D4.1. Report on mapping local innovation ecosystems opportunities

Erasmus+ Project	
Project Name:	Joint University challenge-based Minor Program for future generation of innovative entrepreneurs
Project Acronym	JUMP
Project start date:	01 September 2024
Deliverable	
Title:	Report on mapping local innovation ecosystems opportunities
Deliverable No.:	D4.1
Type of Deliverable	R: Document, report
Authors:	Jacek Sawicki, Lodz University of Technology Robert Blażlak, Lodz University of Technology Agnieszka Roganowicz, Lodz University of Technology Dorota Piotrowska, Lodz University of Technology
Level of completion (0 – 100)	100% = fully achieved
Delivery date (due):	31 March 2025
Due deliverable (actual):	31 March 2025
Dissemination level	PU = Public, fully open access, e.g. web

Partners

Università degli Studi di Trento (UniTrento)
Linköping University (LiU)
Łódź University of Technology (TUL)
Institut National des Sciences Appliquées (INSA Toulouse)

Revision History

Grant Agreement Number	2024-1-IT02-KA220-HED-000256021	Acronym: JUMP
Deliverables	Report on mapping local innovation ecosystems opportunities	
Work Package	WP 4	
Date of Delivery	First Draft: 28/02/2025	Final: 31/03/2025

Nature	Report	Dissemination Level	Public
Lead Beneficiary	Lodz University of Technology		
Responsible Authors	Agnieszka Roganowicz, TUL Jacek Sawicki, TUL Robert Blażlak, TUL Dorota Piotrowska, TUL	Email:	agnieszka.roganowicz@p.lodz.pl
		Phone:	
Contributors	Anelia Grigorova, UniTrento		
Reviewer	Anelia Grigorova, UniTrento		
Approved By	Maurizio Marchese, UniTrento		
Key Words	local innovation ecosystems opportunities; report		

REVISION HISTORY

REVISION HISTORY			
Rev.	Date	Description	Status (Draft/Final)
1.0	28/02/2025	First draft	Draft
2.0	17/03/2025	Second draft	Draft
3.0	31/03/2025	Final version	Final

Table of contents

1. Executive Summary

1.1. Objectives of the WP4

WP4 specific main objectives are defined as:
- Building a comprehensive project consortium approach to map and manage Challenge-based learning opportunities in local innovation ecosystems;
- Designing and implementing CBL internship & thesis model in the project consortium.

The first one contributes to the general objective of the project, i.e. (O1) and is to create a space for dialogue among the quadruple helix actors and co-create a number of societal human-centric real-life challenges to be worked out by our international, multidisciplinary and multicultural teams of students by carrying out an in-depth analysis of the local innovation ecosystems in the consortium, followed by identifying groups of interests and learning opportunities in the local ecosystems.

The second one supports the general objective by designing and implementing in the consortium novel form of internship & thesis grounded in a CBL model based on groups of interest opinions gathered in the first stage of this WP, pilot it and collect guidelines about the implementation.

We emphasize that in our partnerships, internships & thesis grounded in a CBL model are a novel type of internships & thesis, that need to be designed from scratch: challenge providers will need to be open to group of students working together in internships and thesis projects (normally individual) and HEI will need to develop appropriate internal processes and evaluation framework to support such team work in curricular internships and thesis projects.

The main focus of the JUMP team is exploring practical solutions to develop linkages and establish synergies between universities and their ecosystems, as well as to create and initiate opportunities for CBL challenges, internships and thesis in partner universities.

WP4 is organized in four main activities. The first one is:
A4.1 Mapping local innovation ecosystems (Q-Helix stakeholders) opportunities

The objective of the A4.1 activity is mapping the opportunities which are created by the local innovation ecosystems (Q-Helix stakeholders). As a result, a report on the opportunities for CBL thesis and internship will be prepared.

The Q-helix model integrates four key sectors: academia, industry, government, and civil society. We have designed a survey (Appendix 5.1) and distributed it among the representatives of the local Innovation Q-helix actors in the four partner institutions.

The survey aims to gather insights from various stakeholders, including educators, students, industry professionals, and policymakers to understand how the Q-helix framework can be leveraged to foster innovative learning environments. The data collected will help us identify strengths, opportunities, and areas for improvement within our local innovation ecosystems to establish space for development of challenge-based learning opportunities. Additionally, it will support and enhance students' I&E skills and as a result a model of second degree studies based on CBL learning opportunities will be created.

Ultimately, our goal is to develop strategies that enhance challenge-based learning experience and drive sustainable innovation.

1.2. Assumptions of the report

The Q-helix model is a response to emerging challenges in the world and changes in society. In order to meet the needs, the model, which identifies the four elements included in this structure, was created. It also defines the dependencies that exist between the participants in the innovation process i.e. academia-industry-government-civil society. In order to explore the potential of the Q-helix elements in terms of creating an innovation ecosystem and meeting the needs of society, it was necessary to create a map of the ecosystem and its dependencies but also to examine the needs and capabilities of particular actors of the Q-helix.

1.3. Parallel work on project deliverables

The first part of the report was based on desk research of each of the four universities on local innovation ecosystems based on available sources, including statistics, reports, and university strategies, etc. As a result of the desk research of four ecosystems conducted by each university, 4 reports were prepared (Appendices 5.2 to 5.5) which constitute the basis for the first part of this study. This section of the reports particularly covers: characteristics of the region, geographical conditions, location, natural advantages, characteristics of the regional innovation strategy and regional innovation ecosystem (if identified) with an indication of regional smart specialties, potential for development of the region in the area of regional smart specialties by Q-Helix, description of the Institution with an indication of the main areas of cooperation with the

environment (other Q-Helix shareholders) in the area of research and courses conducted, assessment of the current status of the university cooperation with other Q-Helix shareholders.

The second part of the report is based on the results of a survey (Appendix 5.1) conducted in local ecosystems among representatives of each of the groups belonging to the Q-Helix: academia, industry, government, and civil society. Using the survey, the possibilities of cooperation within the Q-helix were explored from the perspective of respondents belonging to different actors of the Q-helix.

The survey helps the JUMP consortium to analyse the potential of the local innovation ecosystems, including all Q-helix actors, in terms of challenge-based learning opportunities for projects, internships and thesis which provide students with real-world challenge solving experiences and preparing them for future challenges.

In order to collect the data for the consortium partners the following tools were prepared:

- a template for data collection on existing collaborations,
- a survey form on the nature and content of the interactions between the stakeholders of the ecosystem, which is available online, targeting four groups representing all Q-helix actors: academia, industry, government, and civil society.

Our target audience was:

- society: cluster members, NGOs representatives, and students,
- academia: university staff,
- industry: responsible persons at enterprises,
- government: public administration units representing regions.

Each partner designated survey participants within a specific group of respondents in their region and extended invitations for them to take part in the survey.

1.4. The Regions

In each case, the region covers a different area, and these areas are:

- UniTrento: Province of Trento in northeast Italy
- INSA Toulouse: Occitanie region in southern France
- LiU: Region Östergötland in southeastern Sweden
- TUL: Lodz Voivoideship in central Poland

The geographic location of the university affects the dependencies within its ecosystem. The universities participating in the project are located in urban agglomerations, whose natural and cultural heritage, is reflected in the region's strategy and influences the direction of its development.

Each of the universities, being part of the Q-helix and being an educational organization, has an impact on creation of the academia and provides support for the development of the economic environment. The regions in which the consortium universities are located define the SMART strategy, and on its basis the following areas of innovation have been defined:

UniTrento: Province of Trento

- Sustainability, mountain and energy resources,
- ICT and digital transformation,
- Health, food and lifestyles,
- Smart Industry.

INSA Toulouse: Occitanie region

- Sustainable and localized food systems,
- Coastal and marine economy,
- Health and well-being,
- Smart and sustainable mobility,
- Energy transition,
- Big Data, AI, and cybersecurity.

LiU: Region Östergötland

- Effective logistics,
- Business models and arenas for sustainable system solutions,
- Smart, robust, and secure connected products and systems,
- Visualization and simulation,
- Advanced materials.

TUL: Lodz Voivoideship

- Innovative textile and fashion industry,
- Smart Construction,
- Medicine, pharmaceuticals, cosmetics,
- Innovative agriculture and agri-food processing,
- Mobility and logistics of the future.

2. Results and outcomes of conducted research

2.1. General Information

All universities are public universities and conduct research and educational activities focused on the needs of the region. The strategies of the universities are the driving force behind the activities within the Q-helix and shape their relationships with other actors in the region. The study programs of all universities, through the use of I&E initiatives, respond to the current needs of the local ecosystem. The example is the Challenge-Based Learning - a Teaching & Learning model common to all universities that are members of the European Consortium of Innovative Universities ECIU.

TUL and INSA are technical universities that primarily offer engineering courses, while LiU and UniTrento are multidisciplinary universities. In terms of student numbers, they range from 3,200 at INSA Toulouse, 10,500 at TUL and 16,400 at Trento to 40,400 students at Linkoping. INSA Toulouse is part of the INSA group, which includes 7 INSA engineering schools and 6 partner schools.

Detailed description of the collaboration of the partner universities with the different actor of the Q-helix actors of the local ecosystems is available in the Four Appendices (4.2 to 4.5). Brief summary is done in Art 2.2. to Art 2.6.

2.2. Cooperation within the ecosystem

All Universities engage in cooperation with the local ecosystems through local initiatives, both formal and informal.

Cooperation with the economic environment takes place at all universities, but in each case, it has a different level of advancement and a slightly different nature.

Each university collaborate closely with the local unit that facilitates technology transfer from academia to industry and enables the integration of local resources and opportunities. All Universities introduce solutions to support innovation and entrepreneurship. They support students and scientists in the initial phases of business development by providing legal and financial advice.

