DEVELOPMENT OF A SKILL ECOSYSTEM IN THE VISEGRAD FOUR COUNTRIES – PROSKILL

Miskolc, 2022

RawMaterials ACADEMY

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Content

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CHAPTER 1.
ProSkill: a project for co-development of Earth science engineering and business skills in higher education

Tamás Bakó – Norbert Németh – Tekla Szép – Krisztina Varga – Viktória Mikita

ProSkill is an EU project in Hungarian-Slovak-Czech-Polish cooperation, coordinated by the University of Miskolc. It is aimed to the harmonization of the skills and competences of the graduates and of the demands of the labour market. The future professionals working in the raw materials sector have to possess technical, business and communication skills as well, and utilize these skills with a complex approach and cooperative attitude.

Introduction

The project presented below was driven by the need for higher education in economics and engineering to keep pace with industry development: to educate graduates who meet the current and likely future expectations of the industry. The current trends show that, on the one hand, the tasks of professionals will change significantly during their active lives, and on the other hand, those who are equipped not only with knowledge of the narrower field but also with complex information processing capabilities and are able to see through both its economic and other social aspects, will benefit.

The competitiveness of each industry is largely determined by the abilities and skills that employees have. Most researchers agree that in the next decade, education systems will not be able to fulfill the task of giving knowledge to future workers and employees and developing competencies that will be key to the labour market in the future (e.g., Bartlett, 2013). Lack of skills and competencies, inadequacies or insufficient levels for a given task can be a problem (Cappelli – Keller, 2014). The EU organization Cedefop (European Centre for the Development of Vocational Training) points out that there is a significant gap between the skills and qualifications required by market participants (Skills Index, 2020). In the case of Hungary, the fit according to the European Skills Index calculated from several factors is 57%, so there is a 43% chance of improvement, mainly in the field of vocational training, where Hungary is among the last in the EU according to the sub-indicator.

Although recycling is expected to account for an increasing share of the circular economy model, the use of minerals will certainly increase in the medium term (especially for those materials for which there is insufficient recyclable waste (Moser – Feiel, 2019). Although labour force growth is generally projected to be minimal in the mining and extraction sectors over the next decade, a growing shortage of labour with the right skills and competencies is projected (Cedefop, 2016).

Figure 1: Logo of the ProSkill project

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The ProSkill project - creating a skills development ecosystem in the Visegrad Group (V4)

The ProSkill project will run from 2020 to 2022. Participants representing higher education in the four countries are the University of Miskolc (project coordinator), the Silesian University of Technology (Gliwice, Poland), the Slovak Technical University in Bratislava and the Technical University of Ostrava (Czech Republic), and the European Federation of Geologists (EFG). At the University of Miskolc, two talent management associations, the Hantos Elemér College for Advanced Studies of the Faculty of Economics and the Natural Resources Research and Utilization College for Advanced Studies of the Faculty of Earth Science and Engineering will be involved in the tasks related to the project. In any case, the project is a close collaboration between the two faculties, and dozens of instructors have been involved in each task so far.
10% of the project's budget of around € 600,000 will be financed from own resources, with the rest funded by the EIT RawMaterials (European Institute of Innovation and Technology - Raw Materials Division). Its mission is to develop the sustainable competitiveness of European institutions and economic actors dealing with primary and secondary raw materials throughout the value chain by fostering innovation, education and entrepreneurship, and its vision is to make the raw materials sector one of Europe's main strengths [1]. Through its calls for proposals, it encourages participants to develop cooperation between industry, higher education and research institutes, as well as at regional level. The University of Miskolc, especially the Faculty of Earth Science and Engineering, has a number of other projects promoting education and development in the raw materials sector (Table 1), and the Faculty of Economics has been the leader of LIMBRA project aiming to expand the entrepreneurial skills of engineering students [2]. This list also demonstrates the university's commitment to providing state-of-the-art and internationally sound education.

Table 1: Additional EIT RM projects with the participation of the Faculty of Earth Science and Engineering of the University of Miskolc

Project name and duration	Short description of the project
TRAINESEE 3 2020-21	Educational Methodology Capacity Building Project at six universities in Eastern and South-Eastern Europe, strengthening skills ranging from science to business competence.
ENGIE 4 2020-22	Increasing the interest of high school girls in careers in earth sciences and engineering, increasing the proportion of women in these fields.
MOBI-US 5 2020-21	Creating mobility windows for MSc students in raw materials-related education between universities in Eastern and South-Eastern Europe.
AMIR-RIS 6 2019-21	Providing high quality Masters' degrees in materials science with international mobility, with a focus on recycling technologies.
OPESEE 7 2018-22	Launch of an international triple degree Master's program to educate maintenance engineers for the raw materials sector.
DIMESEE 8 2021-24	Organizing and conducting international training in the field of mining, raw material exploration and raw material processing for industry professionals and university staff in Eastern and South-Eastern European countries.
UNEXUP 9 2020-22	Design and creation of underwater exploration robots capable of independently exploring flooded mining areas for future utilization of remaining mineral resources.
RM@Schools ESEE 10 2020-22	Organize programs to make science education and careers in the raw materials sector attractive to young students.
MINETALC 11 2020-23	Validation of an economically attractive, environmentally sustainable, socially acceptable mining-backfilling process for medium-poor mineral deposits.

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The ProSkill project has a dual purpose. On the one hand, it develops a "skills development ecosystem" concept (Figure 2), examining what knowledge-based and human skills are lacking in the raw materials production and processing sector, where there are skills problems (mismatches, discrepancies and gaps), and what strategies can be used to solve the problems. On the other hand, it is developing a strategy to achieve a high level of skills, complemented by an action plan. An important aspect of this is the training of trainers, the introduction of new and innovative teaching methods and the renewal of curricula. We are also testing the methods at the two colleges for advanced studies and at the partner universities.
The project consists of five task groups ("work packages"). The first is project management, in the framework of which project activities are coordinated, controlled and supervised. The coordinating tasks are performed by the University of Miskolc. The second is the communication and information part, where the information about the events related to the project is provided both through social media and using other channels, aiming to reach as many people as possible. Dissemination and marketing materials are produced in this group, making intensive use of the opportunities offered by social media. The work is led by the European Federation of Geologists. The third package is the development of an ecosystem strategy for skills development, which has already been fully implemented under the leadership of the University of Miskolc. The aim of the fourth project unit is to modernize teaching methods and curricula, to adapt them to the requirements of the changing environment, which ensures the long-term sustainability of the results of the ProSkill project. The Slovak Technical University in Bratislava is in charge of this task. The aim of the fifth work package is to raise the professional standards of colleges for advanced studies, talent management and to harmonize methods between the participating universities. All this is done through mentoring programs, participation in international competitions, factory visits, reward systems, consultations with experienced business people and other creative techniques under the supervision of the Silesian University of Technology.

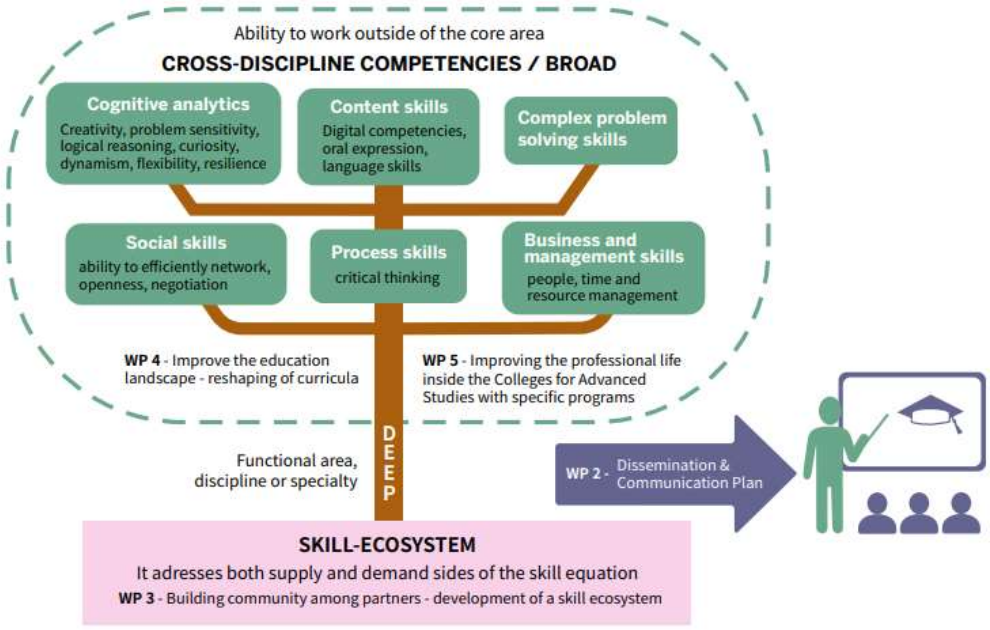

Figure 2: Model of the ProSkill project

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Results of the first year and a half

At the end of January 2020, the implementation of the ProSkill project started with a two-day kick-off meeting, which was attended by representatives of the five participating institutions and organizations, as well as a representative of the EIT Raw Materials. A Project Steering Committee has been set up to continuously monitor and supervise the program, and the partner universities and the European Federation of Geologists have been introduced. A few weeks later, an agreement for the ProSkill project was signed by the partners, setting out the rights and responsibilities of the participants, as well as the main rules for cooperation.
It was the time when the coronavirus epidemic appeared in Europe (and then worldwide). This required a number of changes to the original plans, a significant change of the budget, the schedule of the programs and the order of the various events, and the way in which they were carried out. In most cases, online forms had to be chosen instead of a personal presence due to the restrictions that came into effect. Nevertheless, the project started in June and was broadly in line with the original timetable [12]. We also plan to publish the results of the ProSkill program on an ongoing basis; the following is a brief summary of what has already been completed and what is expected.

Survey on actors in the raw materials sector

The first important task was to prepare a unified questionnaire to assess the expectations of companies in the raw materials sector in the V4 countries regarding the competencies of graduates leaving universities that employers consider to be an advantage when hiring them. These were translated from a unified English master text into national languages by our colleagues. Respondents included companies engaged not only in mining but also in the processing and use of raw materials. However, businesses involved in the extraction and processing of energy sources were not included in the analysis. A total of 216 companies in the four participating countries completed the questionnaire. We then conducted in-depth interviews with representatives of 35 selected partners to clarify expectations regarding student competencies.
Regarding the results, the respondents indicated such important expectations about the graduates as the ability to analyse, complex vision, knowledge of foreign languages (mainly English), communication skills. Two competencies were identified as particularly important: verbal communication skills and the ability to cooperate. The most important of the technical competencies was that the recent graduate was “able to perform technical and engineering tasks corresponding to his / her degree”.
The second important task was to assess the competencies of students when starting university. To this end, we purchased a user license for the Vienna system [13], which was developed to perform online psychological tests, and used it to test the competencies of a total of 161 students from the four countries. Based on the results, there were gaps in communication skills, teamwork, and resilience.
After learning about the expectations of employers and the abilities of students starting their studies, the third important task (a key task for the first year of the project) was to develop a strategy by the end of 2020 that could reduce disparities by changing teaching methods accordingly. We plan to publish this later in a separate publication.

Events

According to the original plan, we would have held programs to present the ProSkill project in connection with Earth Day in April 2020, but due to epidemiological constraints, we had to change. In November, we organized an online roundtable conference on well-known experts on Researchers’ Night, also at V4 level, where sustainable development was a central topic. A total of 678 people attended the online events.

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Another important event was the organization of national conferences entitled “Challenges for the Raw Materials Sector for Industry 4.0”. At these conferences, 168 presentations on the topic were made available on the project website [13]. The Hungarian conference was personal but the others were online - also due to restrictions on the coronavirus.

Talent management

Talent management plays a very important role in bringing students’ skills closer to the expectations of economic actors through more modern teaching methods. Of the four participating countries, only Hungary has a system of colleges for advanced studies, where the most talented candidates have the opportunity to receive special education according to their abilities, take part in competitions and receive research assignments. In the other three countries in V4, this is unknown in this form, they select and mentor talented students in a different way.
Therefore, one of the important tasks of 2020 was to coordinate and harmonize the talent management methods of the four participating higher education institutions, as this is an essential element in the development of the skills development ecosystem. The methods of nurturing talent were harmonized through a working group set up for this purpose by the four universities by October 2020, and by the end of January 2021, a qualification and reward system for talented students had been developed.

Tasks for 2021

Due to the continuing epidemiological constraints, parts of the program requiring travel had to be postponed or moved to the online space in the first half of 2021. The main task of the year is the practical implementation of the developed strategy. It focuses on educating teachers and talented students through a variety of qualified mentors to strengthen and demonstrate the practical application of the skills and methods outlined in ProSkill’s strategy and explored by research.
To achieve the above goals, we will organize four workshops for college for advanced studies students in 2021, two for the lecturers, train more lecturers as mentors by each partner, and participate in more plant visits and international competitions as part of our second semester program if the coronavirus situation allows. Developments can be followed on the project website [13].

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CHAPTER 2.
Dissemintation and Communication Plan

Anita Stein – María A. López – Tamás Miklovicz

EXECUTIVE SUMMARY

This document describes the dissemination and communication plan for PROSKILL, identifying major target groups and appropriate communication channels. It defines and prioritises key objectives of dissemination and communication and details steps to be taken during the project's lifetime in order to achieve maximum impact and reach relevant audiences.
The overview of planned dissemination activities provides a concise description of actions designed to strategically address and mobilise the stakeholder community, informing them about the project objectives and expected results. The internal communication framework defines communication responsibilities among project partners and consortium bodies, sets communication channels and monitoring instruments.
According to the business plan, this is the third deliverable (D3) of WP2 and its content and correspondent implementation will be monitored, updated and adapted to changing conditions during the project lifetime, and hence it will operate as a live evolving document.

OBJECTIVES OF THE COMMUNICATION AND DISSEMINATION PLAN

The dissemination and communication (D&C) plan of PROSKILL covers both internal and external communication actions as follows.

