



# Business-academia cooperation model design

## Deliverable D2.1

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### Work package / Task

WP 2 Model, courses, knowledge and preconditions development  
Task 2.1 Business-academia cooperation model design

### References

Project description (Annex I to the Grant Agreement)

### Short description

The Deliverable provides good practices for business academia cooperation. These are based on findings and recommendations of tasks 1.1 and 1.2.

### Keywords

Business-academia cooperation, good practices



## 1. Objective

The overall scope of task 2.1 “Business-academia cooperation model design” is to develop good practices for business-academia cooperation, which facilitate the introduction and further advancement of new GI technologies in the business and academic sector in the partner countries. Such good practices shall enable a sustainable cooperation based on mutual interest of the involved parties and need to address the broader general conditions in the partner countries. The cooperation model will be based on findings and recommendations of tasks 1.1 and 1.2.

## 2. Scope

Task 2.1 “Business-academia cooperation model design” identifies actors and instruments (in terms of good practices) to

- a. involve the business sector in the modernisation of geoinformatics curricula (especially concerning technology related courses), and
- b. to involve the academic sector in expanding the business sector to new business areas in geoinformatics and linked sectors (business development).

In order to address relevant stakeholder groups, communication channels are identified to “spread the word”.

It has been agreed amongst the tasks T2.1 and T2.2 that the subtask “Development of a model for joint creation on business driven problem-based cases repository for technologically driven geoinformatics” as described in the DoW is covered by T2.2.

## 3. Basic principles

The following principles describe the foundation for the development of a business-academia cooperation model. Due to the setup of the GeoBIZ project team, the cooperation model focuses on best practices, which can be thoroughly implemented by actors from academia and business not needing an active buy-in of other parties. Thus, instruments involving e.g. governments on the regional and national level as well as the European Commission are deliberately excluded.



The cooperation model design is based on the following steps:

- Identification of Instruments to increase strategic commitment
- Identification of target groups
- Identification of cooperation fields
- Identification of supporting mechanisms
- Identification and development of best practices

### 3.1. Instruments to increase strategic commitment

According to [1] the strategic commitment of HEI and business to business-academia cooperation can be increased by:

- ensuring that both academics and business get greater benefits from their cooperation that contribute to both their short-term and long-term objectives, with focus on research / innovation outcomes;
- prior to implementing cooperation mechanisms, auditing the environment to have clarity about which supporting mechanisms are already in place and what is needed;
- providing a clear cooperation strategy and development policy which is aligned and included in the mission of the organisation;
- establishing an executive-level position that is responsible for business-academia cooperation and a person responsible for its execution;
- seek opportunities to remove barriers for business-academia cooperation, which primarily relate to lack of funding and resources;
- seeking ways to develop improved cross-cultural understanding between the academic and business environment.

### 3.2. Identification of target groups

Based on a thorough analysis of the D1.1, D1.2 and final report of “The State of University-Business Cooperation in Europe Project” (2018) [1] as well feedback from relevant stakeholders in the partner countries the following target groups were identified:



	<b>Higher Education Institutions</b>	<b>Private and (non-academic) public sector organisations</b> (in the field of geo-informatics, geodesy, ICT, related disciplines and beyond)
<b>Type of organisation</b>	<ul style="list-style-type: none"> <li>• Universities</li> <li>• Polytechnic / University of Applied Sciences</li> <li>• Research institutes</li> <li>• Faculties</li> <li>• Departments, centers and laboratories that are part of the faculty</li> </ul>	<ul style="list-style-type: none"> <li>• Governmental authorities</li> <li>• Public administration and agencies</li> <li>• Companies (small and medium enterprises, large enterprises)</li> </ul>
<b>Stakeholder group within the organization</b>	<ul style="list-style-type: none"> <li>• Rectors, deans, decision makers responsible for strategic planning</li> <li>• (Research) Project managers</li> <li>• Researchers</li> <li>• Project support staff (fund acquisition, controlling, etc.)</li> <li>• Persons in charge for programme and course development (teachers, administrative staff support accreditation processes, etc.)</li> <li>• Teachers teaching in geo-informatics (and related) courses</li> </ul>	<ul style="list-style-type: none"> <li>• Business developers, product / service developers, innovation / research managers</li> <li>• Knowledge management, human resources</li> <li>• Individuals with interest in teaching</li> </ul>

### 3.3. Fields of cooperation

Based on a literature review [1] identifies 14 business-academia cooperation activities. Since this structure confirms the results of D1.1 and D1.2, it will be used as a basis for the GeoBIZ business-academia cooperation model.



<b>Business-academia cooperation domain</b>	<b>Business-academia cooperation activities</b>
Education	<ol style="list-style-type: none"> <li>1. Curriculum co-design (e.g. business in curricula design)</li> <li>2. Curriculum co-delivery (e.g. guest lectures)</li> <li>3. Mobility of students (e.g. student internships)</li> <li>4. Dual education programmes (e.g. part academic / practical)</li> <li>5. Lifelong learning for people from practice</li> </ol>
Research	<ol style="list-style-type: none"> <li>6. Joint R&amp;D (incl. joint funded research)</li> <li>7. Consulting to business (e.g. contract research)</li> <li>8. Mobility of staff</li> </ol>
Valorization	<ol style="list-style-type: none"> <li>9. Commercialization of R&amp;D results (e.g. licensing, patenting)</li> <li>10. Academic entrepreneurship (e.g. spin-offs)</li> <li>11. Student entrepreneurship (e.g. start-ups)</li> </ol>
Management	<ol style="list-style-type: none"> <li>12. Governance (e.g. participation in business / HEI boards)</li> <li>13. Shared resources (e.g. infrastructure, personnel, equipment)</li> <li>14. Industry support (e.g. sponsorship, scholarships)</li> </ol>

### 3.4. Supporting mechanisms

To foster joint efforts, supporting mechanisms are needed, which aim to

- help reduce or eliminate the largest barriers,
- offer facilitators (e.g. common aims),
- provide incentives (e.g. recognition).

Thus, each of these guiding principles need to be reflected by the proposed good practices for business-academia cooperation.