Support is provided by the following units within the structures of the partner universities:

- LiU Innovation, part of Strategic Collaboration Office at Linköping University,
- Centre for Innovation and Entrepreneurship at Lodz University of Technology,
- Industrial and Commercial Activities Department at INSA Toulouse.

The Universities work closely also with regional units:

- INSA Toulouse - Innovation and Technology Transfer Centres CRITT, SATT,
- University of Trento – The Hub Innovazione Trentino,
- Linköping University – LiU Invest, LEAD, Uni Talent or Spetsa,
- Lodz University of Technology - TULVENTURE Sp. z o.o.

LiU is recognized for its advanced entrepreneurship and innovation strategies, playing a pivotal role in driving technological and societal advancements. It fosters innovation through:

- Innovation challenges, where students and researchers collaborate with local companies, academic institutions, and government bodies to solve pressing industry and societal issues,
- Participation in collaborative projects and research contracts, enabling knowledge transfer and commercialization of research findings.

INSA Toulouse demonstrates a strong commitment to building an interdisciplinary and impactful education and research ecosystem.

The strategic plan of the UniTrento takes into account the fostering of innovation and entrepreneurship activities through a combination of fundamental and industrial research.

One of the Lodz University of Technology strategic objectives is to build the university committed to dialogue and cooperation with the socio-economic environment, contributing to societal and economic development through research and education.

2.3. Cooperation with industry

For all universities, collaboration with industry includes:

- conducting research together with external stakeholders or on behalf of them, including the participation of students, leading to the implementation of innovative solutions in industry or for the benefit of society,
- involvement of companies in the educational process through internships for students, providing topics for Challenge-Based-Learning (LiU, TUL, INSA, UniTrento) or consulting study programs as Business Councils (TUL).

Universities also engage with companies in various initiatives such as "48h to Bring Ideas to Life" (INSA) or “Mechaton” (TUL) - a 48 hour event where students collaborate to find the effective solution to the real-life problem delivered by a company.

The patterns of cooperation with industry implemented at universities have a long tradition, however, this type of cooperation is currently evolving towards interdisciplinarity.

Cooperation within hubs or clusters is well developed at all universities:

- Linköping University - Linköping Science Park, a hub for over 600 companies, Norrköping Science Park and Ebbe Park;
- INSA Toulouse – IoT Valley and Oncopole;
- TUL - Digital Innovation Hub;
- UniTrento - Hub Innovazione Trentino;
- TUL - Lodz ICT Cluster, LODZISTICS, Q cluster, Association Bioeconomy Cluster and Energy Wave Cluster;
- INSA Toulouse – Aerospace Valley and Digital 113;
- LiU – Vreta Kluster.

2.4. Cooperation with Academics and Research Labs

The cooperation of JUMP partners with other universities or research centers develops at regional, national and international level. It focuses primarily on:

- Sharing experiences and good practices regarding study programs and open modules (INSA Toulouse, TUL, LiU, UniTrento),
- Joint study programs (INSA Toulouse within INSA Group, TUL),
- Collaboration in research (LiU, TUL, UniTrento),
- Challenge-based activities in ECIU network (INSA Toulouse, TUL, LiU, UniTrento).

2.5. Cooperation with Regional Authorities

Universities have developed and maintain a wide range of interactions with the regional authorities. The strongest and most significant aspect defining mutual relations is the region's strategy, which determines the directions of the university's development.

Representatives from universities sit on local and regional government organizations, ensuring that science and education are in line with the goals of the region, as it is with LiU. INSA Toulouse and TUL, together with representatives of regional government institutions, are part of clusters that jointly implement projects that support sustainable development.

Moreover, Trento, INSA Toulouse and TUL are the beneficiaries of grants intended for the development of training programs, research and research infrastructure, or grants for doctoral students.

2.6. Cooperation with NGOs and civil society

Cooperation with civil society has a multifaceted nature and may include:

- systematically structured services such as TUL Nursery and TUL Kindergarten, Public Secondary School for schoolchildren, Children's University of Lodz for the youngest and University of the Third Age for seniors. TUL extends its services to the local community through providing facilities such as PoliClinic (health care facility) or the Sports Bay (a sports centre),
- activities for the benefit of society based on initiatives aimed at implementing the SDGs, for example, through the participation of UniTrento in the "IEEE Smart Cities Initiative" (11th SDG) or TUL's in the Race to Zero initiative,
- cooperation with NGOs, for example, INSA's cooperation with Handicap International or the Red Cross, allowing students to address challenges affecting society, or TUL's cooperation with charitable organizations, e.g. the Gajusz Foundation or the Great Orchestra of Christmas Charity,
- participation in projects aimed at solving social problems, for example, UniTrento promotes a new car-sharing platform to reduce traffic and environmental impact of cars.

3. Survey results

The analysis of the survey results is available in the Appendix 5.6 and is divided by respondent's category:

- university / higher education institution (an employee)
- university / higher education institution (a student)
- the last category includes: cluster member, NGO (nongovernmental organization), public administration unit representing the region, enterprise (including small enterprise up to 50 employees, medium-sized enterprise 50-250 employees, large company with more than 250 employees)

For each category, we have analysed the data received from all partner institution to create an exhaustive overview for the entire JUMP consortium.

4. Summary

All universities are actively engaged in joint activities with other actors of the local ecosystems contributing to their development. The survey conducted among the actors of the Q-helix will identify potential and opportunities for development towards CBL for projects, internship and thesis.

5. Appendices

Appendix 5.1. Survey Mapping Local Innovation Ecosystem Opportunities for CBL - description

Appendix 5.2. UniTrento desk research on local innovation ecosystem and UniTrento survey results

Appendix 5.3. TUL desk research on local innovation ecosystem and TUL survey results

Appendix 5.4. INSA desk research on local innovation ecosystem and INSA survey results

Appendix 5.5. LiU desk research on local innovation ecosystem and LiU survey results

Appendix 5.6. Survey Mapping Local Innovation Ecosystem Opportunities for CBL - JUMP consortium overall results and analysis

Appendices 5.1. to 5.5. are comprehensive documents and as such relatively extensive. They are not intended to be read in detail, especially their second parts, but we thought it would be appropriate to publish all the results of the research on the opportunities of the local innovation ecosystems to ensure their availability for potential future use.

For overall results and analysis we recommend to read Appendix 5.6.

D4.1. REPORT on mapping local innovation ecosystems opportunities

Appendix 5.6. Survey Mapping Local Innovation Ecosystem Opportunities for CBL - JUMP consortium overall results and analysis

The analysis of the survey results is divided by respondent's category:

- university / higher education institution (an employee)
- university / higher education institution (a student)
- the last category includes: cluster member, NGO (nongovernmental organization), public administration unit representing the region, enterprise (including small enterprise up to 50 employees, medium-sized enterprise 50-250 employees, large company with more than 250 employees)

For each category, we have analysed the data received from all partner institution to create an exhaustive overview for the entire JUMP consortium.

Structure of the questionnaire

For reader convenience we recall here the overall structure of the used questionnaire (the full description is also available in Appendix 5.1)

The questionnaire consisted of 54 open-ended and close-ended questions and was used as a research instrument. It was maximum (based on the answers) 22 questions directed at cluster member organizations, NGOs, public administration unit representing the region and enterprises, 15 directed at students and 18 directed at HEI employees.

Each version of the questionnaire included a set of the same questions and set of the questions directed exclusively to a particular group. The online questionnaire was designed to take an average of 10 minutes to complete.

The survey was anonymous, however, if the respondent expressed such a desire she or he could leave the email address.

Four identical, separate questionnaires were created, one for each partner institution.

In the following results and analysis report, the number in red refers to the questions' number.

Cluster member, NGO (nongovernmental organization), Public Administration unit representing the region, Enterprises (including small enterprise up to 50 employees, medium-sized enterprise 50-250 employees, large company with more than 250 employees)

Respondents - **46**

Among the responses: 30 (65%) were provided by company representatives, 13 (26%) by respondents from public administration units representing the region, and 3 (7%) by representatives of non-governmental organizations.

3. Do you cooperate with the university on the educational level?

Yes – 33 (71,74%)
No – 13 (28,26%)

Among Cluster member, NGO, public administration unit representing the region and enterprises representatives, 71,74% declare that they cooperate with companies at the educational level and indicate the following areas of cooperation:

4. What is the form of such cooperation?

- **My organisation participates in events (competitions, open days, etc.) organised by university: 26**
- **Students carry out their thesis in my organization: 17**
- **Students carry out internships in my organization: 16**
- **My organisation hosts the study visits: 7**
- **I deliver guest lectures: 3**
- **I am a co-teacher: 2**

The most common form of cooperation with the university on the educational level among this group is **participation in events (competitions, open days, etc.) organised by university**, however many organizations indicate that students **carry out internships and thesis** in the organization. Interaction as **a co-teacher** or **delivering guest lectures** have very few indications.

6. What benefits have you gained from such cooperation?

- **My organisation has established relationships with potential employees: 16**
- **My organisation gained access to new knowledge: 10**
- **The students have solved the challenge posed to them: 9**
- **None: 9**
- **My organisation has improved the product/optimised the technological process: 5**
- **My organisation has improved its organisational management system: 3**

Representatives of the Cluster, NGO, public administration unit representing the region and enterprises indicate **gaining access to new knowledge** and **establishing relationships with potential employees** as the most significant benefits of the cooperation. The benefit "**the students have solved the challenge posed to them"** is mentioned less frequently (by 9 respondents), likewise no benefits.

5. Have you ever delivered challenge based learning opportunities for projects, internship or thesis to university:

- **yes, current challenge 10**
- **yes, the challenge that has been solved before 10**
- **no 13**

20 (60,60%) respondents out of 33 who collaborate with the university report they have delivered challenge based learning opportunities (current or solved before) for projects, internship or thesis to university.