For internal purposes, the plan offers the members of the project consortium a valuable scheme to track dissemination work and results. Internal communication will itself be conducted via periodic emails sent out by the coordinator and work package (WP) leaders, regular teleconferences, and periodic face-to-face personal meetings. Project documents (including reports, administrative papers, project minutes, deliverables and design files) are stored and shared in the project's internal documents on Nextcloud.

The objectives of PROSKILL's external communication activities are to:

- Ensure coherent external communication on PROSKILL activities, progress and achievements, as well as the optimal exploitation of the developed high skill ecosystem strategy and action plan.
- Create visibility for the high skill ecosystem towards the international raw materials community, fostering innovation and exploitation of results.
- Identify and involve relevant stakeholders throughout the project lifetime. This plan provides a basis for engaging with stakeholders through an identification and interaction process.
- Implement the consortium's strategy for dissemination and communication activities and for engaging stakeholders in order to ensure the coherency of the core messages across the various channels used;
- Ensure a strategic coverage of different audiences, combining timing and different media supports with consistent messages content, structure and format. This is the purpose of

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this deliverable. The plan will be constantly reviewed throughout the project in order to assess the effectiveness of different activities.

The creation of dissemination and support services is aligned with the development of the project website and the project identity (logo, templates for presenting project outcomes including digital files, posters, roll up banners, brochures, infographics and factsheets) for project partners' communication and dissemination activities.

The project website and related channels will horizontally support the implementation of PROSKILL and will be managed by the European Federation of Geologists (EFG). Each WP will produce written deliverables designed to work together in an integrated way. These documents will consolidate information on key outputs and will signpost users to sources of more detailed information in the deliverables and wider technical literature. In addition, short press releases will be produced as each publicly available deliverable is completed for distribution to key sectoral and public interest publications and websites.

Management of communication activities will encompass the provision of a news feed for social media (Facebook, Twitter, Instagram and LinkedIn), maintenance and continuous update of the project website, preparation of press releases, as well the publication and dissemination of key central documents. These documents will be available for download from the project website. In addition, brochures concerning project aims and outcomes will be printed for distribution in conferences and other external events when convenient and in agreement with the Project Coordinator.

GUIDELINES FOR EXTERNAL COMMUNICATION

The overall objective of the dissemination plan is to ensure that information is shared with appropriate external stakeholders in a timely fashion and by the most effective means of communication.

INFORMATION ON EIT FUNDING

According to the FPA Article 44 on promoting EIT Raw Materials and ensuring visibility of the EIT and EU funding the KIC partner must follow certain obligations when communicating specific activities and their results.

The KIC Partners have an obligation to promote specific actions and results and must promote them by providing targeted information to multiple audiences (including the media and the public) in a strategic and effective manner. Unless the EIT requests or agrees otherwise or unless it is impossible, any communication activity related to the specific action (including in electronic form, via social media, etc.) as well as any infrastructure, equipment and major results funded by the specific grants must:

- display the EIT KIC logo as adopted by the EIT;
- display the EU emblem;
- follow the brand guidelines outlined in the EIT Community Brand Book as adopted by the EIT; and
- include the following text when applicable, e.g., in scientific papers, articles etc.:

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Hereinafter the official communication documents of the EIT KIC RM have primary importance. All these documents are available in the EIT RawMaterials InfoCenter – Communications and Branding section. Click here.

PROJECT IMAGE

The project logo must be placed on all published materials and documents/presentations illustrated for the public. This includes not only promotional material, but also event invitations, presentations or agendas. The logo is available in different file extensions in the internal document folder 'Logo and templates'.

Figure 1: PROSKILL logo.

Further details on the project's visual identity will be provided in the stylebook (D7, Month 3).

KEY MESSAGE - POPULAR PROJECT DESCRIPTION

The key words of the PROSKILL project are skill problems, competitiveness, high-skill ecosystem, soft skills, colleges for advanced studies, ESEE and Visegrád Four countries.

Our motto: "Be an engineer of the present, with the most prized skills of the future!"

Popular project description:
The European Union puts an emphasis on raising productivity as an important factor in maintaining economic growth. In order to improve productivity, it is vital to offer products and services with a high added value, and for that purpose highly qualified employees are required. Companies and professional organisations in the RM industries have stressed the need to improve the soft skills of students in order to meet the requirements of the labour market. The engineers of the future have to accept that engineering problems – as well as their solutions – are embedded in complex social, cultural, political, environmental, and economic contexts. Engineers have to access, understand, evaluate, synthesise, and apply information and knowledge from engineering as well from as other fields of study. They have to find and achieve a synergy between technical and social systems.
PROSKILL has a double purpose. From the one side it adopts a 'skill ecosystem' concept, looking at what (hard and soft) skills are missing in raw materials sector, which areas are affected by skill problems (shortages, mismatches and gaps) and what strategies can work. A high-skill ecosystem strategy supplemented with an action plan is developed. To ensure sustainability, the project focuses on the lecturers ('train the trainer'). The main goal is to develop their knowledge about new and innovative educational techniques and to reshape the outdated curricula. On the other side, a pilot project is launched involving the colleges for advanced studies in partner HEIs. Short-term and long-term programmes help to implement the strategy with the targeted development of selected soft skills.

STAKEHOLDER/ TARGET GROUPS

The term "stakeholder" describes, on a rather general level, the different organisations, initiatives, groups or individuals that affect or might be affected by PROSKILL and its activities. Stakeholders can be identified on an internal and external level. Accordingly, the key stakeholders of PROSKILL are listed in the following table:

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Table 1: Key stakeholders of PROSKILL

Stakeholders reached via the consortium	External stakeholders
• undergraduate students/postgraduate students/early careers (in BA and MA courses related to the raw materials sector) • lecturers/academics	• Industry (SMEs, companies, industry chambers, labour unions) along the RM value chain • EIT KIC RM community • Policy makers (local, regional, national level) • General public

For simplification purposes the different stakeholder groups are merged to four primary target groups:

- Students
- Academics (HEIs)
- Industry representatives (professionals, industry chambers, labour unions, EIT KIC RM community)
- General public (policy makers at different levels and wider society)

Thereby, the **'Students'** target group includes those undergraduate and postgraduate students/early careers (in BA and MA courses), who are directly or indirectly related to the raw materials sector.

'Academics' refers to those lecturers and professors, who take part in the event organization, development of reports, creating training materials and mentoring programs.

'Industry representatives' include potential future employers who may suffer from skill gaps. It covers SMEs, companies, industry chambers and labour unions along the whole raw materials value chain. It also involves the EIT KIC Raw Materials Community.

'General Public' involves policy makers at local, regional and national level. The general public can be seen as a secondary audience in means of overall information provision with distribution influence through commenting and sharing.

Even though the PROSKILL project does not intend to prioritise the above mentioned four target groups, the **focus of the stakeholder mapping lies on 'Students' and 'Academics'**. To ensure sustainability, the project focuses on the lecturers ('train the trainer'). The main goal is to develop their knowledge about new and innovative educational techniques and to reshape the outdated curricula. On the other side, a pilot project is launched involving the colleges for advanced studies in partner HEIs which attract the most talented and motivated students of each university. Short-term and long-term programmes for students will help to implement the strategy with the targeted development of selected soft skills.

VISION & METHODOLOGY

VISION

The vision of PROSKILL is to combine fundamental engineering skills with other soft skills to create unique, creative individuals with critical thinking who are uniquely prepared to succeed in technical business applications in their professional lives. As a result, the raw materials sector in the Visegrád Four (V4) countries will become a self-sustaining high-skill ecosystem, one that once

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started will generate a positive, mutually reinforcing dynamic. This process fuels innovation, knowledge creation and adaptation to changing competitive conditions.

METHODOLOGY

Along with the project objectives and the above-mentioned vision, the following methodology will be applied:

- PROSKILL contributes to achieving a key objective of the ESEE Education Concept Note related to 'capacity building of vital skills and competencies of students, professionals and faculties in the ESEE region by transforming best practices and experiences from the EIT Raw Materials community into resilient transferable programmes'. The Concept Note calls attention to the importance of innovative pedagogical models (regarding teaching and learning).
- To implement these goals, WP3 ("Building community among partners – development of a skill ecosystem") will focus on the demand side of soft skills and competencies. A survey will be carried out (questionnaire and interviews) to determine the missing skills, in order to identify what companies really need in the medium and long term.
- Based on revealed information a high-skill ecosystem strategy (supplemented with a strategy map and an action plan) will be developed. The skill ecosystem strategies need to have the following characteristics: 1) they address both supply and demand sides of the skill equation (i.e., they focus on the availability or development of skills, and their utilisation); 2) they seek to achieve both improved business performance and positive outcomes for individual employees.
- WP4 and WP5 will act as a pilot project to achieve this skill ecosystem strategy and action plan.
- At the partner HEIs a wide range of BA and MA courses related to the raw materials sector are offered. As the ESEE Education Concept Note (2018) confirms "consolidating and enhancing existing programs are priority against creating new programs […]". The main objective of WP4 ("Improve the education landscape – reshaping of curricula") is therefore not to create new courses and curricula but to rethink, improve and fit them to the changing environment.
- The following workshops will be organised within WP4: Workshop on 'Effective ways of mentoring and other best practices'; National conferences on 'Challenges of raw materials sector toward industry 4.0'; Workshop 1: 'New and innovative teaching methods – reshaping of curricula with focusing on active learning and other solutions'; Workshop 2: 'Digital Education Tools for Teachers and Students - Challenges in the education of generation Z and Alpha'.
- WP4 also ensures the long-term sustainability of PROSKILL: the developed syllabuses will be used after the end of the project. The lecturers receive up-to-date information about active learning methods and realise new demands related to skills of graduated students.
- In the current educational system, the students receive focused (not comprehensive and general) knowledge related to a scientific area. As a consequence, mining engineering students and economist students are partly narrow-minded. One of the most important objectives of WP5 ("Improving the professional life inside the Colleges for Advanced Studies with specific programs") is to increase the international embeddedness of the local Colleges (related to business education and RM sector), to develop a real and liveable network among the partners and to create multidisciplinary teams. This work package provides specific programs developing specific knowledge and skills for the

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main target group. A unified reward system will be developed, which will work after the project end as well as ensuring the requirement of long-term sustainability.

- The following initiatives will be developed: Competency tests for students; Guest lectures; national solutions of talent management; reward system; mentoring program; Spend a day with me! (one day program with a top manager); participation in international competitions; V4 – SX (simulation of stock trading – international competition); inter-university field trips.
- The professional work will be dedicated to selected topics: CSR (corporate social responsibility), circular economy (principles, challenges, life-cycle assessment) and industry 4.0 will dominate the events. All programs will be adapted to the results of WP3. At the end of the project, a group of highly engaged students will emerge with developed soft skills and professional experiences.
- The Colleges for Advanced Studies in the areas of business and mining studies offer a good framework for implementation, because the most talented (and highly motivated) students are selected here. The professional programmes aim to develop the soft skills of undergraduate and postgraduate students who have a connection with the raw materials sector.

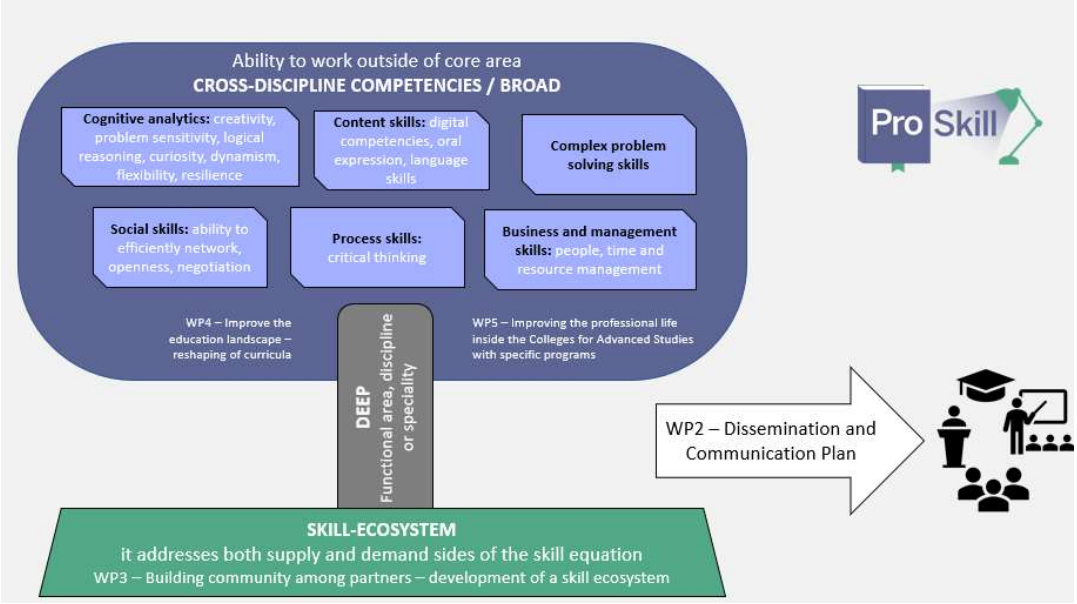

Figure 2: PROSKILL project model including T-shaped skills and competencies.

OUTREACH MEASURES

PROSKILL brings together a multidisciplinary consortium which covers all aspects of the knowledge triangle, providing thus an important internal impetus for the external outreach capacity and the establishment of a high skill ecosystem. This internal input provided by the consortium is detailed here:

- PROSKILL represents a multidisciplinary consortium: members provide not only engineering training but business BA and MA courses as well. A total of more than 50,000 students (part-time and full-time) attend these universities, so the adequate number of participants in the specific programmes is ensured. The four universities (3+1) represent the periphery-sending regions in the ESEE, which similarly suffer from skill shortages.

