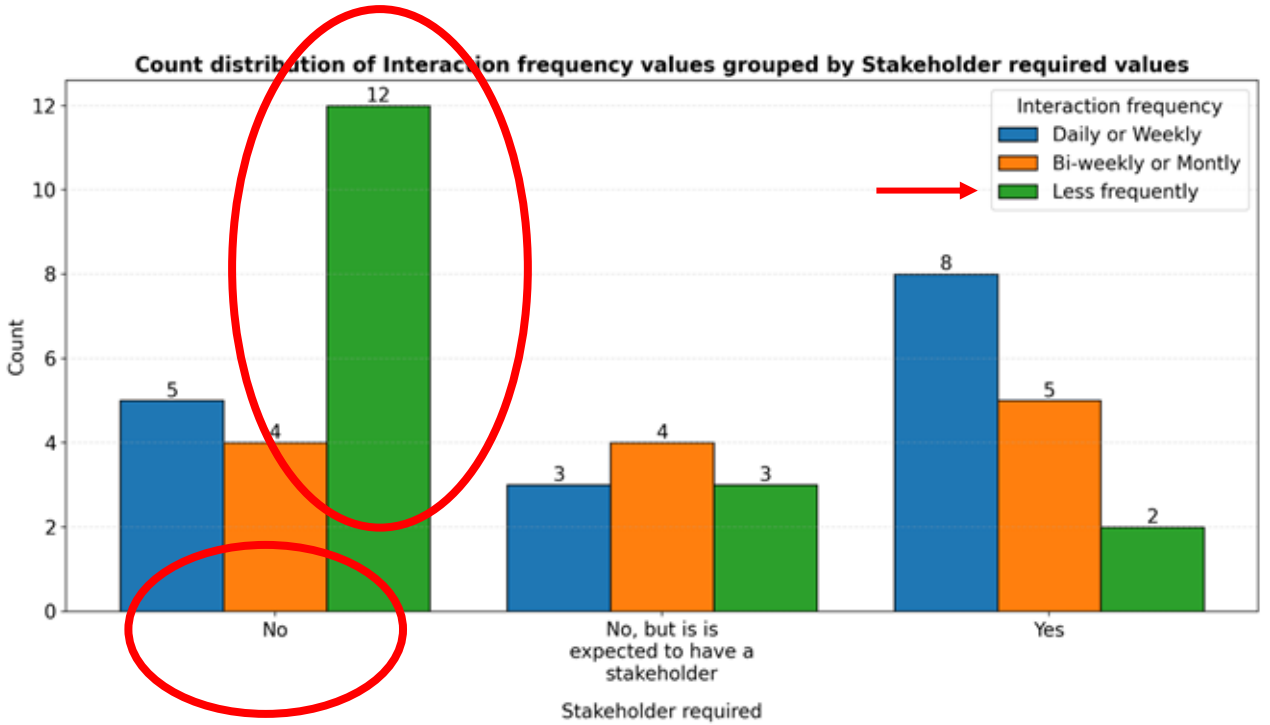
Quantitative Data

Some interesting correlations (3)

- Distribution of interaction frequency is rather uniform
- However projects meeting less than monthly tend not to have a stakeholder



(Fig.22)