7. Your organisation's expectations in terms of cooperation with the socio-economic environment (outside actors) are:

- **New insights and perspectives on real-life challenges within the organization: 24**
- **Establishing relations with the University or with researchers: 22**
- **The desire to improve the competence of the organisation's employees: 21**
- **I regard it as a way to learn to know students: 9**
- **Transparent rules for the management of intellectual property: 8**
- **Access to university laboratories: 7**
- **Simplification of the procedures for such cooperation, particularly in terms of protecting the interests of the organization: 5**

The representatives of this group from the cooperation with outside actors mainly expect **new insights and perspectives on real-life challenges within the organization** (52,17%), **establishing relations with the University or with researchers** (47,83%) and **improving the competence of the organisation's employees** (45,65%).

8. The cooperation between university and industry can bring the following benefits:

- **Employment opportunities within the company: 26**
- **Gaining practical experience: 25**
- **Developing business and mentoring contacts: 24**
- **Implementation of activities, practices or diplomas based on challenges to be solved in the company: 21**
- **Gaining teamwork and communication skills in multidisciplinary teams: 12**
- **Finding out what employees' competencies companies need: 10**

Representatives of the Cluster, NGO, public administration unit representing the region and enterprises as the main benefits of university-industry cooperation see

employment opportunities within the company (56,52%), **gaining practical experience** (54,34%) **developing business and mentoring contacts** (52,17%) and **implementation of activities, practices or diplomas based on challenges to be solved in the company** (45,65%). The remaining activities, such as finding out what employees' competencies companies need or gaining teamwork and communication skills in multidisciplinary teams, appear far less frequently.

9. The optimal time to work with a student on the challenge in our organization would be:

- **a month 6**
- **at least 3 months (about a half of semester) 12**
- **at least 6 months (a semester) 18**
- **until the challenge is solved; the possibility of a part-time job 6**

The most preferred period of working on the challenge in the organization is at least 6 months (39,13%), however a period of 3 months is supported by a significant number of respondents (26,09%).

10. To what extent do you agree that the following work-related competences can be acquired during the study programme?

According to the representatives of the Cluster, NGO, public administration unit representing the region and enterprises, the competencies that can be acquired during the implementation of a study program are presented below **(Figure 1).**
The data shows a generally positive perception of various skills, **teamwork, cross-disciplinary collaboration, communication** and **adaptability** receiving the highest levels of agreement. Most respondents strongly agree or agree with the importance of these skills, suggesting they are highly valued. **Persistence, leadership, cultural sensitivity** and **entrepreneurial skills** had more neutral responses, indicating mixed opinions. Overall, the respondents view these competencies as important, with a strong emphasis on teamwork.

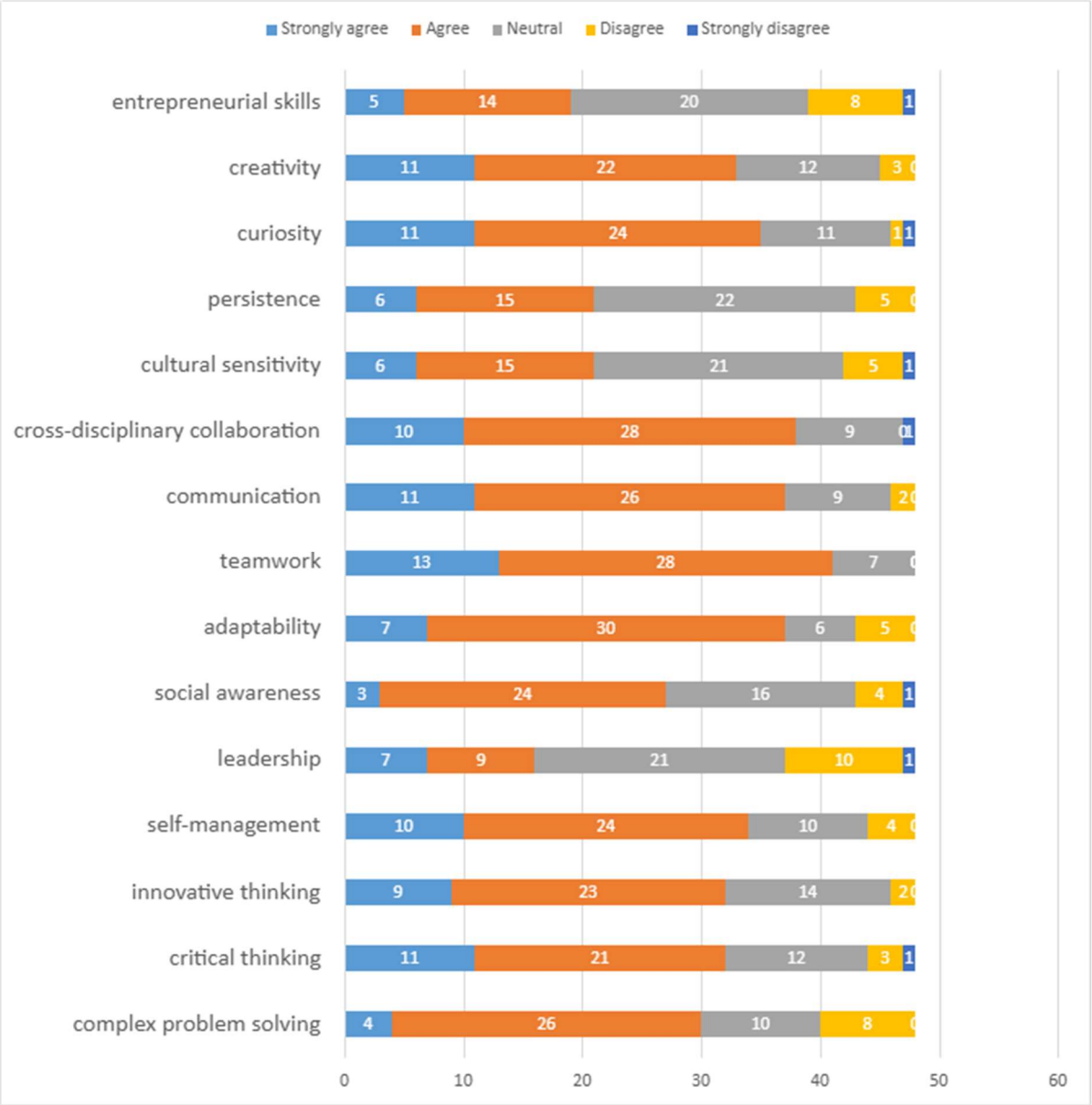

Figure 1

11. Which of the following do you think should be implemented in the educational process to improve students' I&E (innovation and entrepreneurial) skills:

- **Interdisciplinary or multidisciplinary approaches involving the collaboration of experts from different fields to address a complex issue: 21**
- **Project-based learning: 21**
- **Flexible learning: 18**
- **Challenge-based learning: 17**
- **Internationalization: 10**
- **Other: 3**

The representatives of the Cluster, NGO, public administration unit representing the region and enterprises point to the **Interdisciplinary or Multidisciplinary approaches** (45,65%) and **Project-based learning** (45,65%), followed by and **Flexible learning** (39,13%) and **Challenge-**

Based Learning (36,96%). These strategies emphasize collaboration over diverse areas and common sense, hands-on ventures, which can improve problem-solving abilities and real-world application of information. **Internationalization** is present but less emphasized compared to other concepts, suggesting it might be seen as a supplementary or less critical component in the context of the overall educational strategies.

12. Which of the following competencies do you think can be gained through Challenge Based Learning thesis?

- **Critical thinking: 24**
- **Collaboration: 24**
- **Non-routine problem solving: 23**
- **Time management: 22**
- **Teamwork: 20**
- **Self-management: 19**
- **Adaptability: 15**
- **Systems thinking: 13**
- **Self-development: 9**
- **Entrepreneurial skills: 9**
- **Complex communication: 8**
- **Dealing with diversity: 4**
- **Fluency skills: 3**
- **Financial literacy: 3**
- **Other: 3**
- **Executive functioning: 2**
- **Cultural sensitivity: 2**
- **Self-regulation: 0**

According to the representatives of the Cluster, NGO, public administration unit representing the region and enterprises Challenge-Based Learning thesis can significantly enhance competencies like **critical thinking, collaboration, non-routine problem-solving, time management** and **teamwork. Self-management, adaptability** and **systems thinking** are also rated high, although slightly lower than the previously mentioned.

13. Which of the following competencies do you think can be gained through Challenge Based Learning internship?

- **Collaboration: 25**
- **Teamwork: 24**
- **Non-routine problem solving: 19**
- **Self-development: 16**
- **Self-management: 15**
- **Time management: 15**
- **Adaptability: 13**
- **Critical thinking: 12**
- **Systems thinking: 10**

- **Complex communication: 9**
- **Entrepreneurial skills: 8**
- **Cultural sensitivity: 7**
- **Self-regulation: 6**
- **Dealing with diversity: 5**
- **Fluency skills: 5**
- **Executive functioning: 3**
- **Financial literacy: 3**
- **Other: 2**

As mentioned by the representatives of the Cluster, NGO, public administration unit representing the region and enterprises, Challenge Based Learning internship can mainly support gaining the following competencies: **collaboration** (54,35%), **teamwork** (52,17%) and **non-routine problem solving** (41,30%). **Self-development, self-management** and **time management** are also emphasized as competencies valued among the respondents.