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- The consortium covers the three important parts of the knowledge triangle. Officially it involves only higher education and the business sector, but the research activities of the partner universities are outstanding and they function as research organisations as well, with the special colleges as the most research-oriented branches of the faculties.
- University of Miskolc, Hungary (project coordinator): The University of Miskolc has a unique character in Hungary. It is the only Hungarian HEI offering special BA and MA courses related to RMs. It looks back to a history of more than 275 years. The world's first higher education institution of technology, the Mining Academy of Selmecbánya, represented special knowledge and value. The total number of students here is more than 10,000 (from which at least 2000 students focus on RMs related courses).
- Politechnika Slaska, Poland (Silesian University of Technology): 15 educational units of the University – 13 faculties, one college and a scientific didactic centre – currently offer almost 60 study programmes and about 200 specializations, with special focus on mining engineering studies and other RM related studies. It occupies leading positions in both national and international rankings. Not only the offered courses and the high number of students makes this HEI to one of the most important partners in our consortium, but its location. Upper Silesia is the most industrialized area in Poland, and one of the most industrialized in Europe. Here many SMEs (with strong RMs focus) are located which serve as a precondition for building an efficient skill ecosystem and enable us to organize high quality workshops and to invite guest lecturers with great professional experiences (in WP4 and WP5).
- Slovak University of Technology in Bratislava, Slovakia: On average, 12,000 students study at the STU every year. At present, the STU consists of seven faculties based in Bratislava and Trnava. STU is a public university and offers education mainly in technical, technological, technical-economical, technical-information and technical-artistic fields of study using the modern methods of education, laboratories and practical training. It has vast experiences in modern and innovative teaching methods which contribute to carry out the WP4 and WP5 successfully. It has a special unit called Institute of Life-Long Education with special knowledge in wider society learning and life-long learning programmes.
- Technical University of Ostrava, Czech Republic: The four-member consortium will be supported by a task partner. Participation of this task partner is essential. A project focusing on this region (East-Central Europe, the V4 nations) can be successful only if it covers all four nations. The Czech Republic is an inseparable part of the ESEE region from societal, geographical, historical and economic perspectives. Involving a Czech task partner in the consortium may contribute to improving the awareness of KIC RM in non-partner (potential partner) countries, to cover new areas and to strengthen the presence of KIC RM in RIS countries (in line with RIS strategy).
- The European Federation of Geologists (EFG), Belgium, has extensive experience in building communities and in establishing/operating networks. Involving EFG in the consortium enables us to work towards another goal of RIS Strategy, i.e., transferring good practices and know-how of the KTI.
- With the HEIs and EFG, the consortium possesses all the required qualities and competencies to reach the defined goals and create a high skill ecosystem.

From the overall vision and mission statements above and taking into account the major stakeholder groups and the above-mentioned input of the consortium, the following key measures for external communication activities can be derived: PROSKILL will set up a closing conference at the end of the project in order to share the best practices and results of the project with the international raw materials community. In addition, different initiatives such as workshops, guest

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lectures, soft skill trainings, mentoring programmes will be organised, addressing both lecturers and students as the project's main target groups. In particular, PROSKILL will take the following outreach measures for each of the selected stakeholder groups:

- **Students**
  - September 2020: Competency tests for students.
  - October 2020: Development of the reward system.
  - May 2021: Inter-university field trip 1 to the Czech Republic. Way of traveling: personal car. In all HEIs, groups of circa 20 students are formed. The groups with at least two lecturers travel to the selected HEI. There the HEI partner compiles a professional program (including workshop focusing on a specific topic, company visit and social event).
  - September 2021: Workshop 2: 'Digital Education Tools for Teachers and Students - Challenges in the education of generation Z and Alpha'. It is organised in national language at the same time in all partner HEIs.
  - 2022: Mentoring program - supporting the students' professional activity. The international mentoring programme aims at creating an international informal network of experienced professionals capable of providing guidance and support to the new generation of geoscientists. Over a fixed period of 9 months, the mentees will receive advice and targeted support from experienced professionals, according to their individual goals.
  - January 2022: Spend a day with me! - one day program with a top manager. PROSKILL will organise a special one-day program for the best 10 % of involved students from each HEI with an operation manager of the respective company/plant/mine. The underlying reason for this program would be to start developing managerial experience and skills for those students who have the best abilities to become leaders in teams, workgroups. The one-day project would be a well-engineered visit of the hot spots of producing plants, ending up with an informal lunch/dinner, where observations/opinions can be exchanged. The program will be organised separately in all partner HEIs.
  - February 2022: V4 – SX program (simulation of stock trading). The competition will last for 4 months and will start with a webinar.
  - May 2022: Inter-university field trip 2 to Bratislava. Way of traveling: personal car. In all HEIs, groups of circa 20 students are formed. The groups with at least two lecturers travel to the selected HEI. There the HEI partner compiles a professional program (including workshop focusing on a specific topic, company visit and social event).
  - February, October, November 2021; February, April, October, November 2022: Guest lectures (ALUMNI and OLDTIMER) and soft skills training. Guest lectures are organised in all partner HEIs with the objective of enhancing soft skills of students (in the field of i.e., English language, critical thinking, project management training (revealed in WP3) and hard skills to achieve higher competitiveness on the international market.
  - Supporting students to take part in international competitions: all HEIs have to form at least one multidisciplinary team and support them to take part at least in one international competition per year. The competitions, their date and place will be selected later.
- **Academics** (HEIs)
  - April 2020: Thematic event 1 (connected to Earth Day).
  - January 2021: Workshop on 'Effective ways of mentoring and other best practices'.

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- February 2021: Workshop 1: 'New and innovative teaching methods – reshaping of curricula with focusing on active learning and other solutions'. It is organized in national language at the same time in all partner HEIs.
- September 2021: Thematic event 2 (connected to European Minerals Day).
- September 2021: Workshop 2: 'Digital Education Tools for Teachers and Students - Challenges in the education of generation Z and Alpha'. It is organised in national language at the same time in all partner HEIs.
- February 2022: Workshop 3 is organized in national language at the same time in all partner HEIs in February. The topic of Workshop 3 highly depends on the results of WP3.
- September 2022: Thematic event 3 (connected to European Researchers' Night).
- Workshop 4 (WP4) – It is organised in national language at the same time in all partner HEIs in February. The topic of Workshop 3 highly depends on the results of WP3.

- **Industry representatives** (professionals, industry chambers, labour unions, EIT KIC RM community)
  - A survey is carried out at the project beginning (questionnaire, interviews, focus group) to determine missing skills and what companies need in the medium and long term. Based on the outcomes, a high-skill ecosystem strategy including a strategy map and an action plan will be developed.
  - September 2020: National conferences on 'Challenges of raw materials sector toward industry 4.0'. All partner HEIs organise a national conference on 'Challenges of raw materials sector toward industry 4.0'. The four conferences are organised in close cooperation with existing networks to maximise impact. The presentations will be uploaded to the project website and the conclusions will be used for the implementation of WP3. The conferences contribute to stimulate exchange within the national RM community and other stakeholders (such as policy makers).
  - January 2021: Workshop on 'Effective ways of mentoring and other best practices'.
  - November 2022: International final interdisciplinary conference on promoting the skill-ecosystem strategy and other results (Miskolc). The conference will be organised in close cooperation with existing networks to maximise impact. The aim of the conference will be to stimulate exchange within the international scientific community and other stakeholders (such as policy makers), and to connect with and disseminate the results of PROSKILL to the interdisciplinary and international RM community.
  - PROSKILL will help to engage industrial players in KIC activities and mobilise national/regional networks.
  - Activities will also include logging onto international events and EU-level workshops, and publishing articles concerning the project's objectives, approach, methodology and results in national and international journals.
- **General public** (policy makers at different levels and wider society)
  - September 2020: National conferences on 'Challenges of raw materials sector toward industry 4.0'. All partner HEIs organise a national conference on 'Challenges of raw materials sector toward industry 4.0'. The four conferences are organised in close cooperation with existing networks to maximise impact. The presentations will be upload into the project website and the conclusion will be used for the implementation of WP3. The conferences contribute to stimulate exchange within the national RM community and other stakeholders (such as policy makers).

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- November 2022: The PROSKILL consortium organises an international final interdisciplinary conference on promoting the skill-ecosystem strategy and other results in Miskolc. This conference will be organised in close cooperation with existing networks to maximise impact. The aim of the conference will be to stimulate exchange within the international scientific community and other stakeholders (such as policy makers), and to connect with and disseminate the results of PROSKILL to the interdisciplinary and international RM community.
- Activities will also include logging onto international events and EU-level workshops, and publishing articles concerning the project's objectives, approach, methodology and results in national and international journals.
- National Stakeholder groups will be formed, comprising stakeholders and all interested and affected parties from the private and public sectors. These parties will be informed through targeted e-mails, meetings and ad-hoc workshops.
- Local community members will be informed through presentations, booklets and local media.
- The greater stakeholder community of EFG member countries will be informed through publications in national journals, networking events and thematic events.
- Three thematic events (European Researchers' Night, the European Minerals Day and the Earth Day) will help to increase societal awareness on the importance of the mineral raw materials sector.

COMMUNICATION CHANNELS

PROSKILL will make use of different communication & dissemination tools adapted to the preferences and requirements of each target audience:

- Web-based tools: PROSKILL website, newsletters, press releases, social media (Facebook, Twitter, LinkedIn, Instagram, YouTube).
- Promotional material (printed or electronic media): posters, roll-up banners, brochure, presentations, infographics, factsheets, short videos.
- Publications: reports, deliverables, peer-reviewed articles.
- Events: conferences, workshops.

Each Work Package will produce specific deliverables designed to work together in an integrated way. Results will be disseminated in the PROSKILL network and will be available online. In addition, short press-releases will be produced as key milestones and outputs are achieved for distribution to key sectoral and public interest publications and web sites.
Main PROSKILL communication channels:

- Website: http://www.PROSKILLproject.eu
- Facebook: PROSKILL Project
- Twitter: @PROSKILLProject
- Instagram: @PROSKILLProject
- LinkedIn: PROSKILL Project
- YouTube: PROSKILL Project (coming soon)

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Table 2: Stakeholders, communication channels and KPIs

Stakeholder/Target Group	Means/Channels of Communication	Measurement of success (KPIs)
Academics (HEIs)	project website social media mailing lists public reports final conference workshops thematic events network initiatives	• number of website visitors • participants in PROSKILL programmes
Students	project website social media training materials workshops thematic events final conference mailing lists	• number of website visitors • participants in PROSKILL programmes
Industry representatives (professionals, industry chambers, labour unions, EIT KIC RM community)	project website social media thematic events final conference mailing lists network initiatives	• number of website visitors • number of social media followers
General public (policy makers at different levels and wider society)	project website social media thematic events final conference mailing lists network initiatives	• number of website visitors • number of social media followers • number of participants in Wider Society Learning events

MONITORING DISSEMINATION AND OUTREACH ACTIVITIES

Each partner is required to support actively the project dissemination. Consequently, a **"PROSKILL dissemination report table"** has been filed in the project's internal documents (Folder 'Outreach') where each partner shall indicate on a regular basis implemented dissemination activities such as presentations at conferences and workshops, publications in scientific journals or media for the general public, exhibitions, broadcasts on TV/radio, etc. Instructions for reporting the dissemination activities are provided at the beginning of the table and reminders will be sent to Consortium partners on a six-months basis.
To monitor the efficiency and success of the communication activities, the **web and social media statistics** will be recorded and analysed on a monthly basis. This regular performance check will facilitate the fine-tuning of the dissemination and outreach strategy whenever deemed appropriate.

1 DATA PROTECTION

As of May 2018, the EU General Data Protection Regulation (GDPR) replaced the Data Protection Directive 95/46/EC. GDPR has been designed to harmonise data privacy laws across Europe and to reshape the way organisations across the world approach data privacy. In PROSKILL this concerns especially:

- Web contact forms and email subscriptions where personal data is requested and submitted by the user;

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- Cookies and online tracking including Social Media;
- Event registrations;
- Online surveys.

The collection of data will only be made if there's an explicit authorisation by data subjects, obtained by an informed consent procedure, that will be in place in all events/interviews/workshops with external participants. The request for consent will be given in an intelligible and easily accessible form, using clear and understandable language, also detailing the purpose of data collection and treatment.

INTERNAL COMMUNICATION PLAN
COMMUNICATION FLOWS

The type of communication to be used among Consortium members, the purpose, the target group, the author and the frequency of the communication is presented in the following table.

Table 3: PROSKILL internal communication plan

What/ messages	Why/ purpose	Target group	Who/ source	How/ channels	When/ Frequency
Progress Reports	To keep track on the compliance of the project with the DoA; to keep the project partners informed of progress, issues, and solutions.	Project partners, EC officer	Management Project coordinator Consortium members	E-mail	Every 2 months
Consortium meetings	To ensure all team members are apprised of progress, changes, and current priorities	All Project partners	Project coordinator	Face-to-face	At least once a year
Steering committee meetings	To monitor the implementation of the project	WP leaders	Project coordinator	Face-to-face meeting or teleconference	Every 6 months
Email Communi-cations	To distribute meeting minutes, alert partners of document changes posted, share information, answer questions between meetings and collect input on deliverables and its approval.	All Project partners, EC officer	Project partners, WP leaders, project coordinator	Email	As needed
Online communicat on vi Nextcloud	Used for daily operation communication, sharing working documents, discussions and exchanging views	All Project partners	Project partners, WI leaders, projec coordinator	Using online applicatio n – Nextcloud Hub	As needed

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What/ messages	Why/ purpose	Target group	Who/ source	How/ channels	When/ Frequency
Shared Project Folder	Retains all current project documentation.	All Project partners, EIT project officer	Project partners, WI leaders, projec coordinator	PROSKIL L Nextcloud	Upload revisions within 24 hours of the change.

INTERNAL FILE REPOSITORY

At the beginning of the project, the European Federation of Geologists (EFG) has set up a common file-sharing solution using Nextcloud for the collection of the various reports produced during the project. The shared project folder will be used as a central element of the communication between Consortium partners, and is managed by the University of Miskolc (coordinator) and the European Federation of Geologists (lead WP2). All reports, deliverables, results and relevant material will be accessible to all project partners at all time. Project partners have been invited by e-mail to join the shared project space that includes the following folders:

- Deliverables
- WP1
- WP2
- WP3
- WP4
- WP5
- Meetings
- Monthly reports
- Outreach
- Steering committee docs
- Technical documentation

Project partners have the permission to upload any digital file (documents, pictures) by simple drag and drop. Documented user guide and online training to members (through webinar) are available upon request.

