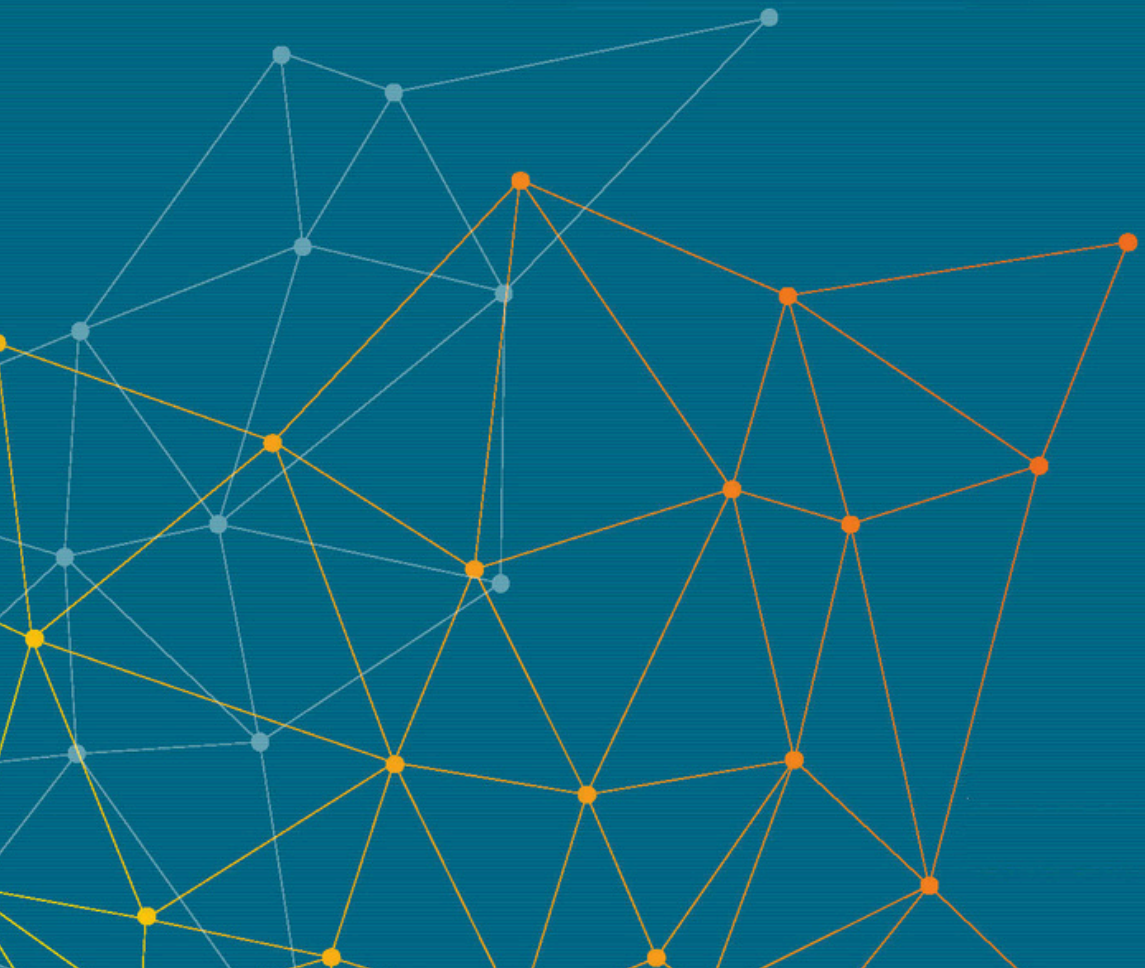
INFORMATICS EUROPE

ACADEMIA–INDUSTRY COLLABORATION IN INFORMATICS BACHELOR'S AND MASTER'S THESES



Academia–Industry Collaboration in Informatics Bachelor's and Master's Theses

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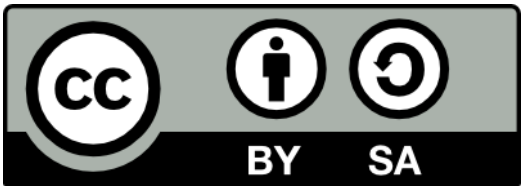

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Abstract

This report provides strategic guidance for university leadership, industry stakeholders, and governmental or funding agencies seeking to strengthen industry-academia collaboration through joint bachelor's and master's theses. Such collaborations are key instruments for innovation, talent development, and knowledge transfer. By analysing academic literature, institutional practices and case studies throughout Europe, we identify structural challenges, outline enabling conditions, and propose recommendations to support collaboration between academia and industry through informatics bachelor's and master's theses. The Report was prepared by a task force of the Informatics Europe Education Research Working Group.