## 4. Repository of good practices

The following sections provide detailed descriptions of good practice examples for business-academia cooperation, based on the structure introduced in section 3.3.



## 4.1. Education

### 4.1.1. Curriculum Co-Design

<b>Curriculum Peer Review</b>	
Addressed stakeholders	Academia: Persons in charge for programme and course development (teachers, administrative staff support accreditation processes, etc.) Business: Senior business representatives (from management, knowledge management, human resources etc.)
Joint goal	Provide a study programme, which is aligned with the needs of the labour market and which attracts new students due to high chances to find an adequate position in business or public administration.
Description of the cooperation measure	In the course (re-) accreditation processes of study programmes, business (or public administration) representatives are invited to review draft curricula from their professional perspective and to advise curriculum developers to align curricula to the business needs.
Expected outcome for each actor (stakeholder group) involved	Academia: Study programme, which “produces” graduates requested by the labour market. Business: Graduates / young professionals, who fit the company's needs respectively who do not need extensive on-the-job training.
Incentives for each actor involved	Academia: Growing number of students due to increasing reputation Business: Graduates, whose skill sets are matching the company's needs; increased number of graduates available on the labour market
Identification of major barriers and measures to overcome them	None.
Internal and external dependencies (e.g. funding)	None. Involvement of non-academic peers in curricula development might need to be authorized by the university's executive board (e.g. rector).
Examples /	Reaccreditation of the study programmes of the Department of



implementations	Geodesy at Bochum University of Applied Sciences
Editor	Andreas Wytzisk-Arens

<b>Permanent and ad-hoc participation of governmental agencies and businesses</b>	
Addressed stakeholders	Academia: Universities and Faculties Business: Governmental Agencies / Companies (small and medium enterprises, large enterprises)
Joint goal	Consulting for defining scope, platform and content of new curricula
Description of the cooperation measure	A) The Faculty of Geodesy has established a consulting body – Advisory Board in which representatives from Government (State Geodetic Administration) and geodesy-geoinformatics business sector are appointed. Board meets occasionally (when there is need) and discusses topics of mutual interest. When curricula are the topic Board is obligatory consulted and asked to provide opinion or information. B) When development of specific curricula is in question (e.g. defining new content of Postgraduate Specialist Study of Geodesy and Geoinformatics in 2020) ad-hoc tasks are established to prepare platform for development or modification of curricula where external stakeholders are expressing their needs and priorities paving the way for Faculty staff to write the new or modified curricula
Expected outcome for each actor (stakeholder group) involved	Faculties/Labs/Centers: New or modified curricula is better aligned with needs of main stakeholder groups enabling to develop curricula which will result in bachelor's and master's better fitted to and recognized by business and governmental stakeholders. Further, external stakeholders will share the credit for new or modified curricula and therefore also be more interested to participate in its execution. SME: will gain better understanding of curricula and teaching of such study programs and get on the market new professionals better fitted for their needs.
Incentives for each actor involved	Faculties/Labs/Centers: primarily, receiving valuable inputs from the external stakeholders and reducing the risk of missing the needs of society in the curricula creation or modification process. Secondary, opening doors for cooperation with external



	<p>stakeholders in latter teaching through interaction with them and benefiting from their contributions (targeted lectures, use of equipment, joint student projects, student training, blended mobility, etc.)</p> <p>SME: becoming a subject in process of creation or modification of curricula.</p>
<p>Identification of major barriers and measures to overcome them</p>	<p>Faculties/Labs/Centers: Reluctance to hear other opinions, views and accept external stakeholders as important subjects in process of development or modification of curriculum. Curriculum development or modification is a complex process and therefore it should be well prepared, barriers foreseen and addressed, also in specific cases through engaging open minded and communicative teachers in bodies which will discuss curricula issues with external stakeholders.</p> <p>SME: Lack of continuous cooperation between actors creates a situation in which external stakeholders are losing interest. Private sector is concrete and does not prefer long-lasting discussions. Create type of well prepared and focused cooperation between Faculties/Labs/Centers and private companies that are not ended after one successfully activity</p>
<p>Internal and external dependencies (e.g. funding)</p>	<p>Identification of academic and business representatives capable and willing to contribute to such activity.</p>
<p>Examples / implementations</p>	<p>Examples of consulting of Faculty of Geodesy University of Zagreb with external stakeholders (governmental agencies and private companies):</p> <ul style="list-style-type: none"> <li>• Work group established at Faculty of Geodesy University of Zagreb with task to define new content of Postgraduate Specialist Study of Geodesy and Geoinformatics in 2020) consisting out of Director of State Geodetic Administration of Republic of Croatia, President of Association of employers in geodesy and geoinformatics at Croatian Association of Employers (ongoing)</li> </ul>
<p>Editor</p>	<p>Željko Bačić</p>

#### 4.1.2. Education Co-Delivery





<b>Invited lecture</b>	
Addressed stakeholders	Academia: Departments, centers and laboratories that are part of the faculty Business: Companies (small and medium enterprises, large enterprises)
Joint goal	Direct interaction between representatives of businesses with students and teachers promoting direct transition of practical experience and projects executed by businesses.
Description of the cooperation measure	The Faculty of Geodesy has a tradition to invite representatives of businesses to deliver presentations about specific topics related to courses (mostly on Master study) presenting implementation of new technologies, solutions or demonstrating projects and experience in their execution. Another form of measure is the Colloquia of Chair of Satellite Geodesy (already organized 17 times) open for all audiences on which a) practitioners from Croatia and abroad are presenting their developments, research and experience and b) students are presenting best research projects.
Expected outcome for each actor (stakeholder group) involved	Faculties/Labs/Centers: Practitioners/Businesses developments, research, experience is directly communicated to students and teachers broadening their knowledge and understanding of specific topics and profession in general. SME: having opportunity to interact with students and teachers and through discussion with them gaining new ideas and possibility for further joint research. Making their businesses better visible to Master students attracting their attention to the specific company.
Incentives for each actor involved	Faculties/Labs/Centers: enriching the delivery of curriculum with real sector development, research, experience. SME: opportunity for presentation and attracting good students
Identification of major barriers and measures to overcome them	No barriers, only good will and planning necessary
Internal and external dependencies (e.g. funding)	Content and level of presentations/lectures should be well fitted in the course syllabus.
Examples /	Chair of Satellite Geodesy examples:



implementations	<ul style="list-style-type: none"> <li>• Chair of Satellite Geodesy Colloquia, Katedra SG - Kolokvij (unizg.hr) and presentation of best student's research projects in academic year 2020/2021 on course on Integrated Systems in Geomatics which took place on January 19th, 2021</li> <li>• Phase one (Danish company) representative lecture which took place on January 21st, 2021 in scope of course on Integrated Systems in Geomatics</li> </ul>
Editor	Željko Bačić