Access is granted by the project coordinator of PROSKILL, Tamás Bakó or Krisztina Varga (University of Miskolc) or the WP leaders Tamás Miklovicz or Anita Stein (European Federation of Geologists). Other users than Consortium partners may be granted limited access to folders or full access to selected folders. If a member (or a grantee) is to be removed from the list (revoking her/his rights) the representative of the project partner shall send an official letter (or email) to the project coordinator indicating the request and the reason for the removal from the list.

To keep the repository functional the following guidelines shall be considered:

- Creation of directories/folders when needed;
- When communicating on uploaded/changed documents, indicate in which folder, if not obvious, e.g. PROSKILL/Outreach/…;
- Upload relevant references to PROSKILL/Outreach/ and create appropriate folders, using easy to recognize filenames;
- If it is needed to upload Word and/or Excel files containing complex formatting, figures, graphs, etc. it must be checked whether these features are preserved when uploaded. If not, convert to pdf before uploading;
- Notifications on changed documents by email is an option, but preferred way is to include relevant authors only (to avoid notification spamming).

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TEMPLATES

Different templates have been made available to Consortium partners via the project's internal repository (folder 'Logos and templates'), and the project stylebook (D7, Month 3) will specify the formatting rules for each of these.

Currently the following templates are available:

- PowerPoint template;
- Minutes template;
- Deliverable template;
- Template for other documents.

Further design templates for roll-up banners, posters and social media cards will be designed within Deliverable D8 and made available to all project partners.

E-MAIL COMMUNICATION

To increase efficiency, a standard **email subject title** shall be used. This will allow the project partners to quickly recognise PROSKILL related emails. These should include in the subject title the project name [PROSKILL] and WP number (if applicable), followed by a more specific description of the subject and a deadline for feedback or reply (if applicable). You can see here some examples of subject lines:

- [PROSKILL] KOM minutes draft – Comments Deadline 2020/03/01
- [PROSKILL] WP2 – Dissemination & Communication plan – Contributions deadline 2020/02/15
- [PROSKILL] Happy Christmas!!!

To keep traffic down, if you have any query about an e-mail, please reply just to the sender.

A **mailing list** has been established to facilitate project internal communication:
proskillproject@googlegroups.com

CONCLUSIONS

The guidelines for dissemination and communication advanced in this document provide to the PROSKILL consortium a clear pathway to effectively reach the project's outreach goals. The consortium will use this plan as a baseline that will be further reviewed, revised and updated during implementation, also considering the stakeholders' interests and needs, and possible challenges that may arise during the project lifetime.

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CHAPTER 3.
Risk Management Guide

Tamás Bakó – Krisztina Varga

It is equally important to monitor any emerging, unforeseen risks related to project activities. This chapter details the risks initially foreseen, and also new risks are described. It also describes control measures for each risk identified, timing for action and corresponding responsible. It provides for continuous assessment of risks during the project to minimize negative effects on project implementation.

Identification of risks and control mechanisms

Central to the successful completion of any project is the effective assessment and monitoring mitigation of downside risks. Continuous risk assessment during the ProSkill project will ensure the success within budget, time and resources achievement of project objectives.
During the implementation of the project new risks may arise which shall be measured and evaluated to define corrective actions. Efforts will be made to solve any conflict with full consensus. If this is not achieved, decision will be taken by the Consortium with a simple majority of votes. In an event of a tie, the Coordinator has the casting vote. Any Force Majeure event affecting the project implementation shall be communicated to the Project Officer.

The table below illustrates ProSkill's risks and potential impacts, and the correspondent control measures and implementation guidelines.

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Nr	Description of risk	Riskassess-ment (score)	Control measures	Responsible	Timing
R1	The effect of Covid-19 restrictions on all WPs.	4*4=16	Regular consultation should be organized to monitor the Covid- 19 situation in all the participant countries	Project Steering Committee, Coordinator	Immediate measures might be taken by the Coordinator if it is seen necessary.
R2	Personal participation is not possible in any conferences, events, dissemination and communication activities.	4*4=16	Constant monitoring of the governmental measures and restrictions and predictions concerning the issue.	WPLeaders, Project Steering Committee, Coordinator	Consortium Partners shall continuously monitor the local situation in their countries and communicate any significant changes that require actions. Regular online conferences are organized by the Coordinator to discuss the necessary steps.
R3	The project is partly pre-financed, but 45% of the costs must be financed till the end of the business year.	3*3=9	Institutions and enterprises within the project have precious experience and capital in similar size project so financing the final part of the project is not problematic.	Coordinator All Partners	Consortium Partners shall continuously monitor the implementation of their own budget. Significant changes and lack of resources shall be communicated to the Coordinator, who will liaise with the Project Officer.
R4	Not properly defined goals and the external parties (end-users, the media, the public) misinterpret the objectives.	2*4=8	The coordinator and the partners have a clear vision of the project, its goals and objectives. To avoid any misinterpretation or loss of information, the official source of information will be the website and the single official contact point for the project will be appointed by the Coordinator. Partners will agree to follow communicational protocols to be outlined at the kick-off meeting.	Coordinator All Partners	At every Consortium meeting this issue shall be assessed and measured, and if needed corrective measures shall be defined by the Consortium.
R5	Lack of interest by the stakeholder community. It could result in that the interest for the project remain below the expected level.	2*4=8	A dissemination plan has been worked out to reach these communities and will be further elaborated during the first 6 months of WP1.	Steering Committ ee	At every Consortium meeting this issue shall be discussed by the Steering Committee and corrective measures shall be defined.
R6	Problems with project and partner performance. The non-performance of one of	2*3=6	Although, during the proposal development partners have been selected carefully, taking into account previous references and existing partnerships. All partners discussed individual tasks,	WP Leaders and the	At every Consortium meeting this issue shall be discussed by the Steering Committee and corrective measures shall

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	the partners may cause delays to the implementation of specific tasks or may even impede the completion of a Work package.		roles and complementarities to great detail. Internal deadlines will be assigned for each task and subtask. Partner performance will be closely monitored. All these measures will provide early indicator to the Coordinator on potentially emerging issues. In the extremely unlikely case that expectations are not met, the Project Steering Committee will initiate actions.	Coordinator, Project Steering Committee	be defined. Immediate measures might be taken by the Coordinator if it is seen necessary.
R7	Lack of capacity or resources. There could be changes locally or in Europe (or globally) that could affect planning (sudden raise of prices, etc.).	1*4=4	The budget has been carefully planned providing financial security for implementation. To some extent these changes can be managed by restructuring funds between cost categories. Should such steps become necessary the Coordinator will liaise with the Project Officer and together they will discuss the possible corrective actions. In the event of Force Majeur exceptional measures shall be taken to minimize damages.	Coordinator All Partners	Consortium Partners shall continuously monitor the implementation of their own budget. Significant changes and lack of resources shall be communicated to the Coordinator, who will liaise with the Project Officer.
R8	Changes in legislation which can influence the realization of the project.	2*2=4	Management monitors regulatory changes and takes appropriate action as needed.	WP Leaders and the Coordinator	At every Consortium meeting this issue shall be discussed by the Steering Committee and corrective measures shall be defined.
R9	Lack of information about the market players and stakeholders or difficulties with gathering information.	1*3=3	The well-designed time plan and the market experiences of the consortium partners ensure the access to all the important information.	Coordinator All Partners	Immediate measures might be taken by the Coordinator if it is seen necessary.
R10	Possible changes in partner institution management and operation during the project implementation.	1*3=3	All the partners are interested in the successful implementation and they will work together to ensure that continuity and outputs are secured.	Coordinator All Partners	At every Consortium meeting this issue shall be discussed by the Steering Committee and corrective measures shall be defined.
R11	Limited access to relevant documents and legislation on regional and national level.	1*3=3	The consortium guarantees the access to existing documents and legislation in the partner countries.	Coordinator All Partners	Immediate measures might be taken by the Coordinator if it is seen necessary.

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R12	Language issues on the project management and on final outputs and deliverables for the partner countries.	1*2=2	Professional translation to national languages and to English if it is required.	Coordinator All Partners	Immediate measures might be taken by the Coordinator if it is seen necessary.

Note: The numerical values provided in the column “risk assessment” (1-25) illustrate the severity of each risk obtained through the multiplication of the probability of each risk factor (in a scale 1 to 5) and its impact (also in a 1 to 5 scal

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Risk classification

The risk classification was made considering two primary dimensions: 1. The probability of each risk occurring (for the risks enumerated in Table 3). The probability was classified using a Likert scale, were 1 corresponds to low probability (below 1%) and 5 to high probability (above 50%). A risk, by its nature, always has a negative impact. Again, a Likert scale was used to rate the economic impact, were 1 corresponds to a low economic impact and 5 expresses a high economic impact (Table 3).

The tables below illustrate the Likert scales used to classify the probability and the economic impact of the risks described for the development of ProSkill.

Table 2: Classification of probability of the risks of ProSkill

Scale	Probability	
1	Rarely	< 1%
2	Unlikely	1-10%
3	Possible	10-25%
4	Real chance	25-50%
5	Possibly	> 50%

Table 3: Classification of economic impact of the risks of ProSkill

Scale	Impact
1	Low
2	Medium
3	High
4	Very high
5	Exceptional

Using this classification a chart was built, representing the probability that a risk will occur on one axis and the impact of the risk, if it occurs, on the other. The severity of each risk was defined as the product of the rates given to probability and impact, and the values obtained were plotted in the chart. These values were used to define a scale of levels of intervention, depending on the severity of the risks. It was decided that risks with a low severity (numerical value from 1 to 9) require no further action, moderate risks (numerical value from 10 to 12) require the development of a contingency plan and high risks (numerical value above 13) require an intervention (Table 4).

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Table 4: Impact/Probability risk chart and classification of risk severity and intervention levels.

			PROBABILITY				
			1 Unlikely < 1%	2 Rarely 1-10%	3 Possible 10-25%	4 Real Chance 25-50%	5 Probably > 50%
IMPACT	5	Exceptional	5	10	15	20	25
	4	Very High	4	8: R4, R5,	12:	16 R1, R2	20
	3	High	3	6: R6	9: R3	12	15
	2	Medium	2	4: R7, R8	6	8	10
	1	Low	1	2: R12	3: R9, R10, R11	4	5

Low risk, no further actions required

Moderate risk, mitigation to be planned

High risk, mitigation measures required

The table below (Table 5), based on the classification process described, summarizes the probability and impact scores (and the severity) of the risks described for the development of ProSkill.

High-probability/high-impact risks for the development of ProSkill are not foreseen. The moderate risk identified will be closely monitored and its mitigation will be planned during the active period of the relevant WPs. The remaining risks will be monitored and, in case their classification does not change, they will be ignored.

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Table 5: Severity of the identified risks for ProSkill

Risk Nr	Affected activity (WP)	Description of risk	Probability	Impact	Severity
R1	All WPs	The effect of Covid-19 restrictions on all WPs.	4	4	16
R2	All WPs	Personal participation is not possible in any conferences, events, dissemination and communication activities.	4	4	16
R3	All WPs	The project is partly pre-financed, but 45% of the costs must be financed till the end of the business year.	3	3	9
R4	All WPs	Not properly defined goals and the external parties (end-users, the media, the public) misinterpret the objectives.	2	4	8
R5	WP2	Lack of interest by the stakeholder community. It could result in that the interest for the project remain below the expected level.	2	4	8
R6	All WPs	Problems with project and partner performance. The non-performance of one of the partners may cause delays to the implementation of specific tasks or may even impede the completion of a Work Package.	2	3	6
R7	All WPs	Lack of capacity or resources. There could be changes locally or in Europe (or globally) that could affect planning (sudden raise of prices, etc.).	1	4	4
R8	WP1, WP2	Changes in legislation which can influence the realization of the project.	2	2	4
R9	WP2	Lack of information about the market players and stakeholders or difficulties with gathering information.	1	3	3
R10	WP1	Possible changes in partner institution management and operation during the project implementation.	1	3	3
R11	WP2	Limited access to relevant documents and legislation on regional and national level.	1	3	3
R12	WP1	Language issues on the project management and on final outputs and deliverables for the partner countries.	1	2	2

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The main risk that we can foresee at the moment is the future effects of the Covid-19 pandemia. If because of governmental restrictions make it impossible to organize meetings, conferences, events personally that are planned in the original budget, then we will be ready to organize these activities in an online environment.
By constant monitoring of the situation, we must be ready for flexible handling of the deadlines and reorganize the planned activities. The main point is to meet the requirements that were involved into the budgets of 2020-2021 including KPIs and deliverables. All the participants have to make any efforts that is necessary to reach the original goals of the project.

Risk management

Due to the turbulent changes of the outside environment and of the regulations made by the authorities constant monitoring is necessary concerning the project. An "if……then" view of any tasks should be built into our perspective including pre-organized decision making processes. Regular online meeting of the Project Steering Committee is planned where we can discuss specific and general problems according to the project timing, task fulfilment etc. This means:

1. Elaboration of alternative solutions foro nline/offline events.
2. Making the necessary change-requests in time.
3. Schedule the regular online conferences of the Project Steering Committee.
4. Monitoring the authorities' regulations in all of the participants' countries.
5. Participation in webinars organized by EIT Raw materials.
6. Checking the KPI's and Deliverables regularly. If necessary, making change-requests.

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CHAPTER 4.
ProSkill Work Plan and Management Guide

Tamás Bakó – Krisztina Varga

Introduction
According to the business plan (2020), this is the first deliverable (D1) of WP1 and its content and correspondent implementation will be monitored, updated and adapted to changing conditions during the project lifetime.