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1. Introduction

The goal of this report is to understand the mechanisms behind successful collaborations between academia and industry, particularly in the context of bachelor's and master's theses. More precisely, its purpose is to analyse how such collaborations are established and can be sustained. It explains what factors contribute to effective partnerships and identifies strategies that lead to successful outcomes for students, academic supervisors, and industry partners.

For our analysis, we conducted three activities in parallel:

1. We performed a **literature review** to uncover the most common challenges, issues, and problems encountered in academia-industry collaborations. We identified various frameworks, models, patterns, and a series of best practices and recommendations proposed in the scientific community to enhance collaboration effectiveness. This review allowed us to compile a detailed list of challenges and a set of best practices tailored specifically for bachelor's and master's theses.
2. We conducted a series of **interviews** with academic representatives from different institutions: Babes-Bolyai University of Cluj-Napoca (Romania), University of West Bohemia in Pilsen (Czech Republic), and NTNU Trondheim (Norway). These interviews were structured around key questions aimed at uncovering the collaboration process: how contacts with companies are established, the role of companies during the thesis work, the formalisation of agreements, evaluation criteria, and the overall current status of collaboration models at each institution.
3. We analysed real-world examples of collaboration practices through detailed **case studies** on UCLouvain (Belgium) and a document provided by Gesellschaft für Informatik (Germany). These case studies provided insight into institutional approaches and practical implementations of collaboration strategies.

Following these activities, we sought to synchronise their outcomes. We analysed how the challenges and best practices identified in the literature review aligned with the real-world experiences from the interviews and case studies. With this, we wanted to highlight areas where practice successfully reflects recommended strategies from the literature, and to identify mismatches where collaborations encounter difficulties despite available best practices, thereby revealing opportunities for further improvement.

The remainder of the document describes in separate sections each activity that we performed.

2. Literature Review

The goal of this section is to provide a more detailed understanding of collaborations between academia and external partners, such as private companies or research centers, in the process of developing and master's theses. We considered several relevant research articles [1,2,3,4,5] in this area that address key challenges and best practices concerning academia-industry collaboration, particularly in the context of student theses.

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This list of articles provides information relevant for the purpose of this report, but is not meant to be exhaustive. Their primary goal is to help us investigate and understand the elements that contribute to successful industry-academia collaboration, primarily in software engineering [1,2,3,5], and, going a step further, on start-up collaborations [4]. All studies aim to identify specific factors that support more productive academia-industry partnerships, and they present various patterns and frameworks that tackle various challenges. All studies are grounded in real-world empirical research, conducted mostly in Europe, but also extending to Australia. The involved institutions include Simula Research Laboratory and SINTEF Digital in Norway, University of South Australia, Comenius University in Bratislava (Slovakia), the Technical University of Berlin (Germany), and Lund University (Sweden). The perspectives these papers offer thus have a particular emphasis (mostly) on European experiences.

2.1. Challenges and Issues

As industry-university collaborations involve partners with different goals and constraints, this can lead to various challenges and problems:

1. *Alignment of goals and expectations* [1,2]. The student and the supervisor produce academic work that demonstrates scientific rigor and often explores novel aspects. Industry partners, on the other hand, look for practical, ready-to-integrate, solutions.
2. *Timing and synchronisation* [1,2]. Deadlines and time spans set by academia do not always match well with time constraints imposed by industry. Synchronisation between academic staff and industrial partners is essential but may cause additional delays.
3. *Commitment and engagement* [1,2,3,5]. Having a sustained commitment of both parties is essential in industry-academia collaboration. If the industry contact is too busy then this could delay or block the student work. Conversely, if the student or supervisor are not sufficiently involved in the project, the industrial contact may lose interest.
4. *Access to resources* [1,2,3,5]. Many projects require access to critical resources that companies have, such as data, equipment, expensive computation power, or other internal facilities. Gaining access to these resources is sometimes hard to obtain. For example, it may be difficult to establish a contractual form of how things should happen so that the company is not affected by data leakage or various internal company processes are not affected in a negative way by exposing it to the student/supervisor.
5. *Background alignment* [1,2,3,5]. Even when the academic and industrial collaborators work in the same domain, they still come from different environments with distinct work practices, rigour and understanding. E.g., while practitioners may find it sufficient to have quick fixes or simpler/partial solutions that allow them to move forward, academics may search for more innovative solutions that are guaranteed to be correct but may be more difficult to implement.
6. *Definition of scope and responsibilities* [1,2]. Unclear responsibilities or poorly defined project scopes can lead to inefficiencies and failures. Students need a well-defined and manageable project that can be finished before the deadline. At the same time, industrial partners are often interested in integrating the results in their codebase/product, which sometimes is very difficult for the student. Some industrial partners tend to ignore the interest of the student and focus solely on their own interest.