14. Which of the following competencies do you think can be gained through Challenge Based Learning project?

- **Non-routine problem solving: 23**
- **Critical thinking: 23**
- **Time management: 23**
- **Teamwork: 21**
- **Collaboration: 18**
- **Adaptability: 17**
- **Systems thinking: 17**
- **Self-management: 16**
- **Self-development: 14**
- **Self-regulation: 8**
- **Complex communication: 7**
- **Entrepreneurial skills: 6**
- **Fluency skills: 5**
- **Executive functioning: 4**
- **Dealing with diversity: 3**
- **Financial literacy: 3**
- **Cultural sensitivity: 2**
- **Other: 1**

The survey results indicate that **Non-routine problem solving, Critical thinking**, and **Time management** are the top competencies gained through Challenge-Based Learning projects, each with a frequency of 23 (50%). Teamwork (21) and Collaboration (18) are also highly valued, emphasizing the importance of working effectively in groups. Adaptability and Systems thinking both scored 17, highlighting the need for flexibility and understanding complex systems. Self-management (16) and Self-development (14) are crucial for personal growth and managing one's learning process. Lower frequencies for competencies like Self-regulation (8) and Cultural sensitivity (2) suggest these are less emphasized in CBL projects.

15. Which of the following competencies do you think can be gained through online courses lasting up to 5 days (micro-modules)?

- **Time management: 15**
- **Self-development: 13**
- **Critical thinking: 12**
- **Systems thinking: 10**
- **Self-management: 10**
- **Self-regulation: 10**
- **Adaptability: 10**
- **Teamwork: 10**
- **Entrepreneurial skills: 9**
- **Complex communication: 9**
- **Financial literacy: 8**
- **Dealing with diversity: 7**
- **Non-routine problem solving: 7**
- **Executive functioning: 7**
- **Collaboration: 6**
- **Cultural sensitivity: 6**
- **Other: 6**
- **Fluency skills: 5**

Survey outcomes indicate that **Time management** (15 – 32,61%) is the most frequently gained competency through online courses lasting up to 5 days (micro-modules). Self-development (13) and Critical thinking (12) are also highly valued, suggesting that 5-day courses can significantly contribute to personal growth and analytical skills. **Systems thinking, Self-management, Self-regulation, Adaptability,** and **Teamwork** all scored 10, together with **Entrepreneurial skills** and **Complex communication** scored 9 are also important according to respondents, however the results demonstrate these competencies are not the main ones acquired during short forms of education.

16. The biggest obstacles in delivering challenge based learning opportunities for projects, internships and thesis to university are:

- **Lack of awareness within my organisation of the possibility for challenges to be solved by an interdisciplinary group of students: 21**
- **Lack of knowledge on problem solving using the CBL method: 21**
- **Lack of motivation to come up with CBL projects: 16**
- **Lack of regulations (e.g., intellectual property rights, NDA-confidentiality with regard to international students): 13**
- **Being afraid of open innovative processes: 13**
- **Lack of procedural and collaborative procedures for problem solving using the CBL method: 11**
- **Lack of access to the appropriate contact person at university introducing the group of CBL students: 7**
- **Other: 6**

Lack of awareness within my organisation of the possibility for challenges to be solved by an interdisciplinary group of students and **Lack of knowledge on problem solving using the CBL method** are indicated as the most significant barriers inhibiting delivery of the challenge based learning opportunities for projects, internships and thesis to university, indicating that many organizations are not aware of the potential benefits of CBL.

17. In order to provide the university with challenge based learning opportunities for projects, internships and thesis, it is necessary:

- **To designate an employee in my organization to liaise with the university: 21**
- **To train the employees in defining the scope of challenges to be solved: 18**
- **To define the criteria that challenges should meet jointly with the university: 18**
- **To designate an employee or unit of the university to liaise with stakeholders: 13**
- **To develop standards of agreements with the university: 13**
- **To create the database of challenges to be solved and supervised by university employee: 11**
- **To conclude cooperation agreements with the university: 7**
- **To promote cooperation between stakeholders and university: 7**
- **To share the results with stakeholders: 5**
- **Other: 1**

To designate an employee in my organization to liaise with the university, To train the employees in defining the scope of challenges to be solved and **To define the criteria that challenges should meet jointly with the university** are the most prioritized steps for improving collaboration between organizations and universities. The results of the survey show that the designation of an employee or unit of the university to interact with stakeholders and the development of standards for contracts with the university are also important to respondents. The prioritized actions emphasize the importance of clear communication, training, standardized agreements, and promoting collaboration.

18. To what extent do you agree with the following statements:

Majority of representatives of the Cluster, NGO, public administration unit representing the region and enterprises strongly agree or agree with all the statements. There is some neutrality on the necessity of continuous supervision and external organization involvement, but overall, there is strong support for teamwork involving people from different disciplines working together. Disagreement is minimal across all statements.

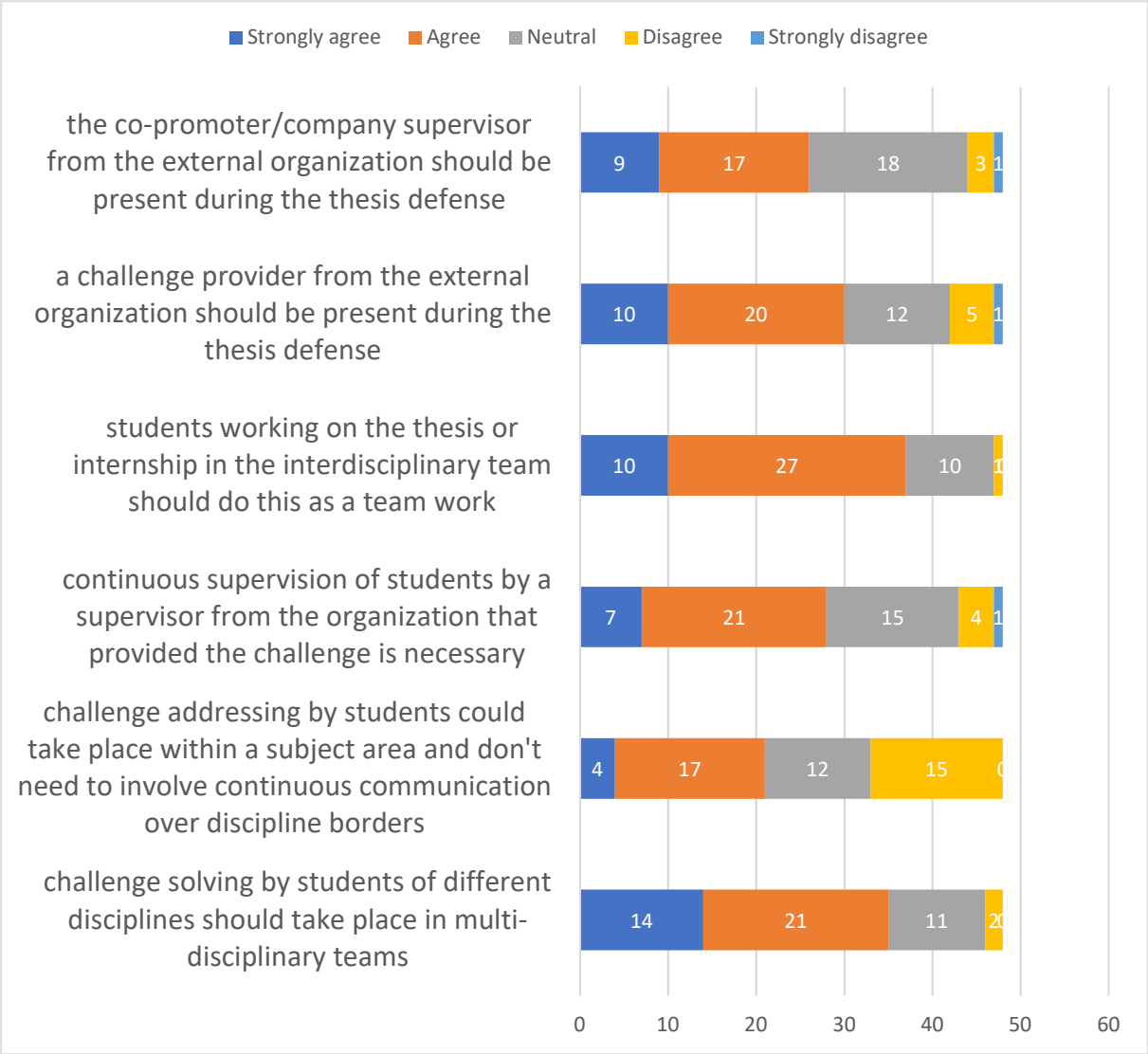

Figure 2

19. My organisation is capable to deliver:

- **At least 1 challenge for CBL project annually: 24**
- **We are not able to deliver challenges for any kind of project, internship nor thesis: 13**
- **At least 1 challenge for CBL internship for a group of max. 4 students annually: 9**
- **At least 1 challenge for CBL thesis for a group of at least 2 students annually: 9**
- **More than 3 challenges for CBL project annually: 6**
- **Other: 4**
- **More than 3 challenges for CBL internship for a group of max. 4 students annually: 3**

The survey results indicate that the most common preference is to provide at least 1 challenge for CBL project annually (24), suggesting that organizations are willing to engage in CBL projects on a yearly basis. However, a significant number of respondents (13) indicated that they are not able to deliver challenges for any kind of project, internship, or thesis, highlighting potential barriers or limitations.

Providing at least 1 challenge for CBL internships (9) and theses (9) annually shows a moderate level of commitment to these types of engagements. Fewer respondents are willing to offer more than 3 challenges annually for projects (6) or internships (3), indicating that while there is interest, the capacity to deliver multiple challenges may be limited.

20. In my organisation it is possible to carry out in English:

- **CBL project 37**
- **CBL internship 26**
- **CBL thesis 24**

The survey results indicate that the most common opportunity available in English within the organization is for CBL projects (37 – 80,43%), suggesting a strong preference for engaging in challenge-based learning projects. CBL internships (26) and CBL theses (24) are also frequently available, highlighting the organization's commitment to providing diverse CBL opportunities in English. These results reflect a robust support for CBL activities in English, which can enhance accessibility and inclusivity for international students and collaborators.