<b>Guest lecture</b>	
Addressed stakeholders	Academia: HEI (Department) Business: Small enterprises, INSTAT, Public agencies, individuals with interest in teaching from businesses
Joint goal	<ul style="list-style-type: none"> <li>• Offering recognized specialists the opportunity to share their own expertise, skills and knowledge with students;</li> <li>• Giving the students enrolled in Professional Master of Applied GIS the benefits of a unique teaching staff extended to specialists from businesses and Governmental authorities,</li> <li>• Developing partnerships and strengthening the UBC network.</li> <li>• Informing students of the existence of jobs for GIS specialists in the business world, Governmental authorities.</li> <li>• Put students in contact with those professionals operating with GIS and their networks.</li> </ul>
Description of the cooperation measure	<p>Guest lectures are invited by the Department with the proposal from the full-time professors/lectures and personal contacts. A list of proposals is approved in the Department then from the Dean and Rector. The Guest lectures approved are invited by the Head of the Department.</p> <p>In other cases it is an open call for guest lecture/s for specific courses and there is a commission who selects the winners.</p>
Expected outcome for each actor (stakeholder group) involved	<p>Delivery of lectures according to curricula with the latest findings that advance UBC. (HEI)</p> <p>Increase of students employability, enrichment of student learning, skill improvement.</p>
Incentives for each actor involved	Funding



Identification of major barriers and measures to overcome them	Lack of funding or low payment for the guest Lectures. Organizational culture of HEI and Businesses. Guest lectures sometimes find it difficult to collaborate and adapt to the HEI style of work.
Internal and external dependencies (e.g. funding)	Funding is low; Lack of joint projects etc.
Examples / implementations	In the Professional Master of GIS in the Department of Geography/UT are actually two guest lectures, one from the Business sector (SME) and one from INSTAT (Governmental).
Editor	Sonila Papathimiu

<b>Guest lecturers and study tours with students</b>	
Addressed stakeholders	Academia: Departments, and laboratories that are part of the faculty Business: Public companies Cadastral Agency and local cadastral offices
Joint goal	Achieve better results by using the same standards and methodology for GIS products in the country.
Description of the cooperation measure	A study tour was organized to show good practices at institutions. Lectures were combined with experts from KCA and local cadastral offices, and with the academic staff from the University.
Expected outcome for each actor (stakeholder group) involved	Current students as future experts will benefit from the shared knowledge and experience from institutions, experts, and academia. In the future, the institutions will benefit from skilled future experts.
Incentives for each actor involved	Usage of new technologies and methodologies are the main incentives for the stakeholders involved.
Identification of major barriers and measures to overcome them	Due to the pandemic situation, many activities were cancelled. While communication was carried out online.
Internal and external	N/A



dependencies (e.g. funding)	
Examples / implementations	N/A
Editor	Murat Meha

<b>Guest lecture to introduce a specific software</b>	
Addressed stakeholders	Academia: Universities and Faculties Business: Companies (small and medium enterprises, large enterprises)
Joint goal	Education e.g. in the use of GIS products
Description of the cooperation measure	To learn how to use a particular software (GIS) package in solving engineering problems (areas of application: environmental protection, urbanism, geodesy, smart cities...)
Expected outcome for each actor (stakeholder group) involved	Universities and Faculties: users (students and teachers) are familiar in using a particular GI-related software packages in several areas of applications Companies: they get students (or users) who are not just educated to use their software solutions, but also users who can improve their software solutions. They get users who know and understand the architecture of the system and users who can improve or refine it.
Incentives for each actor involved	Universities and Faculties: users (students) get education not just through guest lecture, but also through webinars, or participation in competitions with students from whole world (travel and cost of stay is covered by companies) Companies: free ideas they get from the competition, the pilot project that was realized, the improvement of their products and the verification of their products
Identification of major barriers and measures to overcome them	None



Internal and external dependencies (e.g. funding)	None, unless the software used is free of charge for teachers and students.
Examples / implementations	<a href="http://geoinformatika.uns.ac.rs/index.php/en/2020/03/25/registrations-for-gis-contest/">http://geoinformatika.uns.ac.rs/index.php/en/2020/03/25/registrations-for-gis-contest/</a> <a href="http://geoinformatika.uns.ac.rs/index.php/en/2019/11/19/supermap-workshop/">http://geoinformatika.uns.ac.rs/index.php/en/2019/11/19/supermap-workshop/</a>
Editor	Dušan Jovanović

<b>Joint student projects</b>	
Addressed stakeholders	Academia: Teacher Business: Domain expert (Project manager, Software Engineer, Developer etc.)
Joint goal	Allow students to develop competences relevant professional work in business and public administration
Description of the cooperation measure	Offer a compulsory course or elective, which includes project work. The student's project work is jointly supervised by an academic teacher and guest lecturer from business or public administration. The actual project can vary and can be adjusted to technical and scientific developments or to the individual expertise or research and development interests of the supervisors.
Expected outcome for each actor (stakeholder group) involved	Academia: Course content, which is highly relevant to practice; students prepared for working in business or public administration Business: Early contact to future graduates and thus to potential new staff; students, which are aware of competences, needed in practise; input to ongoing projects
Incentives for each actor involved	See expected outcome
Identification of major barriers and measures to overcome them	Resources needed from business partners, thus involvement of business partners should be backed by the management level. This can be achieved by aligning the involvement with corporate business goals or concrete project needs (planned staff growth, research-related work packages in ongoing projects etc.).