7. *Intellectual property rights and private access to data* [3]. These are complex matters that should be handled by professionals but neither the academic institution, nor the company is really motivated to invest their time and resources into that.
8. *Building trust* and personal relationships [1,2]. Since a thesis involves a small number of key people (student, academic, industry contact), a relation of trust between these individuals is particularly important.

2.2. Best Practices and Recommendations

A very useful contribution of the reviewed literature is the good practices they suggest and the fact that they establish a framework for potentially successful collaborations.

A structured 7-phase process, designed to facilitate research knowledge co-creation and continuous joint problem-solving between academia and industry is **Certus** [2]. The phases include problem scoping, knowledge conception, development, transfer, exploitation, organisational adoption, and market research. The model aims to address collaboration challenges such as lack of relevance, commitment, and interest. Specific recommendations include the early clarification of intellectual property rights, promoting regular contacts with industry, building trust through early feedback, ensuring flexible project management, and tailoring outputs to different audiences. Cash investments from industry and relevant academic expertise are emphasised as critical enablers of sustained collaboration.

Evans et al. [3] propose a set of institutional, output, framework, and relationship enablers for successful university-industry collaboration. Key solutions include establishing a single point of contact at the university, stimulating engagement initiatives, and proactively building partnerships. Win-win outcomes must be targeted by balancing benefits for both sides, while legal frameworks like consortium agreements and patents are essential to simplify intellectual property management. Strong relationship management is vital: regular communication, transparency, trust, mutual respect, and top management support are emphasised. Academics are encouraged to be “business ready,” while practitioners must be active in building trust-based relationships.

Marijan et al. [1] propose patterns as reusable strategies to improve collaborations and avoid pitfalls through refactored solutions to common challenges. Key patterns include promoting active dialogue at every collaboration stage, developing minimum viable proof-of-concept tools early, encouraging frequent iteration and feedback, and involving industry practitioners in joint scientific authorship. Intellectual property management must be based on clear consortium agreements. Refactored solutions to anti-patterns suggest creating common vocabularies to bridge communication gaps and aligning reward systems to harmonise incentives. Overall, the paper stresses co-creation as a fundamental model where continuous engagement is the norm.

Focusing on communication as a core enabler, Rico et al. [5] highlight that research relevance, practitioner engagement, frequent interactions, continuity of participants, and mutual trust are key to successful projects. Recommendations include early agreement on research scope and goals, encouraging active involvement from both sides, holding regular meetings with key stakeholders,

and developing a shared understanding of terminology. These strategies aim to mitigate gaps in time horizons, interests, and responsibilities that often undermine collaborative efforts.

Finally, Jirapong at al. explore various collaboration formats between universities and start-ups, particularly targeting sustainability goals. They emphasise the importance of multi-channel collaboration—such as R&D cooperation, joint research projects, student engagement, consulting, and intellectual property licensing—to maximise benefits. Different entrepreneurial goals lead to different collaboration strategies: environmentally-driven ventures tend to use a broader range of engagement modes, while economically-oriented ventures focus on product development and expert consulting. Proper management of intellectual property, alongside diversified collaboration channels, is presented as crucial for achieving effective university-industry partnerships.

2.3. Our Recommendations

Based on the reviewed literature, we compiled a list of best practices and recommendations for successful academia-industry collaboration, shown below. The listed items might appear somewhat detailed or low-level, but this is intended, as bachelor's and master's theses are typically less complex than other projects (e.g., PhD research projects) and therefore require more precisely defined goals. Here is the list:

1. *Formulate research problems based on industry needs* [1, 2, 5]. This needs to be done via intensive interactions between parties. The key here is *communication*.
2. Establish a *follow-up team* (student, advisor, industry collaborator) for each research problem [1,2,3,5]. Put them in contact, give them many occasions to discuss in formal and informal meetings.
3. *Tune the effort* needed to solve a problem [1,2]. Sometimes the defined problem is simpler and can be solved in the short term, yet sometimes the problem is more complex and needs to be decomposed into smaller sub-problems. The problem and expected effort to solve it should be tuned to the expected time frame of a thesis.
4. *Establish the expected outcome* for each problem/task so that it is measurable in the end [1,2,5], even when the topic is more exploratory or open-ended. This brings benefits to both the company and the student. When establishing the outcomes, the team is practically forced to formulate concepts for the problem solution, which is essential for evaluating outcomes.
5. *Prototype implementation and testing* [1,2]. If the thesis involves the development of a prototype, this prototype should be assessed for its potential to solve the industrial problem.
6. The *stable members* of the teams [1] (supervisors, maybe PhD students, company collaborators) should have a *continuous collaboration*, approaching more research problems and familiarising themselves with each other's culture.
7. *Formalise administrative and legal conditions* of the collaboration. All these aspects should be agreed upon early in the process: IP rights, confidentiality and data privacy, access to resources, working schedule, contract and other specific agreements, and insurance.