21. My organisation is interested in cooperation with:

- **Universities, research centers: 38**
- **Industrial or business partners: 33**
- **Local authorities: 22**
- **Civil society (NGOs, associations): 18**
- **Other: 2**

The survey results show a strong interest in collaborating with universities and research centres, industrial partners, local government, and civil society, aligning well with the Quadruple Helix frameworks. These collaborations are essential for fostering innovation, addressing real-world challenges, and ensuring sustainable development.
9 of 46 respondents express interest in collaborating with all q-helix actors.

23. The reasons for lack of such cooperation are:

- **Challenges are solved by ourselves: 7**
- **Competencies of students are insufficient to solve the assigned challenges: 4**
- **No possibility of delegating an employee in the organisation taking charge of the students: 3**
- **Other: 3**
- **Too high expectations of students (e.g., financial, organisational): 2**
- **Unclear policy on the IPM (intellectual property management): 1**
- **Too long waiting time for challenges to be solved: 1**
- **Too short time of students' stay in the organization: 1**

The most common reason for lack of cooperation is that **challenges are solved internally** (7), indicating that organizations prefer to handle problems themselves rather than involving students. **Insufficient competencies of students** (4) is another significant barrier.
No possibility of delegating an employee (3) and other reasons (3) are less frequent.

University / higher education institution - **Students**

Respondents - **48**

24. Did you solve real-life challenges from companies in practical classes (labs, projects)?

Yes – 35 (73%)
No – 13 (27%)

73 % of the HEI students state they were solving real-life challenges from companies in practical classes (labs, projects).

25. During the course mentioned above I acquired the following skills:

- **Complex Problem Solving**: 21 occurrences
- **Teamwork**: 18 occurrences
- **Critical Thinking**: 14 occurrences
- **Innovative Thinking**: 12 occurrences
- **Communication**: 11 occurrences
- **Leadership**: 8 occurrences
- **Cross Disciplinary Collaboration**: 7 occurrences
- **Entrepreneurial Skills**: 5 occurrences
- **Adaptability**: 5 occurrences
- **Other**

The most frequent skills are **Complex Problem Solving**, **Teamwork** (respectively 60% and 51%) and **Critical Thinking** (40%), highlighting that these are core areas the students focus on and likely see as strongest assets. Less Frequent but Notable Skills are **Innovative Thinking, Communication and Leadership**, but also **Cross Disciplinary Collaboration**. Skills like **Cultural Sensitivity** and **Social Awareness** are mentioned very little, indicating areas for potential growth.

Among HEI students, 27% declare that they did not solve real-life challenges from companies in practical classes (labs, projects) and indicate the following reasons for lack of such cooperation (question 37):

37. Why not? Please justify.

- **Lack of Real-World Application**: 25%
- **Basic Course Material**: 25%
- **Inexperience**: 18.75%
- **Focus on Exams**: 12.5%
- **Limited Industry Interaction**: 12.5%
- **Inexperience**: 18.75%
- **Outdated Resources**: 6.25%

The breakdown highlights that **lack of real-world application** and **basic course material** were the most common reasons (25%) for not participating in solving real-life challenges from companies in practical classes (labs, projects). In summary, the disconnect between theory and real-world

practice, along with a lack of industry interactions and practical learning opportunities (inexperience), led to low participation in CBL activities.

All HEI students were asked to answer the following questions (26 to 35).

26. How did you get the topic for the thesis and internship?

- **Personal Initiative** and **Professor-Driven** (each 23%).
- **University and Course-Related Sources** (20%).
- **Company/Industry Opportunities** and **Uncertain/No Topic Yet** (each 14%).
- **Other Miscellaneous Sources** (6%) and **Peer/Group Collaboration** (3%).

Professor/Academic Guidance and **University-Provided Opportunities** were the most common sources for thesis/internship topics, with **Personal Initiative** and **Industry Collaboration** also playing significant roles.

Some students, particularly **first-year students**, have not yet chosen their topics.

There is a mixed response regarding the role of university education, with some feeling it is either too basic or not connected enough to real-world challenges.

27. Which of the following competencies do you think can be gained through Challenge Based Learning thesis?

- **Critical Thinking** – 32 mentions
- **Time Management** – 31 mentions
- **Self-Management** – 25 mentions
- **Non-Routine Problem Solving** – 22 mentions
- **Systems Thinking** – 19 mention
- **Self-Development** – 15 mentions
- **Collaboration/Teamwork** – 13 mentions
- **Adaptability** – 13 mentions
- **Entrepreneurial Skills** – 9 mentions
- **Complex Communication** – 9 mentions
- **Dealing with Diversity** – 6 mentions
- **Other**

Critical Thinking and **Time Management** are the most frequently mentioned competencies (respectively 67% and 65%), indicating their strong alignment with the nature of the **CBL**. Soft skills like **Self-Management**, **Non-routine problem solving**, and **Systems Thinking** are also widely recognized as essential outcomes of **CBL Theses**. Competencies related to **soft skills** such as **Collaboration**, **Adaptability**, and **Self-development** are less frequently noted. Less mentioned are also **Entrepreneurial skills** and **Dealing with Diversity**, but they highlight the importance of creativity, innovation, and inclusivity in real-world problem-solving contexts.

In summary, **Challenge Based Learning** is seen as a method that not only strengthens cognitive abilities but also promotes a broad range of personal and interpersonal skills, equipping students for the complexities of the modern world.

28. Which of the following competencies do you think can be gained through Challenge Based Learning internship?

- **Teamwork/Collaboration** – 24 mentions
- **Self-Development** – 24 mentions
- **Time Management** – 21 mentions
- **Non-Routine Problem Solving** – 19 mentions
- **Critical Thinking** – 18 mentions
- **Adaptability** – 16 mentions
- **Self-Management** – 16 mentions
- **Complex Communication** – 15 mentions
- **Systems Thinking** – 13 mentions
- **Other**

In a Challenge-Based Learning internship, the most emphasized competencies are **Teamwork/ Collaboration** and **Self-Development** (24 mentions each, 50%), followed by **Time Management** (21 mentions) and **Non-Routine Problem Solving** (19 mentions). **Critical Thinking** (18 mentions), **Adaptability** and **Self-Management** (16 mentions) also play key roles. Other competencies like **Complex Communication**, **Systems Thinking**, and **Dealing with Diversity** are also highlighted, while **Entrepreneurial Skills** and **Financial Literacy** are less frequently mentioned. Overall, collaboration, personal growth, and problem-solving are crucial for success in this type of internship.

29. Which of the following competencies do you think can be gained through Challenge Based Learning project?

- **Teamwork/Collaboration** – 28 mentions
- **Critical Thinking** – 27 mentions
- **Non-Routine Problem Solving** – 23 mentions
- **Adaptability** – 18 mentions
- **Self-Management** – 17 mentions
- **Time Management** – 15 mentions
- **Entrepreneurial Skills** – 11 mentions
- **Complex Communication** – 11 mentions
- **Self-Development** – 9 mentions
- **Systems Thinking** – 9 mentions
- **Other**

In Challenge-Based Learning projects, **Teamwork/Collaboration** (28 mentions, 58%) is the most emphasized competency, followed closely by **Critical Thinking** (27 mentions) and **Non-Routine Problem Solving** (23 mentions). **Adaptability, Self-Management** and **Time Management** are also key competencies. **Entrepreneurial Skills** and **Complex Communication** are important, though slightly less emphasized. Other competencies like **Self-Development** and **System Thinking** play a supporting role, with fewer mentions. Competencies such as **Fluency Skills**, **Cultural Sensitivity**, and **Financial Literacy** are mentioned less frequently.

30. Which of the following competencies do you think can be gained through online courses up to 5 days (micro-modules)?

- **Time Management** – 19 mentions
- **Critical Thinking** – 19 mentions
- **Systems Thinking** – 14 mentions
- **Adaptability** – 13 mentions
- **Non-Routine Problem Solving** – 12 mentions
- **Entrepreneurial Skills** – 11 mentions
- **Fluency Skills** – 10 mentions
- **Self-Management** – 10 mentions
- **Self-Development** – 10 mentions
- **Self-Regulation** – 10 mentions
- **Other**

The most frequently mentioned competencies in the online courses (lasting up to 5 days) are **Time Management** and **Critical Thinking**, both appearing 19 times (40%). Other competencies such as **Systems Thinking** (14 mentions) and **Adaptability** (13 mentions) are also highly relevant. Skills related to **Non-Routine Problem Solving**, **Entrepreneurial Skills**, and **Fluency Skills** were mentioned around 10-12 times. Competencies like **Self-Management**, **Self-Regulation**, and **Self-Development** also feature prominently, each with 10 mentions. On the lower end, competencies like **Cultural Sensitivity**, **Dealing with Diversity**, and **Executive Functioning** appear less frequently, with 5-7 mentions each.

The analysis suggests that short online courses, like micro-modules, are particularly effective in enhancing practical skills like **Time Management**, **Critical Thinking**, and **Adaptability**, which may be prioritized depending on the specific task or role. However, the full range of skills was mentioned in the responses, indicating that students believe all these competencies play a crucial role in contributing to overall success and personal growth.

31 To what extent do you agree that the inclusion of the following elements in the curriculum will create a flexible learning pathways?

According to the university students, the inclusion of the following elements in the curriculum, as presented bellow (Table 3), will create a flexible learning pathway.

The data generally reflects a positive reception (the responses lean positively with a significant number of **Agree** and **Strongly Agree** answers) toward most aspects of the learning model, particularly when it involves **Solving Real-Life Challenges** (85%), **Internship or Thesis Based on Real-Life Challenges** (81% and 77%), and **Challenge-Based Projects** (75%).