Internal and external dependencies (e.g. funding)	See identification of major barriers.
Examples / implementations	“Software development project”, which is - on different levels - part of both the Bachelor in Geoinformatics course and the Master in Geoinformatics course at Bochum University of Applied Science (5 ECTS each)
Editor	Andreas Wytzisk-Arens

<b>Industry support – joint organization of professional competition</b>	
Addressed stakeholders	Academia: Departments, centers and laboratories that are part of the faculty Business: Companies (small and medium enterprises, large enterprises)
Joint goal	Promoting profession, specific field of professional activities or student and young professional's activities in specific topic of developing applications based on use of Earth Observation data from EU Copernicus program.
Description of the cooperation measure	The Faculty of Geodesy has applied and was elected to organize one of 20 regional Copernicus Hackathons in 2019. In Zagreb. Recognizing the potential of Hackathon, Faculty has mobilized a broad spectrum of partners as partners in organization of this event. Beside funding from the EU, Croatian Ministry of Science and Education, Town of Zagreb and 7 private companies were allowed to organize the biggest Copernicus Hackathon in Europe in 2019.
Expected outcome for each actor (stakeholder group) involved	Faculties/Labs/Centers: Support in organization of events. SME: Public promotion through participating in event organization and sponsoring it.
Incentives for each actor involved	Faculties/Labs/Centers: profiling Faculty as academic institution which promotes and leads introduction of new technologies in the country SME: promoting companies as ones which deliver and support new technologies and support young people (students and



	professionals) in their development
Identification of major barriers and measures to overcome them	No specific barriers, except energy necessary to establish such cooperation.
Internal and external dependencies (e.g. funding)	Some preconditions are necessary to be created. First, a broader environment and understanding about the value of such endeavors accepted by partners that it has (great) value for all partners. When this is achieved, funding and publicity are not any more problems.
Examples / implementations	Examples Faculty of Geodesy actions which were supported by industry support: <ul style="list-style-type: none"> <li>• Copernicus Hackathon Zagreb 2019 was organized on October 23rd and 24th 2019.</li> <li>• Partners were EU, Ministry of Science and Education, Town of Zagreb, University of Zagreb Computing Centre and seven companies from Austria, Croatia and Slovenia.</li> <li>• There were 20 competing teams in two categories. In total some 170 participants</li> <li>• At the end of the event, conference was organized on October 25th and prizes handed in ceremony.</li> <li>• Great public attention has been raised. Several appearances on national TV and radio, in newspapers, etc.</li> </ul>
Editor	Željko Bačić

#### 4.1.3. Mobility of students

<b>Obligatory internships</b>	
Addressed stakeholders	Academia: Persons in charge for programme and course development Business: Human resources departments, business representatives with staff responsibility
Joint goal	Prepare students for future positions in business and public administration
Description of the cooperation measure	Compulsory module, which includes an internship for e.g. 10 weeks at an organization with a geo-information relevant business. The university may maintain cooperation agreements with relevant



	companies or organisations from public administration, to ensure a certain number of open intern positions in each study year. It's the student's own responsibility to apply for the internship.
Expected outcome for each actor (stakeholder group) involved	Academia: Students better prepared for working in business or public administration Business: Early contact to future graduates and thus to potential new staff; short-term tasks done by capable young staff
Incentives for each actor involved	Academia: see expected outcome Business: see expected outcome; possibility to convince high potentials that the own company is an interesting employer; savings by assigning short-term tasks to interns
Identification of major barriers and measures to overcome them	Insufficient number of intern positions, which could be overcome by arrangements with companies and organisations from public administration, which pledge themselves to offer a defined number of positions each year.
Internal and external dependencies (e.g. funding)	See major barriers
Examples / implementations	Obligatory internship in the 6th semester of the bachelor courses in Geoinformatics and Surveying of Bochum University of Applied Sciences.
Editor	Andreas Wytzisk-Arens

#### 4.1.4. Dual education programmes

<b>Dual education programme</b>	
Addressed stakeholders	Academia: Management level, persons in charge for programme and course development Business: Management level, human resources departments
Joint goal	Prepare students for future positions in a particular company or organisation from public administration
Description of the cooperation measure	Study programme with a significant practical orientation by combining academic studies with experience in a company. In addition to traditional Bachelor's and Master's programmes, it is





	<p>also possible to combine a degree programme with vocational training. On dual study programmes, practical experience is a component of the degree programme. If you choose a dual study programme, you also have to sign a contract with a company. The training then usually takes place at two separate locations: on the company's premises and at the higher education institution. Students gain two qualifications (an academic degree and a vocational qualification) in a relatively short time, along with valuable experience and many professional skills. In most cases, companies pay students on dual study programmes for their work and cover their tuition fees. The corporate contacts students establish during the degree programme will help to gain a foothold in interesting fields and improve chances on the labour market later on. Many of the companies that offer dual study programmes retain their former students as employees once they graduate. (DAAD, see <a href="https://t1p.de/4zpl">https://t1p.de/4zpl</a>)</p>
Expected outcome for each actor (stakeholder group) involved	<p>Academia: additional study programmes, often with a guaranteed number of students and financed by external partners Business: new staff respectively young professionals, who are “ready to start” right after graduation.</p>
Incentives for each actor involved	See expected outcome
Identification of major barriers and measures to overcome them	<p>Dual study programmes are usually not covered by public funds. Therefore long-term agreements between academia and business are needed to ensure a sustainable development and operation of dual programmes. To reduce costs it might be a strategy to join forces and to offer a dual programme for a group of business (or public sector) organisations with similar interests. However, this increases coordination efforts to develop and run a programme.</p>
Internal and external dependencies (e.g. funding)	See major barriers
Examples / implementations	See <a href="https://www.bibb.de/ausbildungplus/de/index.php">https://www.bibb.de/ausbildungplus/de/index.php</a> (in German only)
Editor	Andreas Wytzisk-Arens