8. These formal and legal conditions of the collaboration should be *managed by the university and facilitated* on behalf of the industrial partners, so as not to burden them with additional tasks they are not interested in handling.
9. Besides this list, one of the most important factors is to establish a *single point of contact* at the university [4], serving as the entry point for both companies and academics.

3. Interviews

This section discusses three interviews carried out according to the same protocol with three different universities across Europe, and maps the findings to some of the recommendations and good practices inferred from the literature review in the previous section.

3.1. Methodology

3.1.1. Interviewed Universities

- Babes-Bolyai University Cluj-Napoca, Romania
- University of West Bohemia, Plzen, Czech Republic
- NTNU Trondheim, Norway

3.1.2. Protocol

With each university, a recorded interview of 30 minutes with the questions detailed below was carried out. Based on the recording the interviewer then produced a transcription which was sent to the interviewed professor to be reviewed and approved.

3.1.3. Questions considering BSc/MSc Theses in Collaboration with Industry

Q1. Can you describe briefly the topic selection process:
- Who is proposing the topic?
- How is the student / coordinator assigned to the topic?

Q2. What is the role of the company:
- Coordination / support
- Providing access to resources
- Time spent in company (mandatory / recommended / …)
- Relation to internship

Q3. Formalisation:
- Does there exist a protocol between student / company or institution / university?
- How is IP (intellectual property) handled and managed? What about NDA issues?

Q4. Evaluation rules for theses (e.g., are there general rules for all theses or specific rules for industrial theses?)

Q5. Collaboration contacts:
- How to attract companies?

- How to motivate them?

Q6. Assessment of the current situation (e.g., do you have procedures in place, which is the approximate number of such theses defended per year?)

3.2. Results

Responses received from the interviewed universities:

3.2.1. Babes-Bolyai University Cluj-Napoca, Romania

Interviewee: Assoc. prof. Dan Mircea Suciu

Q1. Process: The topic is usually proposed by a company (in some rare exceptions, proposed by students themselves, who spent an internship or are currently working at that company). The supervisor of the thesis is a member of the department that will also maintain contact with the company adviser. How much this adviser is involved is based on a mutual understanding, not imposed by any procedure. Such procedures only refer to student responsibilities.

Q2. Company role: There is a coordinator from the company, who has the role of advisor for the technical part. Students might have access to company space, data, in which case there exists an NDA between student and company. No relation is imposed between thesis and internship, but for the master's studies, there are cases in which the student is doing his/her internship and the MSc thesis within the same company, but as separate activities.

Q3. Formalisation: There exists a document signed by student, university coordinator and company coordinator, including the following:

- The thesis should be public for examination;
- The student must respect the general conditions for thesis examination;
- The university supervisor is responsible for the coordination of the student thesis;
- The external (company) specialist has the role of advisor.

Q4. Evaluation: The evaluation rules are general, not specific for this type of thesis, including the fact that the development of a software application is a mandatory part of theses in computer science.

Q5. Collaboration contacts: There exist interests from local IT companies to collaborate with the university. The protocol of collaboration includes joint BSc/MSc theses. There is no specific strategy to attract companies for this.

Q6. Current situation: The procedures exist. For BSc, the number is very low (rare cases). For MSc, since the change of curriculum which includes one final semester with internship and research project, the number significantly increased (but decreased again after the pandemic). Estimated as 25% of such cases. More in the domains of Software Engineering and Databases, very few in AI master's programmes.

3.2.2. University of West Bohemia, Plzen, Czech Republic

Interviewee: Prof. Premek Brada

Q1. Process: Topics are preferred from companies that are official collaborators of faculty. There exists an online database of topics where companies can register their topic, which is managed by the department staff. The list becomes official after review from academic staff. In most of the cases, each company has a liaison, an academic staff as contact, which gathers ideas and formulates the topic together with the company. Students choose a topic from the database and then contact coordinators and company representatives. Some particular cases: i) students