Organisation
All organisations participating in ProSkill will have the same administrative, legal and financial responsibilities. The Consortium consists of 4 Project Partners (legal entities) and 1 Task Partner (VŠB - Technical University of Ostrava) and in line with the Project Agreement, they will all perform their share in the development and delivering of results and other contributions as agreed during the development of the project concept. Project partners represent academia (University of Miskolc, Politechnika Slaska (Silesian University of Technology), Slovak University of Technology in Bratislava (STU), VŠB - Technical University of Ostrava) and the business sector (European Federation of Geologists (EFG). Some of these Partners have been nominated Work Package leaders, in which case the leader of the team responsible for the given WP will assume responsibility and a strong coordination role for the timely delivery of tasks and high-quality performance of the given WP. The nominated WP leaders are (Table 1):

Table 4: WPs and WP leaders

WP	WP Leader
WP1 Project management	University of Miskolc
WP2 Communication and dissemination	European Federation of Geologists (EFG)
WP3 Building community among partners – development of a skill ecosystem	University of Miskolc
WP4 Improve the education landscape – reshaping of curricula	Slovak University of Technology in Bratislava (STU)
WP5 Improving the professional life inside the Colleges for Advanced Studies with specific programs	Politechnica Slaska (Silesian University of Technology)

WP leaders will assume overall responsibility for the work carried out in their WPs, including coordination between sub-WP activities. The WP teams will be composed of one WP-leader and several other partners. The activities of each WP are subdivided into sub-tasks that will be carried out by one or more partners. The overall organization of the tasks will be supervised by the WP leader that will need to address the following activities:

- Achieve the WP-related deliverables and their transmission to the Coordinator;
- Organize the internal communication between WP participants for task-related information, documents, planning and deliverables;
- Conduct a first evaluation of the scientific and technical content of deliverables;

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- Identify in-time any potential risk or conflict, any delay or difficulty that might alter the quality and/or the achievement of deliverables and inform the Coordinator.

WP leaders will report directly to the Coordinator and discuss any emerging issues, difficulties or challenges as they arise. WP leadership is, however, a non-legally binding role, and as such WP leaders cannot make legally binding decisions on behalf of the Consortium. Such decisions will be under the jurisdiction of the Project Steering Committee (PSC).
The PSC will consist of the Project Coordinator and a single representative of Project Partners. The mandate of the PSC is to audit project progress, define project standards and agree on all project policies. The PSC will convene on a regular basis, at least once a year in the frame of the regular consortium meetings and additionally at the core group meetings held in parallel with main milestones of the project implementation. The PSC will also convene if any of the Project Partners requests this in writing and the meeting may take place in the form of a tele-meeting (Skype, Gotomeeting, etc), in which case the discussions may be recorded. The PSC will have the following mandate:

- Review and evaluate project progress and approve changes if deemed necessary,
- Approve Deliverables and project reports,
- Monitor budget spending and decide on corrective measures if deemed necessary,
- Ensure that the project maintains its relevance with the EIT rules in general and the raw materials topic in particular,
- Resolve any conflicts that may arise during the implementation of the project,
- Resolve any technical, administration or contractual issues not yet resolved by other means.

Decisions within the PSC will be made with a simple majority. In an event of a tie the Coordinator makes the casting vote. Minority views may be recorded and enclosed to the PSC Resolutions.
In order to continuously monitor progress, the Coordinator will develop a standard set of templates for tracking the project right from the beginning. The template for monitoring and controlling will record a summary of overall progress, a list of milestones due to be completed since the last report and their current status (on time or late), a list of milestones with dates due in the next reporting period, actions set in place in case of late delivery, forecast for task completion based on current information, reasons for any revision to earlier forecasts to completion and costs to date compared to the budget. The WP leaders will be responsible for the implementation of work in time and to the quality needed, maintaining regular monitoring, issuing regular and accurate status reports and promptly alerting on problems. With the help of simple templates WP leaders will report to the Coordinator on a quarterly basis allowing for a quick-glance evaluation of project status and progress by the Coordinator. In addition to regular reports, the Coordinator may request to be informed about the progress of the active scientific tasks, problems encountered, anticipated with work waiting to be fulfilled and technical difficulties that could potentially emerge.
Administrative, financial and technical reporting procedures are discussed in great detail in the Project Agreement. All these procedures will be complied with. The guidelines state that the collection and initial review of technical reports from all partners will be the Coordinator's task. Each team will be directing their own work but will discuss all administrative aspects directly with the Coordinator. Individual financial reports will be the responsibility of the administrator of each partner, but for the overall management the Coordinator will be in charge. The coordinator will also handle payments of the EIT contributions to the consortium partners and maintain liaison with the KIC RM for all contractual and administrative aspects of the project. The Coordinator will set up internal procedures for the collections of Partner input for the various reports using a commonly accepted file-sharing solution, such as Google Drive.
Figure 1 presents the Reporting structure based on EIT KIC RM rules.

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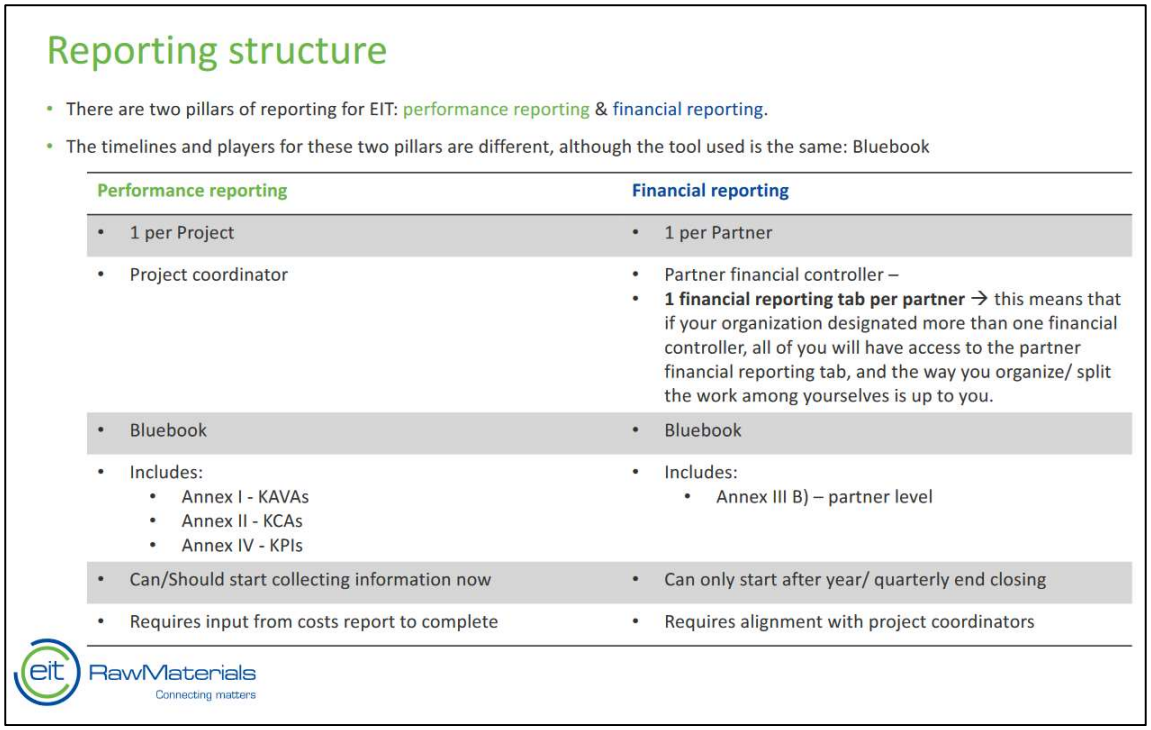

Figure 3: Reporting structure
Source: EIT RM Financial Reporting Guidelines &Tips, p.3.

Dissemination and Communication Plan

The dissemination and communication (D&C) plan of ProSkill covers both internal and external communication actions as follows.

For internal purposes, the plan offers the members of the project consortium a valuable scheme to track dissemination work and results. Internal communication will itself be conducted via periodic emails sent out by the Coordinator and Work Package (WP) leaders, regular teleconferences, and periodic face-to-face personal meetings. Project documents (including reports, administrative papers, project minutes, deliverables and design files) are stored and shared in the project's internal documents on Nextcloud.

The objectives of ProSkill's external communication activities are to:

- Ensure coherent external communication on ProSkill activities, progress and achievements, as well as the optimal exploitation of the developed high skill ecosystem strategy and action plan.
- Create visibility for the high skill ecosystem towards the international raw materials community, fostering innovation and exploitation of results.
- Identify and involve relevant stakeholders throughout the project lifetime. This plan provides a basis for engaging with stakeholders through an identification and interaction process.
- Implement the consortium's strategy for dissemination and communication activities and for engaging stakeholders in order to ensure the coherence of the core messages across the various channels used;

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- Ensure a strategic coverage of different audiences, combining timing and different media supports with consistent messages content, structure and format. This is the purpose of this deliverable. The plan will be constantly reviewed throughout the project in order to assess the effectiveness of different activities.

The creation of dissemination and support services is aligned with the development of the project website and the project identity (logo, templates for presenting project outcomes including digital files, posters, roll up banners, brochures, infographics and factsheets) for project partners' communication and dissemination activities.
The project website and related channels will horizontally support the implementation of ProSkill and will be managed by the European Federation of Geologists (EFG). Each WP will produce written deliverables designed to work together in an integrated way. These documents will consolidate information on key outputs and will signpost users to sources of more detailed information in the deliverables and wider technical literature. In addition, short press releases will be produced as each publicly available deliverable is completed for distribution to key sectoral and public interest publications and web sites.
Management of communication activities will encompass the provision of a news feed for social media (Facebook, Twitter, Instagram and LinkedIn), maintenance and continuous update of the project website, preparation of press releases, as well as the publication and dissemination of key central documents. These documents will be available for download from the project website. In addition, brochures concerning project aims and outcomes will be printed for distribution in conferences and other external events when convenient and in agreement with the Project Coordinator.

Risk management

Risk management in ProSkill will follow an approach in three levels: 1- the identification of risk; 2- its assessment and 3- response to it. The identification of risks will be the duty for each partner within the consortium with their responsibility to inform their WP leader. The risk identification will represent a proactive task for the Coordinator for the entire project and for the WP leaders within the framework of their WP activities. The assessment and the response to this risk will be achieved by the Project Management.
The assessment of a risk aims to qualify its impact(s) on the project and therefore to rank the risk according to a minor, moderate or high degree. A minor risk (e.g., small delay) represents an event with a small likelihood to affect/alter other activities of project. A moderate risk corresponds to issue that might affect significantly other activities but not the objectives of the project, while a high risk can conduct to a major breach for the entire project. The response to these various risks will also be graded in proportion to their degree.

- Minor risk can be fixed by a series of recommendations emitted by the project management and an eventual support by other partners;
- Moderate risk needs to be carefully addressed by the selection and implementation of a strategy to solve the issue. It will also include in turn a monitoring and possibly additional adjustments. The management will be competent for the strategy response;
- High risk will also lead to a strategy to solve the issue, the monitoring and possibly followed by additional measures during which the Project Officer will be consulted.

The Coordinator and the project partners involved are experienced in working in an international environment and have a track-record of successfully implementing research projects of this scale. The coordinating organisation has the experience and capacity to act as the administrative and scientific manager of the proposed project and by implementing the above-outlined management strategy, the timely implementation of the project will be secured.

Communication flows

Consortium bodies meeting agendas/minutes must use available templates, standardized for consistency and will be available to all Project partners in a reasonable period prior to the meeting for agendas or after the meeting for minutes.

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File repository / shared platform

At the beginning of the project, the Coordinator sets up a commonly accepted file-sharing solution on Google Drive for the collection of the various reports produced during the project lifetime to be accessible to all the project partners.

The shared project folder will be used as a central element of the communication between project Partners, and is managed by the University of Miskolc. All reports, Deliverables, results and relevant material will be accessible to all partners at all times. The shared project folder structure is a web browser based access to secure project area. Partners will be invited by e-mail to join the shared project folder that will include:

- Administration
- Communication
- Meetings
- Professional content
- Promotion

Partners have the permissions to upload any digital file (documents, pictures) by simple drag and drop. If required, documented user guide and online training to members through webinar session can be implemented.

Access is granted by the Coordinator of ProSkill, Tamás Bakó (University of Miskolc) at szvbako@uni-miskolc.hu. Other than project members can be granted limited access to folders or full access to selected folders. Project members send a request to the administrator for inclusion of additional member to the list of users. If a member (or a grantee) is to be removed from the list (with revoking her/his rights) the representative of the Project Partner sends an official letter (email) to the project coordinator indicating the reason for the removal from the list.

Project website

Objectives

The official website of ProSkill will serve as a project management platform as well. The access to a certain part of the website will be limited (only the partners with strict authorization process get access to it). It helps the successful implementation of efficient management and support structures. Thereby, the aim of it is to provide management instruments facilitating and safeguarding the project's overall workflow. Especially through the implementation of the electronic data storage the ProSkill consortium will benefit from an always accessible centralized location data is stored and many other features helping the partners to track, monitor and manage the upcoming steps of the ProSkill project lifecycle.

The working documents (drafts) are available in Google Drive and Nextcloud (https://nextcloud.proskillproject.eu/), the completed documents are uploaded to the official website.

General Information about the website

Project management online

The website will facilitate the day-to-day tasks of project coordinators, work package leaders, team leaders and project partners during the entire life cycle of ProSkill. From the very beginning our goal has been to minimise the administration work in the management.

The website provides project coordinators and their team members with clear structures that:

- define and delineate project management procedures,
- actively enforce the collaboration between all project participants,
- create effective lines of communication and structured transparent workflow,
- clearly assign responsibilities and ensure that deadlines are met on time,
- integrate financial and work progress reporting facilities,

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- monitor the work plan‘s progress and financial status.

The content of the website consists of ten different modules listed in alphabetic order and described below.

Access rights

We choose an approach that only shows a user the allowed functions and contents defined by the user group he is assigned, so that the range of handling solutions for each user appears to be customised. By constraining the functions the user is assigned clear responsibilities, for he/she is only able to view contents relevant to his area of accountability. This improves the ease of handling the system. Information about users and their rights is respectively saved, while a back-end administration tool keeps it up-to-date and fills in the information gaps.