Several categories have a substantial portion of **Neutral** responses, which may suggest uncertainty or lack of strong opinion on certain aspects, particularly in: **Online Courses**, **Blended mobility** and **Synchronical and Asynchronical Learning.**

Disagreement: There is a very smaller portion of **Disagree** and **Strongly Disagree** responses, particularly in **Online Courses (Micro-Modules)** and **Synchronical and Asynchronical Learning**, which indicates that not all respondents are on board with these ideas.

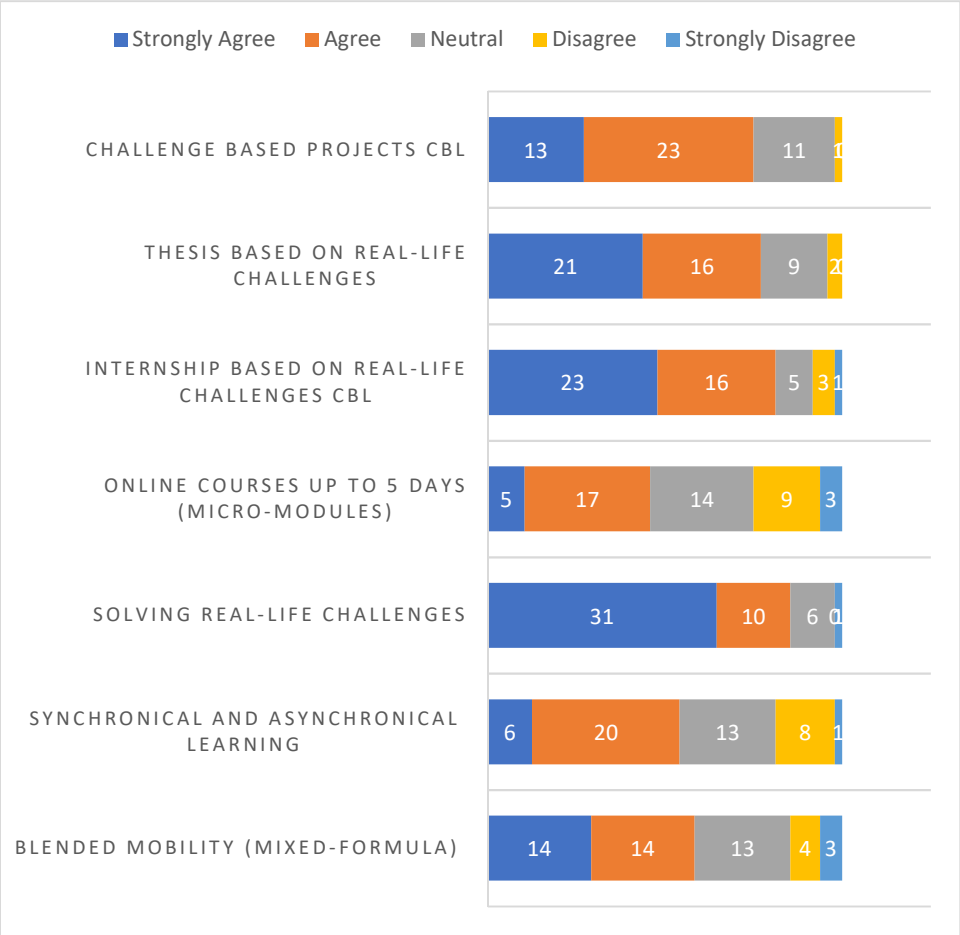

Figure 3

32. In your opinion, what should flexible learning pathways look like?

The analysis shows that students desire **flexibility** in their learning pathways, but also recognize the need for structure to maintain focus and engagement. They express a strong preference for learning experiences rooted in **real-life challenges** and **hands-on activities** that provide practical experience. Additionally, students value **collaboration** and **mentorship** in team-based settings, which help individuals complement each other's skill sets. Students also appreciate the ability to **personalize** their learning paths, offering them **choice** and **autonomy**. A blended approach to learning, combining both **online and in-person formats**, is also favored to accommodate different needs and schedules.

While students value flexibility, some have concerns that too much freedom could hinder the development of key skills such as managing deadlines and responsibilities. Moreover, students suggest that **global learning opportunities** and continued **mentorship** would further enhance the learning experience, providing valuable guidance and support.

Overall, the students' feedback indicates that flexible learning pathways should be designed with a **learner-centered approach**, allowing for **adaptability** while maintaining essential structure, integrating practical **real-world experiences** and **mentorship** to enhance students' skills and readiness for future careers.

33. Which of the following do you think should be implemented in the educational process to improve students' I&E (innovation and entrepreneurial) skills?

- **challenge-based learning** – 21 mentions
- **interdisciplinary or multidisciplinary approaches involving the collaboration of experts from different fields to address a complex issue** – 17 mentions
- **project-based learning** – 12 mentions
- **flexible learning** – 10 mentions
- **internationalization** – 7 mentions
- **learning based on cultural diversity** – 2 mentions

Students believe that the most effective ways to improve **innovation and entrepreneurial (I&E)** skills are **challenge-based learning (44%)**, **interdisciplinary collaboration (35%)**, and **project-based learning (25%)**. They also value **flexible learning** paths, **international exposure**, and **learning from cultural diversity**, but these are considered less important compared to hands-on and collaborative approaches. These methods help foster creativity, critical thinking, and real-world problem-solving skills essential for innovation and entrepreneurship.

34. I am interested in facing real challenges occurring in external environment while working on:

- **Challenge Based Learning project** – 35 mentions
- **Challenge Based Learning internship** – 27 mentions
- **Challenge Based Learning thesis** – 16 mentions

The students are very interested in working on real-world challenges through **Challenge-Based Learning (CBL)** in various forms. More than 40% of the students expressed multiple preferences. Half of them are interested in all **Challenge-Based Learning (CBL)** opportunities, while many students prefer a combination of **CBL internships** and **CBL projects**. This highlights a strong interest in engaging with various forms of CBL to tackle real-world challenges.

The most popular options are **CBL projects** (35 mentions, 73%), followed by **CBL internships** (27 mentions, 56%) and **CBL theses** (16 mentions, 33%).

35. The cooperation between university and industry can bring the following benefits:

- **gaining practical experience** – 38 mentions
- **employment opportunities within the company** – 33 mentions
- **gaining teamwork and communication skills in multidisciplinary teams** – 17 mentions
- **establishing business and mentoring contacts** – 17 mentions
- **implementation of activities, practices or diplomas based on challenges to be solved in the company** – 16 mentions
- **what employees' competencies companies need** – 10 mentions

Students believe that university-industry cooperation offers several key benefits, including **practical experience** (38 mentions, 79%) and **employment opportunities** within the company (33 mentions, 69%). They also value gaining **teamwork and communication skills** in multidisciplinary teams (17 mentions) and establishing **business and mentoring contacts** (17 mentions). Additionally, students

see value in **activities, practices, or diplomas based on company challenges** (16 mentions) and understanding **employee's competencies needed by companies** (10 mentions).

Most students expressed multiple preferences, indicating that they see a variety of benefits in the cooperation between university and industry. This suggests that students recognize the value of gaining practical experience, employment opportunities, teamwork skills, and building professional connections, among other advantages.

University / higher education institution - **Employees**

Respondents - **79**

38. Do you cooperate with companies in your educational activities?

Yes – 62 (78%)
No – 17 (22%)

Among HEI employees, 78% declare that they cooperate with companies at the educational level and indicate the following areas of cooperation and the benefits they gained from such cooperation (questions 39 and 40):

39. What is the form of such cooperation?

- **The company is a challenge provider** – **30** times.
- **Students carry out internships in the company** – **23** times.
- **Students carry out their thesis in the company** – **23** times.
- **The company's employee conducts guest lectures** – **17** times.
- **The company participates in events (competitions, open days, etc.) organized by the university** – **16** times.
- **The company hosts the study visits** – **10** times.
- **I co-teach with the company employee** – **7** times.
- **Companies join in courses with concrete projects to be investigated (apart from being challenge providers)** – **1** time.
- **Supporting teachers who involve external partners in their challenges** – **1** time.

Most frequent activity is: "**The company is a challenge provider**" with 30 occurrences (48% of the HEI Employees), which suggests this activity is a primary focus of the company's involvement with the university. **Student internships** and **theses** are also significant activities, with 23 and 23 occurrences, respectively, i.e. for 37% of the HEI Employees. Less frequent activities are "**guest lectures**" and "**event participation**". The other listed activities are more specialized or less common forms of interaction between the company and the university.

40. What benefits have you gained from such cooperation?

- **I have had the opportunity to offer real-life challenges** – **51** times.
- **I have established relationships for future cooperation** – **42** times.
- **I have gained access to industrial equipment** – **5** times.
- **Students can experience what it means to work on industrial problems first-hand** – **1** time.
- **Opportunities for students to get in contact with industries, etc.** – **1** time.
- **I can get work done which serves my research projects** – **1** time.

Representatives of the HEI employee group indicated as the most significant benefits they have had the **opportunity to offer real-life challenges** (82%) and they have **established relationships** for the future cooperation (68%), that emphasize long-term collaboration goals. Several activities appear only **once** such as "Students can experience what it means to work on industrial problems first-

hand" and "Opportunities for students to get in contact with industries". Activities related to industrial equipment access, feedback, and teaching insights also appear less frequently but represent more specific or strategic outcomes.