working in companies might propose a topic; ii) an academic member has a topic and needs a company partner, usually through personal connection and iii) in very rare cases, the supervisor of the thesis is from the company.
Q2. Company role: The supervisor is from the department and the company provides an advisor. As mentioned above, in very rare cases the supervisor can also be from the company. The company provides access to resources. Regarding the time spent in the company: in most cases the students need to spend some time there; in some cases students even work part-time there, but no restrictions are imposed (it is just common practice). Internships are regarded as separate activities though, not connected to the thesis.
Q3. Formalisation: "No robust process in place", there is currently no standardised protocol or 3 party agreement.
A written agreement between company and faculty covering the process of student theses is not enforced but desirable. To facilitate the process, the faculty provides a document to the company explaining the steps, requirements, and process for a student thesis.
Regarding IP: According to Czech law, the thesis is a public document and the copyright belongs to the student. IP management, if needed, is treated case by case, the transfer of the IP to the company might be discussed in some cases (separate process that involves university and company). Remark: there is a need to improve this situation and to formalise the IP management better.
Q4. Evaluation: No specific evaluation rules for this kind of thesis, they obey the general rule. The general rule (implemented in most Czech universities): the thesis must be evaluated by an independent reviewer. In case of these theses the company advisor or another independent company specialist might act as the reviewer of the thesis. In conclusion, company specialists might contribute to thesis evaluation, but not on a mandatory basis.
Q5. Collaboration contacts: There exist several companies interested, and faculty needs to retain students to research and need to guarantee the quality of the thesis, thus the companies need to follow requirements for thesis elaboration. It is a challenge to propose "good" topics and to supervise as thesis adviser and not as employer. The department must trust that the process will happen as required, and as a consequence, official faculty partners are highly preferred.
Q6. Current situation: 10% to 20% of the students, depending on the study programme, choose a company thesis. In some cases, when the topic is more research oriented, for some study programmes the percentage can drop to 1-2%. The proposals should be aligned with the research interest of the department and of the study programme.

3.2.3. NTNU Trondheim, Norway

Interviewee: Prof. Letizia Jaccheri
Q1. Process: The department manages a portal for thesis topics; the proposals are introduced by academic staff, including those with industry and must have an academic staff as supervisor. There exists some special cases:

- students working or collaborating with a company come to the academic staff to ask for supervision of the thesis and they suggest the topic;
- the topic is proposed by a professor who needs an industry partner; the industry partner is selected by the professor through personal contacts.

Q2. Company role: The supervisor of the thesis is the professor, with the exception that it might be from the company if he/she is also an adjunct professor. The company provides access to resources. There is no relation to internships.

Q3. Formalisation: There exists a standard collaboration agreement in place signed between company, student and professor. According to Norwegian law, the copyright belongs to the student and the thesis is public. In some cases, if needed, the student can transfer IP to university, such that the university can then negotiate IP rights with the company. If needed by the project specificity, a NDA (Non Disclosure Agreement) can be signed between student and company and such a procedure exists.
Q4. Evaluation: There exists general rules, not specific for industry theses. The standards for MSc evaluation are very high and detailed so this might be a challenge for such a thesis. There exists the possibility that the company expert acts as evaluator of the thesis.
Q5. Collaboration contact: Attract companies through different actions: via LinkedIn, invite them to university, participate in industry events in the region/country. There are a lot of companies interested, so it is not a problem to attract them, but rather to assure the quality of the produced thesis and of the proposed topics. On the other hand, it is somehow difficult to attract them to research projects which would represent a more beneficial form of collaboration for the academic staff.
Q6. Current situation: Approximately 25% of the thesis are in collaboration with industrial partners.

3.3. Conclusion

The results of these 3 interviews show that universities consider the BSc/MSc theses in collaboration with industry as an important part of their overall cooperation agenda. While the procedures and level of formalisation might differ, many common points attest a uniform view of the academic community regarding these theses. These common points include:

- Requirement to have an academic supervisor of the thesis, to ensure academic standards, to track the progress of the student and to preserve scientific rigor;
- The evaluation process is uniform for all types of theses, including the ones in collaboration with industry, thus guaranteeing the same complexity, workload and scientific contribution;
- A main challenge highlighted by the interviewees refers to IP management.

Mapping findings to good practices and recommendations:

1. *Formulate research problems based on industry needs*. Collaboration is understood as a two-way path. The academic community is open to support industry needs and to supervise theses on these topics. At the same time, there exists a constant interest from the academic staff to find industrial partners for their research problems. This might represent the basis of further project funding opportunities.
2. *Establish a team (student, advisor, industry collaborators) for each research problem*. In all cases, this is the situation: the students have an academic supervisor and at the same time a mentor from the industrial partner. A good coordination and collaboration between these partners with regular meetings can be greatly beneficial for a good outcome.
3. *Tune the effort needed to solve a problem*. The academic supervisor has the experience and expertise to tune the effort. In most cases, the topic proposed by the company is first reviewed by the academic staff and then posted as a topic proposal. This process assures the requirements needed for any thesis.
4. *Establish the outcome for each problem/task so that it is measurable in the end*. According to the opinions from the interviews, these are part of the requirements for the BSc/MSc

theses, according to academic standards. Although our interviewees do not advocate for separate, specific requirements for industrial theses, a better formulation and agreement of the outcomes of such theses between the universities and their industrial partners can improve the collaboration. Communication is key.

5. *Prototype implementation and testing* and 6. *Legal conditions* of the collaboration: This aspect was not asked during the interview and not explicitly addressed by respondents, so this is one point that can be improved, namely to address further exploitation of the results (especially the practical part) by the company. IP management plays an important role here, and in all 3 cases this belongs to the student, but can be transferred to the company in specific cases.
6. *The stable members of the teams (supervisors, maybe PhD students, company collaborators) should have a continuous collaboration*: This good practice was expressed in all 3 interviews, and is usually based on personal contacts. One aspect that boosts the situation is if the collaboration is further funded from national or European research funds.