<b>Dual education programme (e.g. part academic / practical)</b>	
Addressed stakeholders	ASIG INSTAT ALUIZNI Municipalities
Joint goal	Gain scientific and practical knowledge on real life aspects of GIS/RS use through hosting internships
Description of the cooperation measure	This cooperation is based on a joint agreement between the Department of Geography and target institution. Its aim is to facilitate the practical assignment phase (up to 3 months) and scientific research of students in Professional Master Programme. It is done by offering them mentoring and lab equipment to fulfil their tasks.
Expected outcome for each actor (stakeholder group) involved	Students: Professional experience Institution: Identification of potential new researchers
Incentives for each actor involved	Funding
Identification of major barriers and measures to overcome them	Up to now there has been a good collaborative environment between stakeholders and our Department. Joint projects are lacking.
Internal and external dependencies (e.g. funding)	Institutional agreement
Examples / implementations	Obligatory practical part in one of the above mentioned companies and governmental authorities in the fourth semester of the Professional Master in Applied GIS course of the Department of Geography/FHF/UT.
Editor	Sonila Papathimiu and Enkela Begu

#### 4.1.5. Life-long learning for people from practise



<b>Long Life Learning for people from practices</b>	
Addressed stakeholders	Academia: Departments, centers and laboratories that are part of the faculty Business: Companies (small and medium enterprises, large enterprises)
Joint goal	Interaction between academic staff and external stakeholders (both private and public sector) in creation of LLL training programs which will address needs of the people from the practices.
Description of the cooperation measure	Two approaches are possible: arranged or independently environment. In the conducted environment academic institutions arrange with external stakeholders (it could be a bigger company, professional association, or public authority) to provide LLL courses for a group of practitioners which in some manner depend on this subject. In this case it is on the academic institution and external subject to define the content, volume, duration and way of execution of LLL training through, usually some agreement or contract meaning also that the academic institution is not contacting practitioners directly. When an academic institution is independently offering LLL training it means that prior to the execution of LLL training communication with practitioners should be established through direct contact or some survey to find out needs of practitioners and in accordance with this prepare LLL training. While in the first case no pre-promotion or advertising is necessary, in the second case it is. Note that LLL training can be organized with and without participation fee!
Expected outcome for each actor (stakeholder group) involved	Faculties/Labs/Centers: LLL training is conducted benefiting financially to the institution and expanding influence among the practitioners (good training promotes better than any promotion activity). SME: Practitioners gain new knowledge and skills which they need.
Incentives for each actor involved	Faculties/Labs/Centers: spreading influence and (if) financial rewards. SME: more capable staff.
Identification of major barriers and measures to	Faculties/Labs/Centers: To create a habit between teachers and practitioners that an academic institution is providing valuable LLL training engagement must be invested in launching such activity



overcome them	which should always be understood as a permanent activity (not holding one training cycle and that's it). Staff delivering LLL training should have good knowledge about training offers and the needs of practitioners, being aware that reward will not come immediately, so some patience is necessary. SME: Confidence in academic partners that it will provide valuable LLL training.
Internal and external dependencies (e.g. funding)	Approach (arranged or independent) depends on the overall setup of specific profession and Faculty/Lab/Centres
Examples / implementations	Examples of LLL trainings provided by Faculty of Geodesy to practitioners: <ul style="list-style-type: none"> <li>• The Faculty of Geodesy delivers an annual LLL training program for the surveying engineers, members of Croatian Chamber of Licensed Surveying Engineers (HKOIG) where they have legal obligation to attend such training and collect a certain number of points (some 6-10 courses with 10-40 participants). All LLL training for HKOIG includes a participation fee.</li> <li>• In the period between 2012.-2020. The Faculty of Geodesy had organized six trainings for the teachers of geodesy and geoinformatics courses teachers in secondary professional geodesy and geoinformatics schools in Croatia. Those LLL courses were organized for targeted audience (15-20 annually) and without fee (partially co-financed by University of Zagreb)</li> </ul>
Editor	Željko Bačić

<b>Eurogeographics</b>	
Addressed stakeholders	<ul style="list-style-type: none"> <li>• Universities</li> <li>• Polytechnic / University of Applied Sciences</li> <li>• Research institutes</li> <li>• Public administration and agencies</li> <li>• Companies (small and medium enterprises, large enterprises)</li> </ul>
Joint goal	Enhancing knowledge transfer and doing applied research in the context of geospatial information management across Europe



Description of the cooperation measure	<ul style="list-style-type: none"> <li>• Lifelong learning for people from practice</li> <li>• Joint R&amp;D (incl. joint funded research)</li> <li>• Shared resources (e.g. infrastructure, personnel, equipment)</li> <li>• Industry support (e.g. sponsorship, scholarships)</li> </ul>
Expected outcome for each actor (stakeholder group) involved	Shared workshops, shared (small) projects, support for lifelong learning, enhanced knowledge transfer
Incentives for each actor involved	Being member of an European-wide network
Identification of major barriers and measures to overcome them	Financial resources to enlarge the project budgets Not for profit organization, so not drive to fully valorize the potential of the network
Internal and external dependencies (e.g. funding)	Membership fee for the members and associate members
Examples / implementations	EduServ courses
Editor	Joep Crompvoets

## 4.2. Research

### 4.2.1. Joint research and development

Publicly funded joint r&d projects	
Addressed stakeholders	Academia: Researcher Business: Business developers, research managers, product and service developer
Joint goal	Innovation in a geo-information related domain
Description of the cooperation	Cooperation partners identify research goals of joint interest and form a consortium (usually by involving further cooperation)



measure	partners). The consortium applies for research grants provided by public funding organizations, which has published a call for proposals within the scope of the planned project (e.g. EC, Ministry for Science etc.). Once selected by the funding organization, the consortium receives funds, which enables the partners to conduct the planned research activities. Business partners usually need to co-finance their contribution.
Expected outcome for each actor (stakeholder group) involved	Academia: Publications, thesis, prototypes, software, data, new methods, patents etc. Business: Prototypes, proof of concepts, software, data, new methods, patents, etc.
Incentives for each actor involved	Academia: Recognition; research output, which addresses real-world challenges; easier exploitation of research results and thus increased impact in practice Business: Competitive advantage, exposure to young professionals (and thus to potential new staff), access to experts not available in the organization, shared costs for innovations
Identification of major barriers and measures to overcome them	Often significant efforts are required to prepare a competitive research proposal, but even then funding is not guaranteed. Once funded, publicly funded research projects usually have a quite significant duration (often up to three years). In particular for business partners this is often too long to address arising market needs. Consequently publicly funded research projects should not address (short-term) business goals which are time-critical. Furthermore resource allocation of business partners is often an issue (R&D activities have to fit into resource plans defined by professional services, leading to dynamic resource allocations, which might be in conflict with work plans of academic partners). Consequently a joint time management is needed. In order to raise the priority of a research project, it should be clearly aligned with an organization's business goals. Joint research projects often suffer from the partner's different cultures of work. Thus open and intense communication as well as a transparent expectation management is needed.
Internal and external dependencies (e.g. funding)	Funding, resource allocation (see above), available (temporary) staff
Examples / implementations	Various R&D projects of the department of Geodesy at Bochum University of Applied Sciences (prospective.Harvest, WaCoDIS)