Detailed presentation of the website

The ProSkill project management platform consists of eight individual modules.
Website: www.proskillproject.eu

1 EXECUTIVE SUMMARY

A webpage is developed for the project, which supports all of us to share information with each other and stakeholders as well. The basic website consists of 6 main pages: home, about the project, consortium, press corner, news, contact. The project website will serve as an additional showcase to present the project’s activities and achievements. The news feed on the project website will be supported by regular posts on Facebook, Twitter, Instagram, and LinkedIn. Several interesting articles, infographics, blog entries, factsheets, statistics, networking opportunities, etc. will be published and continuously updated. The website is a dynamic platform, it will be improved over time and will accommodate more and more content as the project generates results.

2 OBJECTIVE AND ROLE OF THE PROSKILL PROJECT WEBSITE

The project website will support the implementation of the ProSkill project. It will be used to provide description of activities, intermediate results and other publications accessible for the public and other interested and affected parties. Internet is considered to be one of the best channels for introducing the project results and raise awareness of the stakeholders for the project. In addition, interesting articles, blog entries, infographics, factsheets, statistics, networking opportunities, and short videos, etc. will be published. Specific target is that the articles will re-appear in media in other countries. News entries will be used to post regular updates on the project.

3 NAVIGATION STRUCTURE AND LAYOUT

The website consists of 6 main pages:

- Home https://www.proskillproject.eu
- About the project https://www.proskillproject.eu/about-the-project/
- Consortium https://www.proskillproject.eu/consortium/
- Press corner https://www.proskillproject.eu/press-corner/
- News https://www.proskillproject.eu/category/news/
- Contact https://www.proskillproject.eu/contact/

These pages are indicated on the main top menu. The home page is not included in the menu, but the visitor can re-enter by clicking on the project logo, or reloading the https://www.proskillproject.eu/url. The website structure is expected to evolve throughout the project lifetime in order to satisfy the objectives and needs.
The home page provides an overview of the project with the description of the project scope, concept, partners, latest news posts, and social media channels. The About the project page is an

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extension of the home page. It gives a deeper explanation of the project concept, the objectives, the work plan for 2020-2021-2122.
The consortium page explains the partners institution in one paragraph each. The press corner was designed to showcase all the illustrations, interesting articles, infographics, blog entries, factsheets, statistics, that was generated in the project. Currently the project brochure, the roadmap, the ProSkill presentation and the social media cards are included. The News section is a category page, where all blogposts are automatically collected. The contact page offers a way to get in touch with the office, without giving email addresses, meeting cybersecurity standards. On each page, the footer element contains EIT funding information and the EU flag. The social media icons are also present at each page, on the bottom and top menu line.

4 BACK-END ELEMENTS

The website is hosted by the Icdsoftweb hosting company, and it is managed through a WordPress Content Management System. The website editing is facilitated by the Enfold responsive theme. The chosen domain name for the website is proskillproject.eu, which was purchased by EFG in January. The website can be accessed through the secure HTTPS (Hypertext Transfer Protocol Secure) protocol. Furthermore, the visitors can access the page through a secure channel (https://) without security warnings, due to the Transport Layer Security (TLS) certificate, issued by Let's Encrypt certificate authority. The TLS certificate is issued for 60 days, and it is renewed automatically, providing encryption. The website uses Google Analytics integration and measures the traffic on the various pages of the website. However, the data may be inaccurate, due to unfiltered automated bots, webcrawls, etc. therefore an alternative web analytics plug in has been also used to measure traffic: WP-Statistics12.6.13WordPress plugin. Search Engine Optimisation has been a priority when developing the website, so the website can be easily found through web search. In order to increase Google search ranking, Yoast SEO, WordPress is used to finetune the sites metadata. Each page (including main pages and blog posts) is being reviewed for SEO improvements. The objective is to include internal/outbound links, custom snippets (SEO title, slug, meta data description, each optimal length) and a focus keyphrase for best Search Engine Optimisation results. Now one can search for "ProSkill EU project", and the project will be in the first results. Cookies are used on the website, in order to improve the user experience, but the visitor is informed about this at the first visit, with opt-in and opt-out options. Therefore, the user can prevent storing any cookies through settings of the browser in use. Furthermore, the user is provided with a Legal Notice page, with detailed information on the responsible contact persons, copyright, data protection and privacy policy (collected information, marketing, accessing information, google analytics, cookies, other websites, contact).

Conclusion

The official website of ProSkill is a key instrument of the project's management process. How does it help?

1. All research data and documents that will be provided to the European Commission during and after the project lifecycle will be securely stored in one place and can be shared.
2. Communication between partners will be targeted and stored by using email lists and the forum.
3. Dissemination and exploitation activities can be entered when they are published. They can be listed and displayed on the ProSkill public website.

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Deliverables/outputs – 2020

Table 5: Deliverables and outputs in 2020 (ProSkill)

Internal Identifier	Title	Description	Is Deliverable
EITRM108060	D1 - Powerpoint presentation about ProSkill (WP2)	A Powerpoint presentation will be developed describing the project.	Yes
EITRM108061	D10 – Project website (WP2)	A webpage is developed for the project, which supports all of us to share information with each other and stakeholders as well.	Yes
EITRM108062	D11 - Project brochure 1 (WP2)	The brochure will present the project's objectives and activities and will be designed in a way that it allows both for printed and electronic dissemination.	Yes
EITRM108063	D12 - Summary of in-depth interviews and focus groups (WP3)	Based on the analysis (Task 3.3) we identify the critical issues. To get deeper knowledge about the skills shortages (and skill mismatches) we make interviews. In in-depth interviews the aim is to obtain a more detailed, rich understanding of the topic of interest.	Yes
EITRM108064	D13 - Social media campaign 1 (WP2)	ProSkill social media campaign will use infographics and factsheets to communicate the project objectives and activities to a broad audience. It is planned to publish one post per week during one month on all the social media platforms used.	Yes
EITRM108065	D14 - Report about national solutions of talent management (WP5)	The Colleges for Advanced Studies work in different ways in the V4 countries (and in partner HEIs). Although, the system can be found in all HEIs, the names and the operational details are different. A report will be published comparing the different systems in all partner HEIs and an inventory of best practices is developed.	Yes
EITRM108066	D15 - Summary about the results of competency tests (WP5)	It summarizes the results of competency test highlighting what skills the students have.	Yes
EITRM108067	D16 – Presentations of national conferences (WP4)	It is a collection about presentation in national conferences on 'Challenges of raw materials sector toward industry 4.0' (WP4, Task 4.2.)	Yes
EITRM108068	D17 - Skill-ecosystem strategy (WP3)	A skill-ecosystem strategy including an action plan will be developed. This strategy will contain the Learning outcomes and thematic description of the Trainer workshops will be delivered as part of WP4 in 2021. This learning outcome and thematic content will be developed in close cooperation with EIT RawMaterials and/or its delegated experts (planned under 10009 ESE education initiative KAVA)	Yes
EITRM108069	D18 - Annual performance report for 2020 (WP1)	The annual performance report for 2020 contains the detailed description of professional events (i.e.) including the schedule (program), the attendance lists, the results of course assessments and short description of experiences.	Yes
EITRM108070	D2 - Communication Roadmap (WP2)	The communication roadmap (one page long) will be developed. It shows milestones and expected achievements aimed at the general public.	Yes
EITRM108071	D3 - Communication and Dissemination Plan (WP2)	The Communication and Dissemination Plan contains the description of internal communication paths and activities within the consortium and external communication with stakeholders as well.	Yes

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EITRM108073	D5 - Risk management guide (WP1)	Continuous assessment of risks during the implementation of the project will be the basis of effective risk management. During monitoring new kinds of risks may arise which should also be measured and evaluated and proper actions need to be taken. The document contains all the possible risks and mitigation efforts.	Yes
EITRM108074	D6 - ProSkill work plan and management guide (WP1)	The Work Plan and Management Guide determines the exact roles of the consortium partners, contains the schedule of activities, and deadlines to support the daily management.	Yes
EITRM108075	D7 - Project logo and stylebook (WP2)	The project logo will be designed, and a stylebook will specify the project's colour scheme and fonts, defining the project's corporate identity and providing guidance to partners on its use.	Yes
EITRM108076	D8 - Templates (WP2)	Templates for power-point presentations, roll-up banners, posters, and social media cards will be designed and made available to all project partners.	Yes
EITRM108077	D9 - Questionnaire focusing on missing skills in the demand side (WP3)	We design the questionnaire and pilot it by testing the survey with a small and preselected company group. It enables us to determine whether some questions may need to be paraphrased, reordered or removed. We apply Google Forms (online questionnaire). In the kick-off meeting the project partners will determine the exact scope (and targeted issues) of the survey and will choose the right question types and the method of distribution.	Yes
EITRM108078	O1 - Thematic event 1 (connected to European Researchers' Night) (WP2)	The European Researchers' Night is a Europe wide public event to enhance researchers' public recognition and to stimulate interests in presented careers. As usual it is organized parallely in all 4 universities for the local students, local stakeholders and using local resources.	Yes
EITRM108079	O2 - National conferences on 'Challenges of raw materials sector toward industry 4.0' (WP4)	The implementation of industry 4.0 has a far-reaching impact on raw materials value chain. All partner HEIs will organise an interdisciplinary conference. The relevance of Industry 4.0 related opportunities and challenges will be in the focus and its effect on the labour market, in particular the missing and revalued skills. A differentiated perspective on varying company sizes, raw materials industry sectors, and the company's role as an Industry 4.0 provider or user will be taken. The four conferences are organized in the first year of the project (at partner HEIs) in close cooperation with existing networks to maximize impact. The presentations will be uploaded into the project website and the conclusion will be used for the implementation of WP3.	No
EITRM112824	Communication, dissemination or outreach activity for ProSkill	One activity related to the communication, dissemination and outreach to citizens. This might be combined with other activities during the year / in combination with other projects / and or by using online media; details to be defined during the year, and a revised version to be submitted during the course of 2020.	No
EITRM113006	Financial Sustainability mechanism explored for ProSkill	KAVA contribution to the KIC's Financial Sustainability mechanism will be explored and results reported.	No

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Table 6: EIT KIC specific KPIs for 2020 (ProSkill)

KIC KPI Code	Is Public	Baseline Previous Year	Target value 2020	Target value 2021	Target value 2022	Remarks	KPI	Definition	Supporting Evidence
KICN01-11	Yes		0	0,3	0,3	Circa 30 % of participants will be woman. It enables to us to deliver at least 245 female students participating in WP5. The KPI for 2020 is 0 because in this year the main task is to support the background activities of the next years and based on these results the first events (where the target group is MA and PhD students) will be implemented in 2021 and 2022. In 2020 the events that will be implemented are related to wider society learning and lifelong education.	Women graduating from RM-related courses	Relative number - percentage value between 0 and 1 - of women graduation from courses that are related to raw materials (incl. summer schools, individual courses, lifelong learning, PhD & Master EIT labelled programs)	List of female students graduated vs total graduates
KICN02-06	Yes		0	8	8	All partner HEIs will delegate at least 2 PhD-students and 60 MA students (per year, total) to WP5 performing KICN02-06 and KICN02-07.The KPI for 2020 is 0 because in this year the main task is to support the background activities of the next years and based on these results the first events (where the target group is MA and PhD students) will be implemented in 2021 and 2022. In 2020 the events that will be implemented are related to wider society learning and lifelong education.	Number of students in PhD Education short courses	Number of PhD students participating in RM-related short courses (Summer school, winter school, individual courses)	Declaration of honor with student name & course
KICN02-07	Yes		0	60	60	All partner HEIs will delegate at least 2 PhD-students and 60 MA students (per year, total) to WP5 performing KICN02-06 and KICN02-07.The KPI for 2020 is 0 because in this year the main task is to support the background activities of the next years and based on these results the first events (where the target group is MA and PhD students) will be implemented in 2021 and 2022. In 2020 the events that will be implemented are related to wider society learning and lifelong education.	Number of students in Master Education short courses	Number of MSc students participating in RM-related short courses (Summer school, winter school, individual courses)	Declaration of honor with student name & course

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KICN02-08	Yes		160	138	80	WP4 focuses on 'training the trainers' with totally 378 participants enable us to achieve the goals of KICN02-08 (8 partners and 50 mentors take part in the Workshop on 'Effective ways of mentoring and other best practices' in Brussels organized by EFG; 160 lecturers in the national conferences on 'Challenges of raw materials sector toward industry 4.0' (40 lecturers/HEI); 40 lecturers/workshop (4 workshops, 4 HEI, 10 lecturers/HEI)).	Lifelong Education	Number of professionals educated (incl. train the trainer and internal trainings for professional employees).	Declaration of honor with student name & course
KICN02-09	Yes		200	612	1228	In the events of WP2 there will be totally at least 1200 participants (200 participants in Earth Day, 200 participants in European Minerals Day and 800 participants in the Researchers' Night). Successful implementation of WP5 results in at least 840 participants: 640 students from guest lectures, 4 students in the 'Spend a day with me program', 24 students in international competitions, 12 students in V4-SX program, 160 students in inter-university field trips.	Wider Society Learning	Number of participants in Wider Society Learning events incl. school students, communities, policy makers and politicians	List of attendees/ event (<50: attendees names, otherwise, number of attendees).
KICN02-10	Yes		0	0	20	20 students will be involved in the mentor program (WP5) performing the KICN02-10.The KPI for 2020 and 2021 is 0, because the Mentor programme is carried out only in 2022. The KPI is definitely connected to this programme.	Students & Industry - Knowledge Triangle Integration	Number of students exposed to industry as part of a KAVA project (participating in upscaling projects, doing internships for a project, in open innovation events, etc.)	List including student name, university, study field and contribution to the project

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Table 9: Responsibilities of partners regarding KPIs for 2020 (ProSkill)