4. Case Studies

This section zooms in on two additional case studies of how collaboration on bachelor's or master's theses are conducted. The first case study are master's theses in collaboration with industry, by either computer science engineering or computer science students, at the school of engineering at UCLouvain university in Belgium (the case study details the situation as it is in

2025). The second case study is based on a report entitled “GI Recommendations for Conducting Student Thesis Papers in Industry”, written by the Gesellschaft für Informatik (GI) in Germany. It proposes a set of challenges as well guidelines that it recommends to be followed when conducting external student theses.

4.1. Master’s Theses in Collaboration with Industry at UCLouvain, Belgium

This first study reports on industrial collaboration and participation with industry in the context of master theses in computer science, computer science engineering, and other engineering degrees at the EPL school of engineering (Ecole polytechnique de Louvain) at the Université catholique de Louvain in Belgium.

4.1.1. Master’s theses at EPL

Master’s degrees in Belgium, and therefore computer science or (computer) engineering master’s degrees at EPL[1] in particular, require the development of a significant master’s thesis work and accompanying master’s thesis manuscript. The final project (thesis) is an original personal work (but can be performed by pairs of students as well). It gives the student(s) the opportunity to develop and apply skills and abilities in analysis, synthesis, and presentation in the context of a complex engineering problem. The final project includes a research and innovation component: the student must conduct a literature review, situate their work in relation to the state of the art, and explore theoretical or practical avenues with the ultimate goal of improving the state of knowledge on a given subject.
The master’s thesis work[2] aims at solving a complex problem arising from the engineering profession. Master’s theses range from technological and industrial projects (designed to introduce students to the engineering profession in industry) to applied or fundamental research projects (designed to introduce students to the engineering profession in research). Many dissertations combine these aims to varying degrees. The cross-disciplinary skills integrated into the dissertation are in line with the targeted learning outcomes: writing, communication, planning and argumentation, accounting for ethical, economic and societal aspects.

4.1.2. Proposing a topic in collaboration with a company

To propose master’s thesis topics, EPL professors post proposals on a platform. Students can then make their selection from the list of proposed topics and meet the professors to ask for more information on these topics. Master’s thesis topics in collaboration with a company[3] follow the same procedure. It suffices for a company to get in contact with an EPL professor who will submit the topic on their behalf and who agrees to co-supervise the work. Each master’s thesis topic, even those in collaboration with a company, is always (co-)supervised by an EPL professor who is in charge of the evaluation and follow-up of the work.

[1] https://www.uclouvain.be/fr/facultes/epl/rules-for-epl-master-theses
[2] https://www.uclouvain.be/fr/facultes/epl/master-theses-at-epl
[3] https://www.uclouvain.be/fr/facultes/epl/collaboration-with-companies

The topic description is a brief 1 page description mentioning the EPL professor, the company contact person, an outline and short summary of the proposed topic, including the research question studied (a university master's thesis topic cannot be purely development and should always carry a research and innovation component), the technical requirements (software, experimental devices, …), and whether an on-site presence in the company will be required (how long, which frequency).
Whereas companies can contact professors directly if they want to propose a master's thesis topic with them, the faculty also organises a matchmaking event with companies to explain the possibility and expectations for master's theses in collaboration with industry. During this event they also have the possibility to meet up with professors that may be willing to support their proposals and offer them to students.
Finally, students can also propose a master's thesis topic by themselves, possibly in collaboration with a company, but in that case too they will need to identify and convince a professor who is willing to support and propose their proposal.
Once the topics have been proposed, the company has limited choice over the students who would be assigned to their master's thesis topics. As for all other master's thesis topics, students make a first selection of 3 to 5 preferred choices and they must meet at least with the supervisor of their first choice. Every student should have equal chances to obtain a topic and no selection can be made based on mere academic grades or merits, nor can selective interviews with the students be organised. Topics are attributed by trying to maximise preferred choices among students and a good distribution of topics over the various academic supervisors.

4.1.3. Master's theses versus internships

Master's theses should be seen as distinct from internships that imply working during 9 weeks in the company. At EPL, and all master's degrees in Belgium for that matter, doing a master's thesis is obligatory for obtaining the degree. Depending on the degree, internships can be optional or mandatory. It is therefore possible for students to do a master's thesis *and* an internship, even with the same company, but these should be considered as two separate and different works, each with their own independent and different evaluation procedures. It is not allowed to make the same work or results count for both the master's thesis and the internship. It is also possible, in the context of a master's thesis, that students perform part of their work at a company, for example to have access to specific resources there, but that is not seen as an internship.