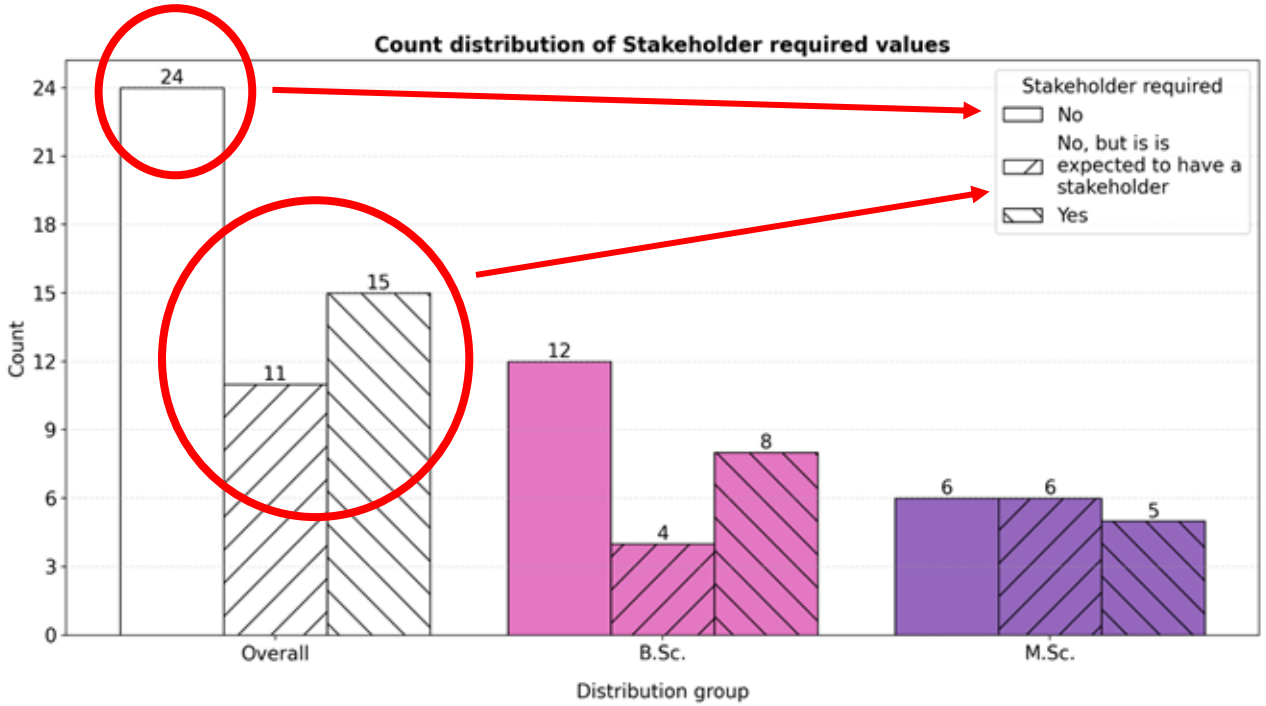


(Fig.18)

Quantitative Data

Some interesting correlations (4)

- Stakeholder required or expected for ~50% and not required for ~50%
- However projects meeting less than monthly tend not to have a stakeholder



(Fig.16)



(Fig.24)

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The European Voice of Informatics Research and Education

Qualitative Results

Informatics Europe Education Research Working Group

Qualitative Data – Departmental Perspectives

Benefits

- Out of 122 comments, 75 described ”Benefits”.
- **Reputation:** Capstone Projects increase a department’s reputation both among potential industry partners and among potential students.
- **Visibility:** Being noticed as ”brand” (related, of course, to “Reputation”).
- **Industry:** Building connections that lead to projects, papers, and internships.

Qualitative Data – Departmental Perspectives

Challenges (I)

- **Capacity:** Running a capstone project requires resources
  - "Resources (allocation of staff, infrastructure, and administrative support)"
  - "Scalability: we can only support a certain number of teams"
  - "convince collaborators to make time for students"

- **Industry:** Finding common grounds is hard at times
  - "Lack of an enough number of project proposals"
  - "To find a suitable area of application of the project"
  - "Sustainability (maintaining long-term quality, partnerships, and project relevance)"

Qualitative Data – Departmental Perspectives

Challenges (II)

- **Alignment and Assessment Quality:** After all, this is an academic course
  - "Finding suitable assignments that are at the right level for the degree programme"
  - "to select the appropriate projects and partners according to the criteria set (a high quality RDI task appropriate for teams of students)"
  - "Homogeneous and fair assessment"

- Summary of other challenges:
  - Day-to-day operation if students are unable to work on-site at the partner's institution
  - Delegation of instruction and supervision
  - Legal agreements involving industry partners, students, and the department.

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Table Talk:

What are local practices addressing these **Departmental** challenges?

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Qualitative Data – Instructors' Perspectives

Benefits

- **81/158 described "Benefits" (51%) – 77/158 addressed "Challenges" (49%)**
- **Industry**:
  - future research cooperation with the industrial partners
  - students get in touch with state of practice in industry
- **Experience**:
  - relevant and authentic experience
  - opportunity for technical knowledge updating
- **Other categories** of benefits:
  - meeting educational goals
  - creating professional networks
  - satisfaction of contributing to students' success.
- **Research** (discussed later)

Qualitative Data – Instructors' Perspectives

Challenges

- **Alignment**:
  - tension between industry partner's expectations and instructor's aims in terms of topics to be covered
- **Operation**:
  - keeping track of students progresses
- **Capacity**:
  - running a project with many students
  - preparing the course
- **Other categories** of challenges:
  - possible legal issues
  - burden of organizing the communication with the external partner
  - constantly coming up with new project ideas.

Qualitative Data – Instructors' Perspectives

Research: a double-sided coin

- (BAD) **No resulting research publication**
  => lack of incentives

- (GOOD) **Testing/Trying research ideas and emerging new ones**
  => possible research publications

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The European Voice of Informatics Research and Education

Table Talk:

What are local practices addressing these **Instructor**'s challenges?

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Next Steps?

Informatics Europe Education Research Working Group

Academia-Industry Collaboration

Next Steps

- B.Sc. / M.Sc. Theses:
  - Report is out (see IE Web Page)
  - to be continued as a research publication: interested to join? Send email
- Capstone Projects
  - Report is out (see IE Web Page)
  - We will assemble the ”local best practices” into a PDF document and send it to you.
    - For this, make sure we have your email address.
- Informatics Europe Education Research Working Group
  - We are welcoming new members, just reach out to us or to the IE office