Among HEI employees, 22% declare that they do not cooperate with companies at the educational level and indicate the following reasons for lack of such cooperation (question 54):

54. The reasons for lack of such cooperation are:

- **Expectations of Students:** 7 mentions
  - **Too High Expectations (Financial, Organizational)** – 3 mentions
  - **Insufficient Competencies to Solve Challenges** – 4 mentions
- **Time-Related Issues:** 6 mentions
  - **Short Stay of Students in the Company** – 5 mentions
  - **Long Waiting Time for Challenges to be Solved** – 1 mention
- **Support and Delegation Issues:** 5 mentions
  - **No Possibility of Delegating an Employee to Take Charge of Students** – 3 mentions
  - **Lack of Support in Teaching** – 2 mentions
- **Collaboration Issues:** 3 mentions
  - **Hard to Find Collaboration Partners** – 1 mention
  - **Lack of Contacts** – 1 mention
  - **Reluctance from Companies to Collaborate with Certain Disciplines** – 1 mention
- **Organizational and Structural Issues:** 2 mentions
  - **Unclear Policy on IPM (Intellectual Property Management)** – 1 mention
  - **Basic-Level Courses** – 1 mention
- **Other Miscellaneous:** 3 mentions
  - **Not the Area of Expertise** – 2 mentions
  - **Specific Topic Out of Attribution** – 1 mention

For the HEI Employees who do not cooperate with companies at the educational level the most common challenges are related to **students' expectations**, with issues like **insufficient competencies** and **too high expectations**. The **time-related issues**, especially **short stays** of students in companies, are also significant. **Support and delegation** are problematic, as companies often lack the resources to assign mentors or provide proper guidance. **Collaboration issues** and **miscellaneous challenges** like lack of expertise and unclear policies are mentioned less frequently but still relevant.

All HEI employees were asked to answer the questions 41 to 52.

41. The university's expectations in terms of cooperation with the socio-economic environment (outside actors) are:

- **New insights and perspectives on real-life challenges within the company** – **72** times.
- **Establishing relations with the company** – **35** times.
- **The desire to improve the competences of the University's employees** – **13** times.
- **Simplification of the procedures for such cooperation, particularly in terms of protecting the interests of both sides** – **6** times.
- **I regard it as a way to learn to know students** – **5** times.
- **Transparent rules for the management of intellectual property** – **4** times.

Employees of the university mainly expect from the cooperation **new insights and perspectives on real-life challenges** in the company (91%), the **establishment of a relationship with the company (57%)**, and the **desire to improve the competence of the employees** of the university. The remaining activities, such as simplifying procedures, transparent rules and offering students real-world examples, appear far less frequently.

42. The cooperation between university and industry can bring the following benefits:

- **Gaining practical experience**: 47 times
- **Gaining teamwork and communication skills in multidisciplinary teams**: 38 times
- **Implementation of activities, practices, or diplomas based on challenges to be solved in the company**: 29 times
- **Employment opportunities within the company**: 24 times
- **Developing business and mentoring contacts**: 22 times
- **What employees' competencies companies need**: 14 times

University employees see as the main benefits of university-industry cooperation: **gaining practical experience** (60%), **Gaining Teamwork and Communication Skills (48%)** and **Implementation of activities, practices or diplomas based on challenges** (37%). The data emphasizes also the potential of **Employment opportunities** and the **Developing business and mentoring contacts (28%)**
The collaborations help students align with **industry needs** and provide insights into **sustainable practices** and **research cooperation**.
In summary, the data reveals that the primary benefits of student-company collaboration are centered around **practical experience**, **teamwork**, and **career opportunities**, with a secondary focus on developing industry-relevant competencies and professional networks.

43. The optimal time to work with a student on the challenge in the company would be:

- **43.65%** of responses suggest the challenge duration should be **at least 3 months** (about half a semester).
- **21.43%** say it should be **at least 6 months** (a full semester).
- **12.70%** prefer **1 month** duration.
- **7.14%** mention the duration should be **varied or until the challenge is solved**.
- **2.38%** mention **1 week to 2 weeks**.
- **5.56%** had **no opinion or were uncertain** about the timeframe.

This shows that the majority of responses favor challenges lasting at least **3 months**, with a significant portion supporting a full semester (**6 months**) duration.

44. To what extent do you agree that the following work-related competences can be acquired during the study programme?

According to the university employees, the competencies that can be acquired during the implementation of a study program are presented below (Figure 1)

The data shows a generally positive perception of various skills, **Complex Problem Solving, Innovative Thinking** and **Critical Thinking** receiving the highest levels of agreement. Most respondents strongly agree or agree with the importance of these skills, suggesting they are highly

valued. **Communication** and **Teamwork** had more neutral responses, indicating mixed opinions. Disagreement was minimal, indicating a general positivity toward the skills assessed. Overall, the respondents view these competencies as important, with a strong emphasis on problem-solving and innovative thinking.

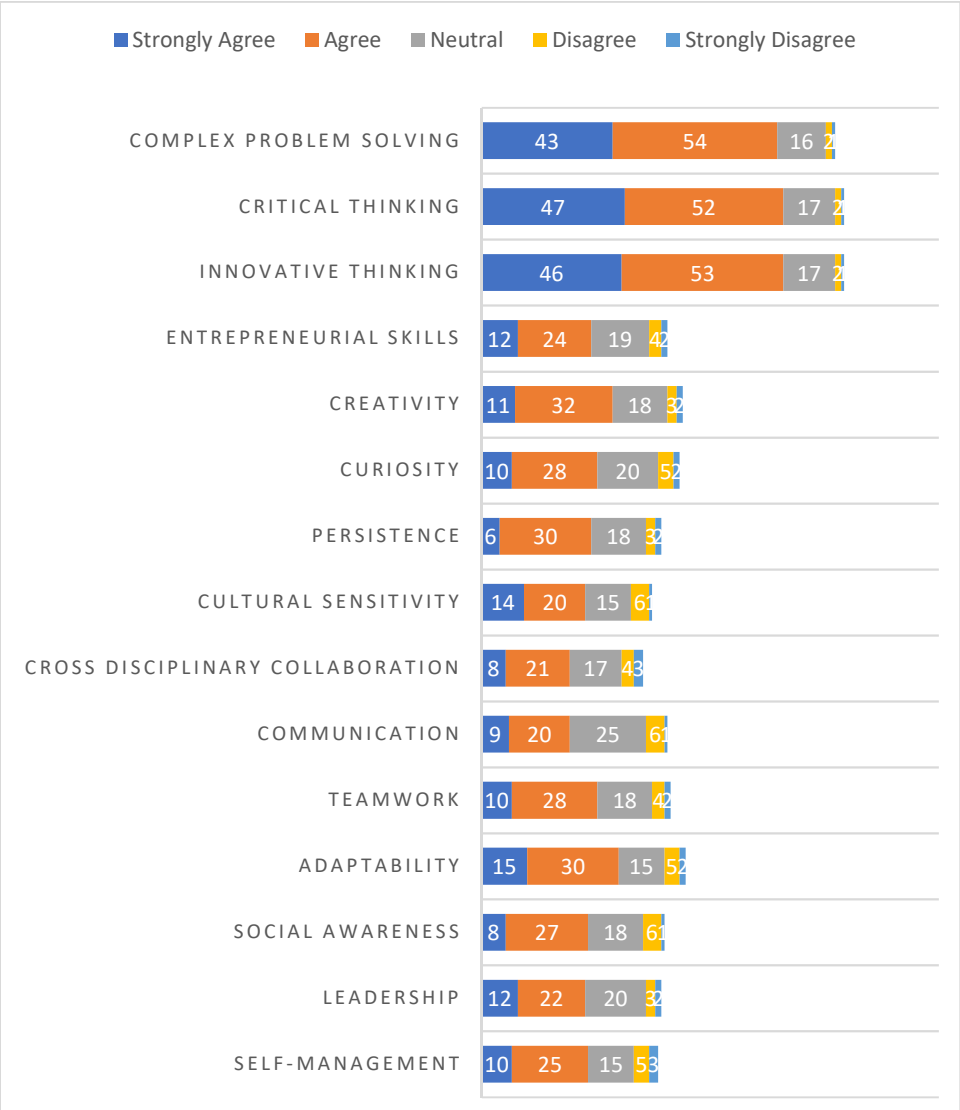

Figure 1

45. Which of the following do you think should be implemented in the educational process to improve students' I&E (innovation and entrepreneurial) skills?

- **Interdisciplinary or Multidisciplinary Approaches**: 50 times
- **Challenge-Based Learning**: 39 times
- **Flexible Learning**: 17 times
- **Project-Based Learning**: 16 times
- **Internationalization**: 6 times
- **Creativity**: 2 times

The university employees point to the **Interdisciplinary or Multidisciplinary approaches** (63%) and **Challenge-Based Learning** (49%), followed by **Project-based learning** and **Flexible learning** (21%)

This indicates a preference for collaborative, hands-on, and problem-solving-focused learning environments. This reflects an educational philosophy that values diverse perspectives, real-world challenges, and adaptable learning environments. **Internationalization** is present but less emphasized compared to other concepts, suggesting it might be seen as a supplementary or less critical component in the context of the overall educational strategies.

46. Which of the following competencies do you think can be gained through Challenge Based Learning internship?

- **Teamwork**: 57 times
- **Critical Thinking**: 35 times
- **Non-Routine Problem Solving**: 30 times
- **Self-Management**: 25 times
- **Adaptability**: 22 times
- **Collaboration**: 21 times
- **Time Management**: 16 times
- **Systems Thinking**: 13 times
- **Entrepreneurial Skills**: 12 times

Teamwork appears most frequently, **57** times (72%). This suggests a strong emphasis on collaborative work and cooperation in various contexts. **Critical Thinking** follows closely, appearing **35** times, which highlights the importance of analyzing, evaluating, and making decisions. **Non-Routine Problem Solving** is also a dominant theme, appearing **30** times. This points to the need for tackling problems that are complex and require innovative thinking. **Self-management, Adaptability and Collaboration** appears less frequently (25-30%), emphasizing self-regulation and time management skills. **Time Management**, **Systems Thinking** and **Entrepreneurial Skills** are mentioned, but slightly less frequent. **Diversity and Cultural Sensitivity** is mentioned few times, suggesting an awareness of the value of diversity and inclusivity in collaboration and teamwork contexts.