4.1.4. Intellectual property

According to the university's charter on intellectual property and valorisation, the default principle is that students own all results, including data, information, inventions, developments, discoveries, whether patentable or not, that they obtain during any project they undertake as part of their courses (and therefore also as part of their thesis). According to this principle, the student is therefore free to exploit and valorise these results as he or she sees fit. In theory, any course instructor or thesis supervisor should ensure that this principle is not called into question. However, this principle can conflict with the interests of companies in the context of particular thesis collaborations where they provide part of the data or solution and where they could be interested in owning potential outcomes of the thesis. In such cases it is possible and even usual

to deviate from this default principle and to condition the completion of the thesis on the signing of a contract transferring the results to the university or the company, provided that the student accepts these conditions. The student must be informed of this particular condition before choosing this thesis. Standard contracts for such situations can be provided by the university. Sometimes, companies prefer or require to use their own IP documents. This is not impossible but requires negotiation with and an agreement of the university's research administration.

4.1.5. Confidentiality

A final issue is related to confidentiality of the results. By default, the thesis text, once defended, will be published as a publically accessible document on an open platform. However, if the company wishes confidentiality of the results, it is possible to make an exception to this rule and make the document only partially public, or to put an embargo on the document so that it becomes public only after a certain time. Similarly, by default all master's thesis presentations are public. But again, for confidentiality reasons it can be arranged to have the presentations only with the jury members and have the jury members sign a non-disclosure agreement just before the presentation.

4.1.6. Conclusion

The situation at UCLouvain thus seems quite similar to that of the other universities that were interviewed (Section 3) and respects most of the recommendations issued in section 2.3.

The first four recommendations (formulate research problems based on the industry needs; establish a follow-up team of student, academic advisor and industry collaborator; tune the effort needed to solve a problem; establish the expected outcome) is done essential at the proposal writing phase. As explained in subsection 4.1.2, the topics are proposed by university professors in collaboration with the company. At this point, care is taken that the needs of both the company and university are addressed, the academic supervisor and industry (co-)supervisor are explicitly indicated, the expected effort and outcomes are assessed. Furthermore, since the academic and industrial advisors will jointly follow-up this thesis throughout the year, adjustments can still be made if the effort or outcomes would turn out to be unrealistic. Communication is indeed key.

Master's theses with companies are by nature typically of the more technological, applied or industrial kind, and less oriented towards fundamental research, which implies that they typically do involve protpotype implementation and testing, especially for informatics-related study degrees.

Some formalisation of the legal (IP and NDA) aspects is taken care of by the faculty with standardised documents and procedures, although some deviations to these documents and procedures are sometimes required due to specific company needs. The Vice-dean of student affairs is the default point of contact for such collaborations and streamlining of procedures, with the help of the faculty secretary.

4.2. GI Recommendations for Conducting Student Thesis Papers in Industry

Our second case study is based on a report entitled “GI Recommendations for Conducting Student Thesis Papers in Industry”, written in January 2010 by Ralf Reussner and Bernd Voigt on behalf of the Gesellschaft für Informatik (GI) in Germany.[4] It proposes a set of challenges and guidelines that it recommends to be followed when conducting external student theses.

This study focuses on theses that students complete, as part of their studies, in non-university environments (as opposed to thesis work conducted at university-affiliated research institutions, which are led by university staff and provide students with a university-like environment). External student theses involve the participation of an external (industrial) partner in defining the tasks and in supervising the thesis. An external supervisor working at the company is appointed to support the student throughout the duration of their thesis. Such theses provide an opportunity to foster and facilitate interactions between companies and universities.

To regulate all legal, confidentiality and liability issues and exploitation rights in advance, it is crucial that a *cooperation agreement* with the company is set up between the thesis supervisor and the company, or to rely upon a framework agreement that was set-up for more long-term collaboration. Such agreements should remain limited to what is necessary and may not restrict the use of the thesis paper. It is also important to ensure that the supervisors have access to all relevant documents from the external partner that are necessary for academic evaluation. The student remains the author of the thesis and holds the corresponding rights of use and exploitation, unless acquired by the university and/or the external partner within the framework of the contractual agreements.

By default, students work on their thesis at university, but deviations from this are allowed, provided that appropriate agreements are signed by the student and the external partner, clearly identifying the external supervision, time scope, required resources, and mutual expectations between the student and the external partner. Since the thesis corresponds to an evaluated activity as part of their master’s degree, it is not advisable that the student be paid by the company for their work during their master’s thesis. In any case, it is strongly advisable that the topic, expected outcomes, schedule and timeframe are explicitly agreed upon in a work programme agreed upon by the academic supervisor, the company, and the student, in advance. The company should provide the students as soon as possible with all necessary data, tools, and other resources necessary to perform their tasks.