KPI code	Target value - 2020	University of Miskolc	Politechnika Slaska (Silesian University of Technology)	Slovak University of technology in Bratislava (STU)	VŠB - Technical University of Ostrava
KICN01-11	0	0	0	0	0
KICN02-06	0	0	0	0	0
KICN02-07	0	0	0	0	0
KICN02-08	160	40	40	40	40
KICN02-09	200	50	50	50	50
KICN02-10	0	0	0	0	0

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ProSkill events - 2020
Name: Kick-off meeting (WP1)
Organizer (responsible): University of Miskolc
Location: Hungary
Date: 01.2020
Participants:

- University of Miskolc: management group
- Slovak University of Technology in Bratislava (STU): 2 persons, 1 night
- VŠB - Technical University of Ostrava): 2 persons, 1 night
- European Federation of Geologists (EFG): 1 person, 1 night
- EIT Raw Materials GmbH: 1 person, 1 night

Name: Thematic event 1 (connected to European Researchers' Night) (WP2)
Organizer (responsible): University of Miskolc, Politechnika Slaska (Silesian University of Technology), Slovak University of Technology in Bratislava (STU), VŠB - Technical University of Ostrava
Location: Hungary, Slovakia, Czech Republic, Poland
Date: 11.2020
Participants: no travel needed by the consortium partners

Name: National Conferences on 'Challenges of raw materials sector toward industry 4.0' (WP4)
Organizer (responsible): University of Miskolc, Politechnika Slaska (Silesian University of Technology), Slovak University of Technology in Bratislava (STU), VŠB - Technical University of Ostrava
Location: Hungary, Slovakia, Czech Republic, Poland
Date: 10.2020
Participants: no travel needed by the consortium partners

Work plan for 2020

WP1 - Project management
Lead Partner
University of Miskolc

Description
The long implementation period of the project and the five work packages, including the consortium with five members (including one task partner), requires the establishment of Project Steering Committee which can coordinate the project well. The University of Miskolc, as lead partner is responsible for the quick set-up of the project's organisational and communication structure in order to safeguard a smooth project start and enable an immediate uptake of activities. Each partner will be personally informed on the relevant rules and regulations as well as project internal workflows. The project management will be responsible for the preparation, collection and maintenance of contractual documents and will ensure that project partners are aware of the project's legal framework at all times. In this context, direct communication lines will be established with the legal departments of all project partners. Another responsibility is to organize and follow-up of periodic project meetings to assess and discuss project progress. Compilation of the performance and finance reports will be managed by Project Steering Committee. The management team will coordinate the collection and monitoring of periodic cost claims, appropriate justification of declared costs in project reports, followup of EIT KIC payments, collection of audit certificates at the end of the project where necessary, and the timely distribution

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of partner shares. A main task of the Project Steering Committee will be the monitoring of work package status measured against deliverable and milestone planning, and quality assurance of project outcomes: The progress of each WP will be presented by the WP leader during the regular project meetings and also ad hoc by personal communication if the need arises, and assessed by the Steering Committee.

Task 1.1 - Coordination and supervision of project activities
The focus of this task relates to the supervision of the whole project according to the work plan and the project (funding) agreement. It provides support to decision making processes, ensuring internal communication within the project and liaising with EIT. Teamwork and clear management processes and responsibilities established by the coordinator and the project manager will ensure effective control and management of deadlines, and communication and monitoring of the duties of partners and deliverables set out in the work packages. Close project control, the day-to-day monitoring of the project will be essential to facilitate the preparation of intermediate and final reports to EIT. The duties and responsibilities of the project manager, project leader and the partners will be described in the Work plan and management guide.

Task 1.2. – Administration, financial management and reporting
The overall objective of this task is ensuring the administrative management of ProSkill in accordance with the EIT regulations, the consortium agreement and the description of work. This includes project planning, supporting the coordination and day-to-day business as well as the management of financial, legal and contractual matters. The University of Miskolc will provide all the necessary tools to the consortium. Management guide will define concrete roles to project partners based on the project's work plan. Project Steering Committee will be established within project consortium (representatives from: coordinator, project partners and task partner). University of Miskolc as coordinator will be responsible for all four project partners (+1 task partner) and will report their performance to EIT KIC.

Task 1.3. – Project meetings
During the project the consortium partners will meet personally at least once a year. During the meetings, progress of the project will be discussed, especially relating to contractual obligations, reported expenditures and all of the work packages will be discussed. Steering group will meet at those meetings to discuss possible bottlenecks and define measures to mitigate risks. Kick-off meeting will be held in Miskolc (kick-off), mid-term project meetings in Brussels (hosted by EFG) and in Gliwice (hosted by Silesian University of Technology). The final project meeting will be at the same time with the final conference (in Miskolc).

Task 1.4 - Risk management and conflict resolution
A consortium agreement will be prepared by the Coordinator and signed by all partners, describing and defining clearly the roles and obligations of the partners, the issues concerning operational regulations, the administrative and reporting procedures and the procedures for dispute resolution. The agreement will contain a detailed conflict resolution mechanism to avoid and/or solve any problems that might occur during project implementation. In addition to the risk considerations already detailed in the proposal it is equally important to monitor any emerging, unforeseen risks to the project. Such continuous assessment of risks during the implementation of the project will be the basis of effective risk management. During monitoring new kinds of risks may arise which should also be measured and evaluated and proper actions need to be taken. Efforts will be made to solve any conflicts with a full consensus. If this is not possible decisions will be made with a simple majority of votes. In an event of a tie, the Coordinator has the casting vote. Any occurring Force Majeure events will be immediately communicated to the EIT Project Officer.

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Duration
2020-01-01 - 2022-12-31

WP2 – Communication and dissemination

Lead Partner
European Federation of Geologists (EFG) (new)

Description
The main objective of WP2 will be to ensure coherent external communication of ProSkill activities, progress and achievements, as well as the optimal management and exploitation of high skill ecosystem strategy and action plan, short-term and long-term programs. Skill ecosystems should be transparent. To ensure this basic principle we put a great emphasis on the efficient communication and dissemination. Based on our former project experiences (H2020, Espon), the use of printed materials is not efficient enough anymore (the unit cost is high and the number of reached people is low). The only device, which is always kept by us, is the mobile phone. The users (mainly X, Y and Z generations) watch short videos via YouTube, and consult interactive contents and infographics on Instagram, Facebook and Twitter. They communicate via WhatsApp, Messenger or other chat forums. If we want to build a bridge among the stakeholders, we must adapt to the changing requirements in terms of communication and outreach. The main goals are: creating visibility and encouraging project outreach, disseminating results to the raw materials community and fostering innovation and exploitation of results. The target audience involves the general European public, KIC partners, national, regional and local governments and stakeholders and relevant networks, NGOs (that form the innovation ecosystem in ESEE region).

Task 2.1 - Dissemination management
At an early stage of the project, a communication and dissemination plan will be developed in close cooperation with the coordinator and all project partners, thereby identifying major target groups (scientific community, policy makers, industry, broad public and specific stakeholder/user groups) and appropriate communication channels. This will elaborate on the activities described below to ensure the coherence of the project's core messages across the various channels used, and a strategic coverage of different audiences and stakeholders, combining timing and different media supports with consistent message content, structure and format. The identification of the networks and dissemination routes to be used and the alternative combinations of available dissemination channels are also included in this task. This will provide central co-ordination and management of the communication efforts of all partners, supporting the reporting role to external stakeholders and ensuring coherent and accessible messages across the project.

Task 2.2 - Communicational Toolset Development
This task will develop the tools needed to implement the communication and dissemination plan. Key communication messages and design elements (project logo, colour scheme, fonts) will be conceived to define the project's "corporate identity". These elements will be used for presentations, reports, rollup banners, posters, as well as for meeting and internal documents and will be provided to all partners as a dissemination toolkit. This toolkit and all other communication materials will be made available to the whole consortium through the internal communication and management platform (specific page of the external project website), allowing project partners to easily access and use the material for all project-related communication and dissemination activities. The external project website will serve as an additional showcase to present the project's activities and achievements. The news feed on the project website will be supported by regular posts on both Facebook and Twitter. Facebook will be used mainly to share photos and multimedia materials created during project meetings and workshops, whereas the regular updates of online

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content and interesting monthly topics will make Twitter an ideal tool to cover project activities in real time. Several interesting articles, infographics, blog entries, factsheets, statistics, networking opportunities, etc. will be published and continuously updated. To foster networking within the academic, industry and policy communities, particular attention will also be paid to the interaction with other related initiatives and other ongoing projects or networks at a national and international level (particularly EU-funded initiatives).

Task 2.3 - Common dissemination actions
This task will be comprised of consortium-level dissemination efforts about the project, its objectives, the approaches and results through international/EU channels and leaflets. Activities will also include logging onto international events and EU-level workshops, mutually promoting these events (e.g. exchange of logos and links) and also publishing articles concerning the project's objectives, approach, methodology and results in national and international journals.

Task 2.4 - ProSkill Partner Dissemination actions
National Stakeholder groups will be formed first, comprising stakeholders and all interested and affected parties from the private and public sectors. These parties will be informed through targeted e-mails, meetings and ad-hoc workshops. Local community members will be informed through presentations, booklets and local media. Stakeholders include scientific community, policy makers, industry, broad public and specific stakeholder/user groups. The greater stakeholder community of EFG member countries will be informed through publications in national journals, networking events and thematic events. The sense of the Thematic events 1 to 3 is to outreach awareness of RM sector especially between young people and wide society, bring the idea visible and acceptable. The European Researchers' Night, the European Minerals Day and the Earth Day are organized annually in the European higher education institutions. The thematic events (in ProSkill) will supplement them and will be implemented by every partner university applying local human resources and targeting the local audience.

Task 2.4.1 – Thematic event 1 (connected to Earth Day)
This thematic event will conclude the series of events raising awareness of RM. Earth Day Network's mission is to diversify, educate and activate the environmental movement worldwide. So there is space for us to promote awareness of the possibilities of environmentally friendly use of mineral raw materials. Topic of the event will be given on kick-off meeting.

Task 2.4.2 – Thematic event 2 (connected to European Minerals Day)
The European Minerals Day thematic event will illustrate the essential role of mineral raw materials in Europe's economy, contributing to innovation and resource efficiency all across the value chain. Typical activities for local community include guided visits through active and rehabilitated sites, workshops, and entertainment activities for children. Topic of the event will be given on kick-off meeting.

Task 2.4.3 – Thematic event 3 (connected to European Researchers' Night)
The European Researchers' Night is a Europe-wide public event to enhance researchers' public recognition and to stimulate interests in presented careers. It is planned to participate within this event in one of the involved partner cities with minimum of three participants. Topic of the event will be given on kick-off meeting.

Task 2.5. - Closing action
ProSkill consortium will organise an international final interdisciplinary conference on promoting the skill-ecosystem strategy and other results. This conference will be organised in close cooperation with existing networks to maximise impact. The aim of the conference will be to

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stimulate exchange within the international scientific community and other stakeholders (such as policy makers), and to connect with and disseminate the results of ProSkill to the interdisciplinary and international RM community.

Duration
2020-01-01 - 2022-12-31

WP3 – Building community among partners – development of a skill ecosystem
Lead Partner
University of Miskolc

Description
Adopting a 'skill ecosystem' concept we have to look at skills used in raw material industries, what strategies can work, what the stakeholders' roles. The main goal of WP3 is to reveal what skills (soft and hard skills) are missing in the RM industries by the business side. The skill ecosystem strategies need to have the following characteristics: 1) they address both supply and demand sides of the skill equation (i.e. they focus on the availability or development of skills, and their utilisation); 2) they seek to achieve both improved business performance and positive outcomes for individual employees. In our view successful skill ecosystems require a deeper, or more complex level of partnership. Skill ecosystems have partners of equal influence and outcomes that are not fixed in advance, are collaborative and invite innovation. Open structures establish a space for exploration of new ideas. The term ecosystem hints at the complexity of a skill ecosystem with a dynamic lifecycle using adaptive iteration. It takes time to develop successful skill ecosystems, to build trust and openness amongst partners. To make it happen, we organize national workshops to address directly the stakeholders of the project. We list the problems and the most urgent challenges regarding skills shortages and skills gap. We support it with an effective questionnaire. In-depth interviews (and focus groups) supplement the results focusing on predetermined issues. Based on our consequences and results we develop a skill-ecosystem strategy and action plan. The group of RM subsectors and related companies will be determined in the kick-off meeting. But the precondition is that the selected companies should represent the RM sector (representative sample).

Task 3.1. – Develop a questionnaire focusing on missing skills in the demand side (in the business sector)
We design the questionnaire and pilot it by testing the survey with a small and preselected company group. It enables us to determine whether some questions may need to be paraphrased, reordered or removed. We apply Google Forms (online questionnaire). In the kick-off meeting the project partners will determine the exact scope (and targeted issues) of the survey and will choose the right question types and the method of distribution. We primarily build on social media. We intend to ensure a representative sample.

Task 3.2. – Achieving the questionnaire/making the survey
The survey questions have to be specific. In the kick-off meeting we determine the project partners' roles and tasks in the survey. After the development of the questionnaire, the project partners have 2 months to take the survey.

Task 3.3. – Analysis of survey data
The results are back from the online surveys, so we collect the statistical survey results. We carry out the analysis of that and we draw conclusions.

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Task 3.4. – In-depth interviews and focus groups
Based on the analysis (Task 3.3) we identify the critical issues. To get deeper knowledge about the skills shortages (and skill mismatches) we make interviews. In in-depth interviews the aim is to obtain a more detailed, rich understanding of the topic of interest. These interviews will be supplemented with focus groups. These are a form of group interviews with the aim of capturing the interaction between the participants based on topics that are supplied by the researcher. The main purpose of focus group research is to evoke a level of respondents' attitudes, feelings, beliefs, experiences and reactions otherwise not available when using methods, such as observation or interviewing.