Editor	Andreas Wytzisk-Arens
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<b>Agreement with Public institutions for business-academia cooperation</b>	
Addressed stakeholders	Academia: Departments, and laboratories that are part of the faculty Business: Public companies Cadastral Agency and local cadastral offices
Joint goal	Consulting for defining and verifying the new methodology for performing specialized land administration tasks by applying new technology e.g. advanced digital photogrammetry and UAV technology.
Description of the cooperation measure	Education of the new coming experts for performing quality professional work. Monitoring the quality control work that has been done by third party. Improvement of work performance for certain phases.
Expected outcome for each actor (stakeholder group) involved	Students from the faculty will advance their knowledge and skills in the field and employees from the SME will be trained for the specific engineer tasks in accordance with new methodology and new technology.
Incentives for each actor involved	Usage of new technologies and methodologies which will enable the realization of engineering tasks and relative fields in a short time and low costs.
Identification of major barriers and measures to overcome them	One of the main barriers is the limited budget that is based on the law by the government, which prevents the implementation of new projects.
Internal and external dependencies (e.g. funding)	N /A.
Examples / implementations	N /A.
Editor	Murat Meha



<b>Joint Open Source Software Development</b>	
Addressed stakeholders	Academia: Researchers, students Business: Business developers, research managers, software engineers
Joint goal	Develop innovative open source software
Description of the cooperation measure	Academic research staff, students and partners from business jointly develop innovative open source software under an open source license. Due to the use of an open source software license, new contributors can easily join and business models can be built upon the contributions by third parties. The financing model depends on the fact, who the main beneficiary is. Possible are in-kind contributions, business funds to finance academic staff, the acquisition of (a series of) publicly funded r&d projects or a combination of those. To ensure sustainable development, it is advisable to develop a contributor and user community, which makes the project independent from a single funding line.
Expected outcome for each actor (stakeholder group) involved	Academia: software that can be used in research and education; academic staff trained in professional software development Business: software that be used in internal or customer projects; basis for innovative service offers; basis for proprietary licensed software packages (depends on the chosen open source license)
Incentives for each actor involved	Academia: development professional software development competencies; reduction of costs for projects needed for internal research and / or education work; network of developers / researchers with a common interest Business: software based on latest research results; reduction of costs; shared maintenance costs
Identification of major barriers and measures to overcome them	The developer community doesn't evolve. The project suffers from a lack of leadership. Good advise on how develop leadership in open source communities offers the Linux Foundation: <a href="https://www.linuxfoundation.org/resources/open-source-guides/building-leadership-in-an-open-source-community/">https://www.linuxfoundation.org/resources/open-source-guides/building-leadership-in-an-open-source-community/</a>
Internal and external dependencies (e.g. funding)	A major dependency for a (long-term) engagement in open source development is sufficient funding. The return of investment does either have to come from savings (e.g. by using the produced





	software for internal processes like education, process optimization etc.) or by providing upstream services (professional services, licensed software etc.)
Examples / implementations	52°North Initiative for Geospatial Open Source Software ( <a href="https://52north.org">https://52north.org</a> )
Editor	Andreas Wytzisk-Arens

<b>New technologies in teaching and professional practice</b>	
Addressed stakeholders	Academia: Departments, centers and laboratories that are part of the faculty Business: Companies (small and medium enterprises, large enterprises)
Joint goal	Introducing new technologies and solutions in teaching process and professional practice
Description of the cooperation measure	Private companies are providing equipment (hardware and software) as well some human capacities to the Faculty of Geodesy and Chair of Satellite Geodesy for research activities conducted by Master study students for various courses seminars, for Master thesis and for research of Chair staff. The students and chair staff are conducting research activities which include equipment testing, comparison of various equipment and development of new applications and solutions. Final result of such cooperation are on one side public documents (seminars, thesis, scientific articles) and on another side promotion for both Faculty and companies through various presentations at events and video clips produced.
Expected outcome for each actor (stakeholder group) involved	Faculties/Labs/Centers: can use newest equipment and software which we are not able to purchase for research and teaching work at the institution raising the level of quality of study at the institution in general. SME: new equipment and software has been tested and used for research and teaching.
Incentives for each actor involved	Faculties/Labs/Centers: Theoretical concepts are checked and implemented in research without delay due to the lack of equipment or software.



	SME: receiving results of research with specific equipment and software without investing much time of own staff and promotion for the private sector company producing or using specific equipment or software.
Identification of major barriers and measures to overcome them	Faculties/Labs/Centers: such type of cooperation requires additional engagement and communication with additional subject in research and teaching process which should be invested SME: Recognizing benefits of such cooperation and investing equipment, software and human resources in such cooperation.
Internal and external dependencies (e.g. funding)	Might happen that a company representing some global producer must ask for permission to enter such cooperation, but this is standard-wise allowed and supported by principals.
Examples / implementations	Examples of Faculty of Geodesy and Chair for Satellite Geodesy at Faculty of Geodesy University of Zagreb about R&D cooperation: <ul style="list-style-type: none"> <li>• Faculty of Geodesy has agreements with representatives of global companies for free use of a specific number of their products licenses (AutoCAD, ZWCAD, Arc-online, Trimble software, etc). Those agreements are automatically extended each year.</li> <li>• Chair of Satellite Geodesy become partner of Trimble company in testing</li> <li>• Chair of Satellite Geodesy has established cooperation with Croatian companies (GDi – representing ESRI), Geocentar (representing Topcon) and Geomatika Smolčak (representing Trimble) in a way that we are testing new products of their principals and reporting findings through Master study student research (seminars), Master thesis and scientific articles.</li> </ul>
Editor	Željko Bačić