Continuous coordination between all involved parties is important throughout the thesis process to detect deviations from the estimated schedule and adapt the work programme when needed. This calls for regular meetings between the external supervisor and the student and, ideally, occasional joint meetings with the internal supervisor to discuss both content and organisational

[4] https://www.informatics-europe.org/images/ECSS/ECSS2024/slides/ECSS24_GI.pdf

issues. The external supervisor should also attend the final presentation of the thesis and any interim presentations if applicable.

Interestingly, the GI also recommends a discussion between the academic supervisor and the external partner after completing the thesis, to discuss what they learned from their joint supervision in order to smoothen possible future collaborations. A discussion between the academic supervisor and the student about their experiences at the company can also provide very useful information about the collaboration.

Finally, while acknowledging the benefits of external thesis, they also highlight some particular challenges and risks of such theses. They offer added value to all participants (students, academics, and companies) by promoting exchange of knowledge and experience between companies and university research. Care must be taken however, that students don't become caught between scientific rigour and industrial utility. On the one hand, the thesis itself is usually assessed mostly on the basis of the written thesis document, which takes a significant amount of time to write. This leaves lease time for the actual implementation work that may be required to bring this more practical type of thesis to a good end and satisfy the needs of the company as well. Both aspects should be carefully balanced and taken into account in the final assessment of the students' thesis work.

5. Conclusion

Bachelor's and master's thesis collaborations are powerful mechanisms for bridging academic research and industrial innovation. However, their success depends on coherent policies, structured procedures, and sustained commitment from all stakeholders. By adopting the recommendations outlined in this report, universities, companies, and funding agencies can significantly strengthen the effectiveness, fairness, and long-term impact of such thesis-level collaborations. We conclude this document with a systems-level SWOT analysis based on the different observations, recommendations and conclusions highlighted earlier in this document.

5.1. Strengths

- Universities possess guidelines and procedures to implement BSc/MSc theses with industry
- Universities possess protocols and standardised documents to establish responsibilities and IP management
- High value for students to obtain industrial experience while performing academic activities
- Theses are developed for real-world use cases or closely related scenarios
- A long-term collaboration between academia and industry may lead to deeper collaborations where technology transfer may happen
- Collaborations may help students understand more about the industry needs while the industrial partner may learn more about their future employees

- The academic supervisor may gain insights about the real-world need of the industry
- The industry partner may gain insight in recent state-of-the-art technology and tools

5.2. Weaknesses

- Practical applications vs. scientific rigor: there exists the risk that such theses do not include the expected scientific investigation required for a BSc/MSc thesis.
- Lack of interest from industry when they feel there exists no immediate business outcome while allocating resources for the theses.
- Being proactive is a key factor in such industrial-academic collaborations but this is not always easy to obtain.
- It might be the case that the requirements of the industrial partner are either too complex or too simple for a thesis or not aligned with the programme the student is enrolled in.
- Possible complexities in IP negotiations.

5.3. Opportunities

- Joint theses as drivers for research funding proposals through partnerships initially created in the context of those thesis collaborations.
- Strengthened regional innovation ecosystems through better connections among regional actors, improved knowledge transfer, increased regional competitiveness, opportunities for follow-up projects, longer term partnerships.
- Enhanced talent pipelines: a stronger, more reliable, and better-prepared flow of graduates entering industry as a result of structured collaboration between universities and companies.

5.4. Threats

- Declining interest in fundamental academic research topics: as industrial theses become attractive for students, there exists the risk that more research-oriented topics proposed by academic staff are not chosen by students
- Potential industry disengagement if outcomes do not meet expectations

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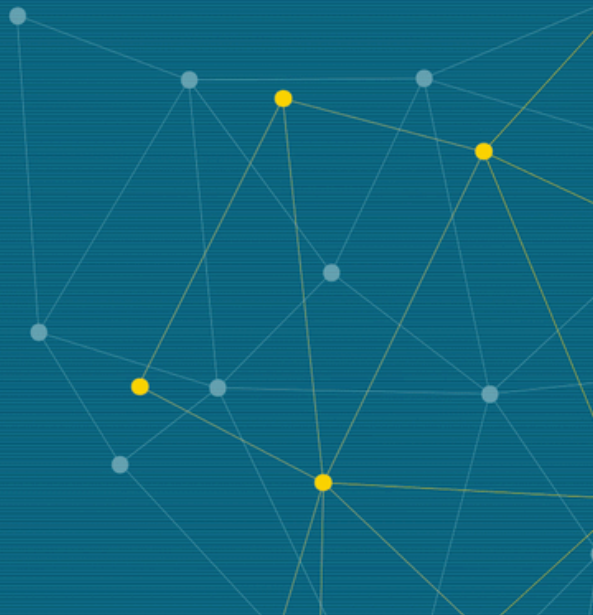
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