Overall, the focus is on core skills needed for effective collaboration, problem-solving, and personal development in diverse environments.

47. Which of the following competencies do you think can be gained through Challenge Based Learning thesis?

- **Time Management**: 43 times
- **Critical Thinking**: 39 times
- **Self-Management**: 36 times
- **Non-Routine Problem Solving**: 31 times
- **Adaptability**: 22 times
- **Systems Thinking**: 18 times
- **Collaboration**: 17 times
- **Entrepreneurial Skills**: 14 times
- **Self-Development**: 13 times
- **Others**

Time Management: is the most frequent skill (43 occurrences, 54%), highlighting its importance in managing tasks and meeting deadlines. **Critical Thinking** and **Self-Management** are also emphasized

as key skills together with **Non-Routine Problem Solving**, focusing on tackling complex, unpredictable issues that require innovative solutions. **Adaptability and Systems Thinking** follow with 22 and 18 occurrences, reflecting the need to adjust to new challenges and changing conditions and seeing the big picture and understanding how various components interact. The inclusion of **Entrepreneurial Skills** and **Self-Development** suggests a focus on personal and professional growth. Overall, the data highlights the critical skills necessary for success in academic, personal, and professional settings.

48. Which of the following competencies do you think can be gained through online courses up to 5 days (micro-modules)?

- **Time management**: 34 times
- **Self-regulation**: 15 times
- **Self-development**: 14 times
- **Collaboration**: 12 times
- **Adaptability**: 12times
- **Critical thinking**: 9 times
- **Non-routine problem solving**: 9 times
- Others

The Most frequent skill is **Time management** appears **34 times** (43%). **Self-regulation** and **Self-development** are also prioritized. It suggests that these are essential skills, followed by **Collaboration**: and **Adaptability**. Skills Appearing Several Times are **Critical thinking**, **Non-routine problem solving** and also **systems thinking**, **entrepreneurial skills**, **complex communication**, all appear multiple times but less frequently compared to the top skills above. Skills like **teamwork**, **collaboration**, and **cultural sensitivity** are also considered important, reflecting the need for interpersonal and communication abilities.

Overall, the data prioritizes personal skills with a secondary focus on **collaboration**. **Entrepreneurial** and **financial literacy** skills are less emphasized in the context of **online courses up to 5 days (micro-modules).**

49. The biggest obstacles in delivering challenge based learning opportunities for projects, internships and thesis to university are:

- **Lack of Awareness within the Company**: appears **23 times**
- **Lack of Motivation to Come Up with CBL Projects**: **17 times**.
- **Lack of Procedural and Collaborative Procedures for Problem Solving using CBL Method**: **15 times**.
- **Lack of Knowledge on Problem Solving Using the CBL Method**: **14 times**.
- **Lack of Regulations (Intellectual Property Rights, NDA, Confidentiality with International Students)**: **11 times**.
- **Lack of Access to the Appropriate Contact Person at University**: **10 times**
- Others

The most recurring issue is the **Lack of awareness within companies** regarding the potential of interdisciplinary student groups to solve challenges. This is mentioned multiple times, indicating a significant barrier to effective collaboration. Other frequently mentioned obstacles are **Lack of Motivation and Lack of Procedural and Collaborative Challenges, but also Lack of Regulations and**

Access to Appropriate Contact Person, indicating that both companies and university staff may not see the value in engaging with this method or may be too busy to initiate such projects and a lack of procedural and collaborative procedures. This suggests a lack of established systems or frameworks to facilitate collaboration effectively. Several responses point to a **Lack of knowledge** on how to solve problems using the CBL method, indicating that training or expertise in CBL could be improved.

In summary, the key obstacles identified are a lack of awareness, motivation, knowledge, and procedural frameworks, compounded by regulatory concerns, time and resource constraints, and administrative challenges. These barriers indicate that for CBL to be more effectively integrated into university-industry collaborations, both structural and cultural changes are necessary.

50. In order to provide the university with challenge based learning opportunities for projects, internships and thesis, it is necessary:

- **To designate an employee in my organization to liaise with the company** – 28 times
- **To designate an employee or unit of the company to liaise with university** – 18 times
- **To define the criteria that challenges should meet jointly with the university** – 37 times
- **To promote cooperation between stakeholders and university** – 32 times
- **To develop standards of agreements with the company** – 19 times
- **Create the database of challenges to be solved** – 17 mentions
- **To conclude cooperation agreements with the company** – 14 times
- **Others**

The most commonly mentioned actions in the list focus on **designating employees** to liaise between the company and the university in both parties (the sum of the occurrences is 46, 58%). Another key point is defining the **criteria for challenges** to meet jointly with the university. Other important tasks include **promoting cooperation** between stakeholders and the university, **developing standards of agreements** with the company, and **creating a database of challenges** to be solved with the university's supervision.

Training, sharing results, and effective marketing strategies will help ensure the success of these initiatives. Time and personnel commitments are also necessary to support these efforts and ensure their sustainability. By focusing on these key aspects (collaboration, clear communication, and structured agreements) both the company and the university can effectively collaborate on real-world challenges that benefit students, faculty, and the company alike.

51. To what extent do you agree with the following statements:

Majority of higher education institution employees **strongly agree** or **agree** with all the statements. There is some **neutrality** on the necessity of continuous supervision and external organization involvement, but overall, there is strong support for teamwork and organizational participation in the process. Disagreement is minimal across all statements.
The responses distribution is presented below (Figure 2)

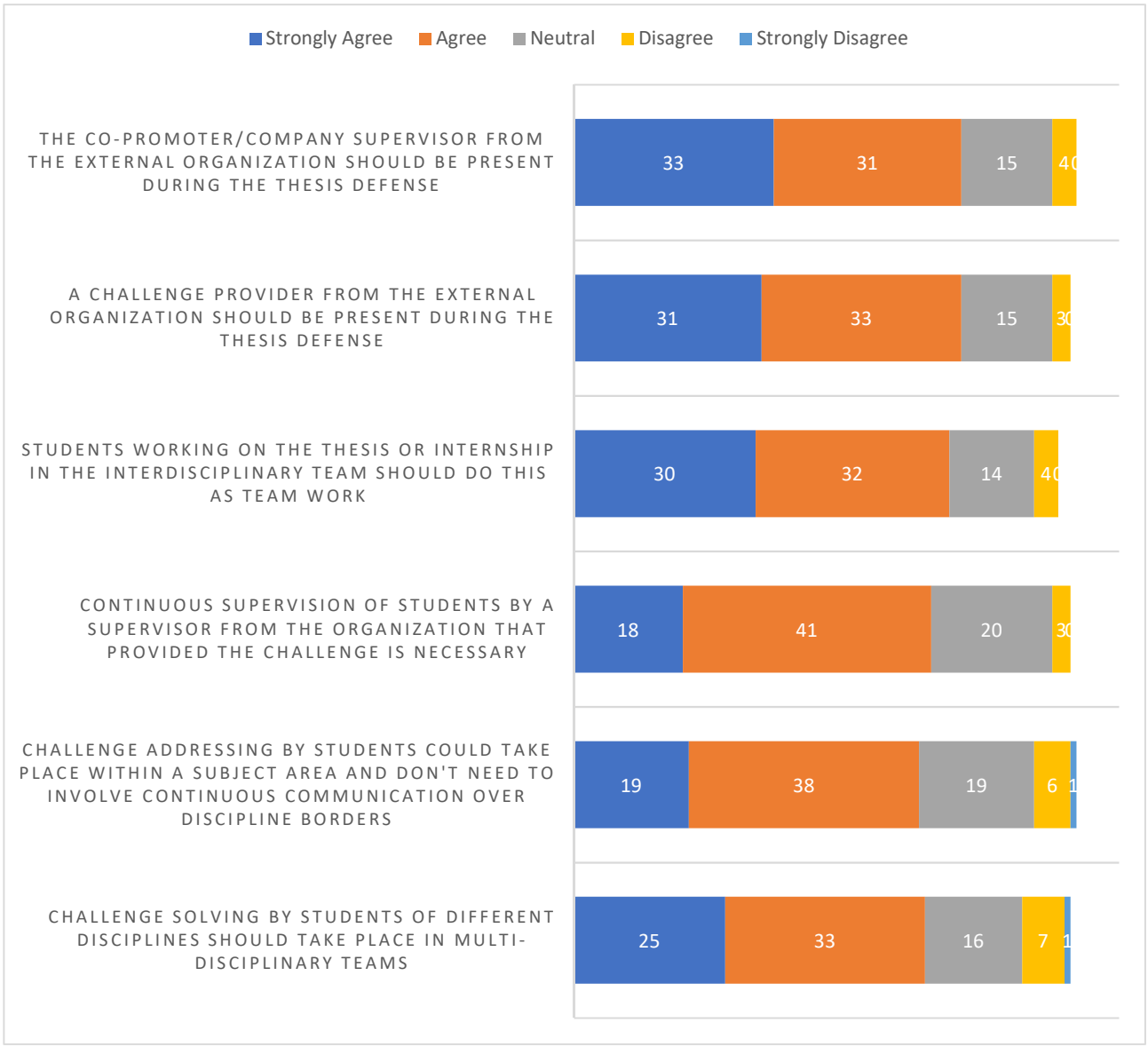

Figure 2

52. My organization is interested in cooperation with:

Civil Society (NGOs, Associations) – 46 times
Universities, Research Centers – 45 times
Local Authorities – 46 times
Industrial or Business Partners – 70 times
Others – 3 times

Industrial or Business Partners are the most frequently mentioned stakeholders, which indicates their prominent role in the collaborations. The remaining stakeholders are listed equally, which indicates an equally strong interest in cooperating with them.
The most frequent combination is: Civil Society (NGOs, Associations) + Universities, Research Centers + Local Authorities + Industrial or Business Partners, which appears 27 times**.**