#### 4.2.2. Consulting to business

Consulting for specialized engineering tasks	
Addressed stakeholders	Academia: Departments, centers and laboratories that are part of the faculty Business: Small and medium enterprises, large enterprises



Joint goal	Defining and verifying the methodology of performing specialized engineering tasks and jobs (for example creating orthophoto from satellite images, appliance of lidar technology)
Description of the cooperation measure	Education of personnel for performing special engineering work. Organization of personnel for performing special engineering work. Organization of work, organization of quality control, organization of improvement of performance of certain phases.
Expected outcome for each actor (stakeholder group) involved	Academia: Methods of work on special engineering tasks have been checked, improved, and well defined. Business: Employees in companies/SME are trained how to work on special engineering tasks.
Incentives for each actor involved	Academia: theoretical concepts are checked, additional funding for research, development and equipment Business: to complete the work in a quality manner and in accordance with all rules.
Identification of major barriers and measures to overcome them	Academia: Funding are conditioned to have to work according to the budget rules (all type of extra funding on state universities/faculties/labs/centers are problematic, because that kind of funding must be strictly done according to the laws for state institutions) Business: They have more flexibility in funding, laws are different for private and for public(state) companies (labs/centers on state faculties) Unstable communication between actors, solution is to build a stable concept of communication. Lack of continuous cooperation between actors. Create a type of cooperation between Faculties/Labs/Centers and private companies that are not ended after one successful job.
Internal and external dependencies (e.g. funding)	Responsibility that exists during the realization of the joint tasks/jobs, and that job is well done. Obtaining a positive reference after successfully completing the job.
Examples / implementations	Responsibility that exists during the realization of the joint tasks/jobs, and that job is well done. Obtaining a positive reference after successfully completing the job.



	<p>Examples of consulting of Center/Laboratory of Geoinformatics (FTS, UNS) with public and private companies:</p> <ul style="list-style-type: none"> <li>• creating digital orthophoto, DEM and DSM for the area of municipality Subotica (Lidar and multispectral camera)</li> <li>• creating digital orthophoto for the whole area of the Republic of Serbia using high spatial satellite images (GeoEye1, WorldView 2,3)</li> <li>• creating digital orthophoto for the whole area of the federation of BiH using high spatial satellite images (GeoEye1, WorldView 2,3,4)</li> <li>• creating orthophoto, classifying lidar data, and creating 3D models of 800 km of power line network using LIDAR technology</li> </ul>
Editor	Dušan Jovanović

## 4.3. Valorization

### 4.3.1. Spin-off Companies

<b>Founding a spin-off company</b>	
Addressed stakeholders	Academia: University, University departments Business: Companies (small and medium enterprises, large enterprises)
Joint goal	The creation of spin-off companies is one of the technology transfer mechanisms through which knowledge and/or intellectual property are transferred, and by which those research results are commercially exploited. This implies that the economic activity of a spin-off company is based on scientific knowledge or technological know-how developed within the university, possibly in collaboration with the private sector. The spin-off company translates these research results in commercial products and/or services. Spin-off companies might be a joint initiative of a department of the university and existing private companies, but they also might be initiated by the university only. In short, in order to speak of a spin-off company, there has to be at least a transfer of knowledge



	or technology from the university to the spin-off company. <sup>1</sup>
Description of the cooperation measure	KU Leuven has set-up a dedicated Technology Transfer Office that supports the set-up of a spin-off in different ways and that guides the entity of the university involved in their efforts to create and to make the spin-off successful. They defend the interests of those entities and help in a balanced approach if the spin-off is a joint idea from the university entity and an existing private company. LRD helps to develop a good business plan, validate the market, put together a strong team, elaborate a roadmap to grow the company, etc. (here is how LRD can support the spin-off set-up process: <a href="https://lrd.kuleuven.be/en/spinoff/service">https://lrd.kuleuven.be/en/spinoff/service</a> and <a href="https://lrd.kuleuven.be/en/spinoff/faq-spinoff">https://lrd.kuleuven.be/en/spinoff/faq-spinoff</a> ).
Expected outcome for each actor (stakeholder group) involved	Faculties/Labs/Centers: Research results are translated into new products that serve the real world. It allows to commercialize the ideas and original findings and will generate value, not necessarily funding streams. <sup>2</sup> Companies: If a company is involved in the set-up of a new spin-off it gains from the solid support of the university.
Incentives for each actor involved	Departments: They become visible players in the external world, they see their research results being taken up in the real-world; it provides a 'name' and reference for attracting new funding. It might also be a mechanism for having job-positions for ex-researchers, offering new opportunities Companies: They have faster access to resources and get direct support (they might benefit from direct financial support); they get

<sup>1</sup> For the full list of spin-offs of KU Leuven, see <https://lrd.kuleuven.be/en/spinoff/spin-off-companies>. Please note two spin-offs in the geospatial sector - <http://www.geoautomation.com/> which was created by the Department of Engineering (ESAT) and a company SPC and Luciad which was a spin-off of the Department of Computer Sciences and which was bought a few years ago by and integrated within Hexagon <https://www.hexagongeospatial.com/>.

<sup>2</sup> The relationship between the spin-off company and the university is also to be clearly defined: "A spin-off company is a separate legal entity. It operates independent from the university. It is however clear that in the initial phase the university is important. On the one hand the university is a R&D partner for turning the research results into commercial products and/or services, and on the other hand it is a networking partner to bring the founders into contact with potential customers. This implies that for the success of the spin-off company, there has to be a clear difference in focus and activities compared to the originating research group(s). By means of a technology transfer agreement, it is clearly defined which research results are transferred to the spin-off company, and which research results remain in the research group(s). Very often the spin-off is also given a 'first right of refusal' on future results, within a certain time frame, to be obtained at market conditions. By means of a collaboration agreement, the commitment of the research group, both in terms of invested time and money, is determined."



	also support in an indirect way (legal support, access to infrastructure ...)
Identification of major barriers and measures to overcome them	For both <sup>3</sup> : Setting-up a successful spin-off is not so easy, it is a complex/demanding process that requires many steps. In setting it up jointly, this becomes even more complex, e.g. identifying correctly who 'owns' and 'contributes' what in the new company. Division of tasks, ... Departments: what to put in the spin-off, what remains part of the activities and portfolio of the department Companies: when does the creation of a new company pays off; why not further develop the existing company
Internal and external dependencies (e.g. funding)	Besides the relationship between the university and the spin-off company (see higher/footnote), the most challenging is to set the spin-off company in the market at the right time.
Examples / implementations	<ul style="list-style-type: none"> <li>• Geoautomation</li> <li>• Luciad</li> </ul>
Editor	Danny Vandenbroucke

## 4.4. Management

### 4.4.1. Sharing resources

Sharing equipment I	
Addressed stakeholders	Academia: Departments, centers and laboratories that are part of the faculty Business: Companies (small and medium enterprises, large enterprises)
Joint goal	Allow application and verification of new technologies

<sup>3</sup> At KU Leuven there is also an example of a non-successful set-up of a joint spin-off: DFC and SADL/KU Leuven had a joint project for the Flemish Government in which OSS components (GEGIS) were developed. The joint set-up did not succeed because of different visions between the university and the company. Finally the company created their own new company on their own which became ultimately Geosparc (<https://www.geosparc.com/en/about-geosparc>).



Description of the cooperation measure	Cooperation between departments, centers and laboratories that are part of the faculty and private companies in using new technology for the needs of business activities. It often happens that the infrastructure at the faculties is better developed than in small and medium enterprises (using a large number of computers or any other kind of infrastructure, for the needs of business activities - faculties can offer better resources for carrying out demanding projects). On the other hand, private companies can more easily purchase modern pieces of equipment (they don't need to fulfil complicated procedures in buying equipment from abroad).
Expected outcome for each actor (stakeholder group) involved	Faculties/Labs/Centers verify the use and necessity of new technologies/ equipment/educated personnel/infrastructure. SME become aware of the capacity that is lacking in such institutions in the realization of different projects where new equipment/educated personnel/infrastructure is necessary.
Incentives for each actor involved	Faculties/Labs/Centers verify new technologies and concepts, and get funding for research, development, and equipment. SME cannot complete the job efficiently, in quality and quickly, make higher profits and reduce costs without additional knowledge/ new technologies/ equipment/educated personnel/infrastructure.
Identification of major barriers and measures to overcome them	Often in the first steps in cooperation between private companies (SMEs) and Faculties/Labs/Centers, distrust towards new technologies. SMEs have ignorance on new technology/equipment and doubt that some projects can be done in such a way because the new technology has not yet been verified on this type of application. Measure to overcome this mistrust between actors, is in involving key responsible people from SMEs in all parts of cooperation.
Internal and external dependencies (e.g. funding)	Dependencies between staff on both sides. Teamwork SME must finance Faculties/Labs/Centers costs of using infrastructure
Examples / implementations	Examples of using new kind of equipment: <ul style="list-style-type: none"> <li>● using of ground penetration radar (GPR)</li> <li>● using Lidar data for education purposes (create smart cities model)</li> <li>● creating digital orthophoto (40cm) for the whole area of the Republic of Serbia using high spatial satellite images (GeoEye1, WorldView 2,3) instead aerial images</li> </ul>



	<ul style="list-style-type: none"> <li>creating digital orthophoto (30cm) for the whole area of the federation of BiH using high spatial satellite images (WorldView 4)</li> </ul>
Editor	Dušan Jovanović

<b>Sharing equipment II</b>	
Addressed stakeholders	Academia: Faculty, departments, and laboratories that are part of the faculty Business: Companies small and medium enterprises
Joint goal	Improve skills and knowledge of application new technologies as much as possible
Description of the cooperation measure	In coordination with the Private company "NEWS" ShPK, which is a licensed geodetic company in Kosovo, during the last 3 years has managed to perform UAV flights with our students. Private companies offered new technology (UAV) and trained personnel. Students participated during the preparation and drone flights, establishing the GCP and other field tasks. This combination works well, and shows good cooperation in business activity Faculty- Private company.
Expected outcome for each actor (stakeholder group) involved	Working in partnerships in the realization of different professional projects, offers more skills and knowledge for students and employees at the private company.
Incentives for each actor involved	Create a base for creativity and future development. This will open the door to attain skills and knowledge to enter new market in geodesy, geoinformatics, GIS and related fields.
Identification of major barriers and measures to overcome them	N/A
Internal and external dependencies (e.g. funding)	N/A





Examples / implementations	N/A
Editor	Murat Meha

#### 4.4.2. Industry support

<b>Scholarships</b>	
Addressed stakeholders	Academia: Students Business: Human resources
Joint goal	Support promising students
Description of the cooperation measure	Financial support of students, e.g. based on the study performance, commitment, social status etc. Business partners provide funds, which are paid to selected students on a regular basis (e.g. monthly) for a certain time period (e.g. one year). The application and selection process can be organized by the funding organization, the academic partner or jointly.
Expected outcome for each actor (stakeholder group) involved	Academia: Students, who are financially secure and thus can concentrate on their study Business: Early access to skilled students and thus to potential new staff; reputation and visibility
Incentives for each actor involved	See expected outcome
Identification of major barriers and measures to overcome them	Business partners may be reluctant to invest in students they do not know. A selection procedure which involves the sponsoring organization and / or allows direct contact to candidates.
Internal and external dependencies (e.g. funding)	Eventually dependent of public co-financing
Examples / implementations	Germany Grant (“Deutschlandstipendium”) (50% co-financed by the German Ministry of Education and Research), <a href="https://www.deutschlandstipendium.de/de/english-1700.html">https://www.deutschlandstipendium.de/de/english-1700.html</a>



Editor	Andreas Wytzisk-Arens
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