Task 3.5. – Development of a skill-ecosystem strategy
Applying the results of Task 3.3 and 3.4 we develop the skill-ecosystem strategy including an action plan as well (in our point of view the strategic goals can be achieved only with actions). The basic principles: it should be straightforward, concise and quite complex to support effectively the specific programs in WP4 and WP5. An essential element of the strategy is a strategy map. The main areas of it are the following: financial perspective, the client (students and partners), processes (how I implement), learning and innovation. It is a visual tool and it may ensure to build a clear roadmap, clarify the causality directions. It is a system of qualitative and quantitative indicators which contribute to measure the impacts and assess the results. It is the basic element of the action plan.

Duration
2020-01-01 - 2020-12-31

WP4 – Improve the education landscape – reshaping of curricula
Lead Partner
Slovak University of Technology in Bratislava (STU)

Description
At the partner HEIs a wide range of BA and MA courses related to the raw materials sector are offered. As the ESEE Education Concept Note (2018) confirms “consolidating and enhancing existing programs are priority against creating new programs […]”. The main objective of this WP is not to create new courses and curricula but to rethink, improve and fit them to the changing environment. WP4 ensures the long-term sustainability of ProSkill: the developed syllabuses will be used after finishing the project. The lecturers get up-to-date information about active learning methods, they realize the new claims related to skills of graduated students.

Task 4.1 – Workshop on ‘Effective ways of mentoring and other best practices’
The workshop will act as a starting point for the international mentoring program (Task 5.5). Two longstanding mentors will be invited to share best practices with the project partners in a workshop held in Brussels in January 2021. The session will ensure a successful implementation of the mentoring program within ProSkill and will cover among others the following aspects: what characterises a successful mentoring programme, how to match efficiently mentors with mentees, how much time should the mentor foresee for the program, etc. The second session will consist of an online training “from mentors for mentors”. The training will be accessible to all European Geologist title holders and all mentors registered within the EFG mentoring programme. It will be delivered online to guarantee accessibility for a high number of mentors.

Task 4.2 – National conferences on ‘Challenges of raw materials sector toward industry 4.0’
The implementation of industry 4.0 has a far-reaching impact on raw materials value chain. In this task all partner HEIs will organise an interdisciplinary conference. The relevance of Industry 4.0

related opportunities and challenges will be in the focus and its effect on the labour market, in particular the missing and revalued skills. A differentiated perspective on varying company sizes, raw materials industry sectors, and the company's role as an Industry 4.0 provider or user will be taken. The four conferences are organized in the first year of the project (at partner HEIs) in close cooperation with existing networks to maximize impact. The presentations will be upload into the project website and the conclusion will be used for the implementation of WP3. The conferences contribute to stimulate exchange within the national RM community and other stakeholders (such as policy makers). Nationally outstanding keynote speakers from different disciplines will be invited.

Task 4.3 – Workshop 1: 'New and innovative teaching methods – reshaping of curricula with focusing on active learning and other solutions'
How can we get the students to participate in class discussions? How can we improve their soft skills in a way that it does not go to the expense of the professional material (hard skills)? A variety of teaching methods - such as peer-instruction, discussion groups, and collaborative problem solving, visualization, so called active learning methods - can improve greater student engagement. Each of these methods forces the students to connect, share information, and discuss possible solutions to posed problems, anticipating real life workplace situations. In this workshop the lecturers get up-todate information how they can develop the current curricula and fit them to the challenges of 21st century. The workshop will be organized in national language at the same time in all partner HEIs.

Task 4.4 – Workshop 2: 'Digital Education Tools for Teachers and Students - Challenges in the education of generation Z and Alpha'
Several digital education tools are unexplored and available to enrich the course materials with the newest product of information technology. Gen Zed involves now the freshmen in Universities, while Gen Alpha refers to the recent high-school population. The workshop is aimed at introducing (1) the digital way of living of these generations to the adult professionals, professors, and (2) introduction of the digital warehouses of geological-geotechnical tools into the course materials in attractive manner to the students coming from these generations. The tools to be used are - among others: chatforums as consultation tools, downloadable apps to mobile-phones (for example geological compass etc), digital maps and GPS/geocaching for field practices, photos and videos for rock/outcrop documentation and archiving including selfies and Instagram posts, downloadable worksheets, spreadsheets, calculators, simple 3D modelling tools. The tools will be complemented by the preparation of a freely downloadable electronic exercise book, ready to be inserted in most Earth Science Engineering technical courses.

Task 4.5 – Workshop 3
The topic of Workshop 3 highly depends on the results of WP3 and it should reflect on the missing skills revealed in the market survey. The high skill-ecosystem strategy will determine the most needed areas, which can be varied regarding the partner nations. The trainings should consider these national differences. Topic of the event will be given in the first mid-term project meeting and the business plan of 2022 will describe it in more detail. The workshop will be organized in national language at the same time in all partner HEIs.

Task 4.6 – Workshop 4
The topic of Workshop 4 highly depends on the results of WP3 and it should reflect on the missing skills revealed in the market survey. The high skill-ecosystem strategy will determine the most needed areas, which can be varied regarding the partner nations. The trainings should consider these national differences. Topic of the event will be given in the first mid-term project meeting

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and the business plan of 2022 will describe it in more detail. The workshop will be organized in national language at the same time in all partner HEIs.

Duration
2020-01-01 - 2022-12-31

WP5 – Improving the professional life inside the Colleges for Advanced Studies with specific programs
Lead Partner
Politechnika Slaska (Silesian University of Technology)

Description
In the current educational system, the students get focused (not comprehensive and general) knowledge related to a scientific area. As a consequence, the mining engineering students and economist students are partly narrow-minded. One of the most important objective of WP5 is to increase the international embeddedness of the local Colleges (related to business education and RM sector), to develop a real and liveable network among the partners and to create multidisciplinary teams. This work package provides specific programs developing specific knowledge and skills for our target group. A unified reward system will be worked out, which will function after the project end as well ensuring the requirement of long-term sustainability. WP5 serves as a pilot project to implement the action plan of high skill eco-system. The professional work will be dedicated to some selected topics. CSR (corporate social responsibility), circular economy (principles, challenges, life-cycle assessment) and the industry 4.0 will dominate the events. Here we note that all of these programs will be fit (and slightly modified) for the results of WP3 (namely high-skill ecosystem strategy and action plan). At the end of the project a group of highly engaged student will be emerged with developed soft skills and professional experiences.

Task 5.1. – Competency tests for students
Not only the company side (what skills they are missing) is important, but also young absolvents what they have experienced to miss in terms of competences themselves. The Vienna software (called VIENNATEST: including The AHA - Attitude towards Work; SKASUK - Customer Service and Orientation Scales; AVEM - Work-related Behavior and Experience Patterns; MAP – Management Potential Analysis; COG – Cognitrone; SIMKAP - Simultaneous Capacity/Multi-Tasking) is suitable to assess soft skills of the participants, such as the respondent's cognitive style (impulsiveness versus reflectivity), the motivational dimensions of aspiration level, frustration tolerance, achievement motivation, attention and concentration skills (focusing on multi-tasking), work- and leadership-related attitudes and personality characteristics. It provides information on behaviour and motivation in stressful situations. The students get information whether they can work in a management position or whether they are suitable for a customer-focused activity. Finally, they have reliable information about their strengths and weaknesses, what skills they should improve. The tests are online available, the students in other partner HEIs can access it and can get the feedback online. In Autumn 2020 the selected tests are filled in by the students, which serves as a good basic for the WP3 and the professional work later.

Task 5.2. – Guest lectures (ALUMNI and OLDTIMER) and soft skills training
Aim of this task will be enhancing soft skills of students (in the field of i.e. English language, critical thinking, project management training (revealed in WP3)) and hard skills to achieve higher competitiveness on the international market. The number of events focusing on hard skills and soft skills should be 50:50. Training (lectures, workshops) will be organised at each HEI separately. In all HEIs the partners invite trainers, ALUMNI, senior managers, graduates of the inviting university, or OLDTIMERS - professionals with several decades of

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industrial/institutional practice. The guest lectures follow predetermined thematic fields (such as CSR activities of the companies, circular economy, challenges of industry 4.0 in the RMs, soft skills training). In every project meeting the partners have to present the next semester agenda. In all HEIs at least two guest lectures have to be organized per semester (in 2021 and in 2022).

Task 5.3. – Reveal the national solutions of talent management
The Colleges for Advanced Studies work in different ways in the V4 countries (and in partner HEIs). Although, the system can be found in all HEIs, the names and the operational details are different. From our point of view, ProSkill helps them to become visible. In this task we compare the different systems in all partner HEIs and an inventory of best practices is developed. The synergies coming from the cooperation are named.

Task 5.4. – Reward system
Motivating students is not always easy. Colleges for advanced studies collect also a number of extra possibilities and benefits in their respective faculty, which would be a resource to acknowledge the outstanding performances of the best students. We propose a uniform virtual credit system in the participating colleges, which would be set up during the kick-off meeting. As a starting proposal, the recent practice of the Miskolc TEKH Special College can be quoted: The submission requirements are 3.5 (out of 5) semester average grade, and sound knowledge of English language. Submission is for 2 semesters, prolongable, until the end of student status of the member. Subsequently she/he may continue in the Alumni Club of the TEKH college. Evaluation is in every end of semester. To maintain membership the following requirements should be met: average grade has to be 3.5 or better; minimum of credits is 3. Credit is given for 1) approved research program (1); 2) accepted progress report (1); 3) publication - written or oral (2); 4) participation in registered events (1); 5) participation in team competitions (1); 6) prizes won (2). The top 20 % of students will publicly be announced and have first option to choose from TEKH benefits - scholarship, demonstratorship, conference participation, travel grants, research expenditures. The lowest 20 % of students receive warning to enhance their contribution. However, the national differences should be considered, but we try to introduce a unified system. After the development of the system it becomes self-sustained and it will be applied not only during the project implementation, but after the project end as well.

Task 5.5. – Mentoring program - supporting the students' professional activity
The best performing students (based on the developed reward system) get into an international mentoring program. It starts in autumn 2021 based on the experiences of spring semester (2020/2021) of WP5. The international mentoring programme aims at creating an international informal network of experienced professionals capable of providing guidance and support to the new generation of geoscientists. Over a fixed period of 9 months, the mentees will receive advice and targeted support from experienced professionals, according to their individual goals. Examples include: feedback and support during the job application process; building up a network, transfer of contacts; development of a career strategy; introduction to informal knowledge and business networks; shadowing (participation in the professional life of the mentor). The cooperation will start with a webinar that will introduce the programme's goals and opportunities to mentees and mentors. Due to the international dimension of the programme, electronic communication tools will be encouraged to keep mentees and mentors in touch. In addition, EFG's membership associations will approach the participants whenever possibilities for face-to-face meetings arise at national level. The programme is coordinated by the EFG and supported by the respective member association(s) at national level.

Task 5.6. – Spend a day with me! - one day program with a top manager

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Based on the existing project of the European Minerals Day (https://www.ima-europe.eu/about-imaeurope/events/european-minerals-days-2019), ProSkill would organize a special one-day program for the best 10 % of involved students from each HEI with an operation manager of the respective company/plant/mine. The underlying reason for this program would be to start developing managerial experience and skills in those students who have the best abilities to become leaders in teams, workgroups. The one-day project would be a well-engineered visit of the hot spots of producing plants, ending up with an informal lunch/dinner, where observations/opinions can be exchanged. The program will be organized in all partner HEIs separately.

Task 5.7. – Participation in international competitions
The partner HEIs support the students to set up multidisciplinary teams and take part in international competitions. The participation fee (and other costs, such as travel) of international competitions is extremely high (in many cases it is 2000-3000 EUR/competition). Otherwise the HEIs cannot afford to give financial support to the colleges for advanced studies, which blocks the students. All HEIs have to form at least one multidisciplinary team and support them to take part at least in one international competition per year. The main requirement for the international competitions is that they have to expect application of multidisciplinary teams. The potential competitions could be: HEC Business Game (http://www.hecbusinessgame.com/), University College London Business Game (http://www.uclbusinessgame.com/), John Molson Undergraduate Case Competition (https://www.jmucc.ca/), etc..

Task 5.8. V4 – SX (simulation of stock trading – international competition)
A webinar will be organized about popular trade tactics (fundamental and technique analysis). The participants (two-person groups, including one economist and one engineering students) have to create a portfolio (to minimize the risk) with maximum 5 basic instruments (including at least one rare earth metal and one precious metal). The students get basic knowledge about the main driven of stock trading and basic definitions (price volatility, stop loss order, buying on margin, technique indicators, such as DeMarker, Alligator, Doji etc.). The groups will compete internationally with each other and at the end of the semester a guest trader assess their performance. They use a trader software (Plus 500, investing.com) in demo version, but it enables them to follow their investment (profit and loss) as in real. It is a one semester task. The webinar is accessible for every student (in all partner HEIs). After it national teams are formed and they will compete with each other (2 months long). The teams get feedback continuously, at the end of the semester there will be the announcement of results and the participants get certification.

Task 5.9. – Inter-university field trips (2 nights, 3 days long) with dedicated factory/company visit
Two field trips are organized (one per year). Way of traveling: bus rent. In all HEIs, groups of circa 20 students are formed. The groups with at least two lecturers travel to the selected HEI. There the HEI partner compiles a professional program (including workshop focusing on a specific topic, company visit and social event).

Duration
2020-01-01 - 2022-12-31

Professional tasks by partner - 2020

- University of Miskolc
  - WP1 leader!:
    - WP1: organize the kick-off meeting
    - WP1: Annual performance report for 2020 (D18)

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        - WP1: Risk management guide (D5)
        - WP1: ProSkill work plan and management guide (D6)
    - WP3 leader!
        - WP3: Summary of in-depth interviews and focus groups (D12)
        - WP3: Skill-ecosystem strategy (D17)
        - WP3:Questionnaire focusing on missing skills in demand side (D9)

- Slovak University of Technology in Bratislava (STU)
    - WP1: take part in the kick-off meeting (2 persons, 1 night)
    - WP4 leader!
        - WP4: Presentations of national conferences (D16)
        - WP4: National conferences on 'Challenges of raw materials sector toward industry 4.0' (O2)

- Politechnika Slaska (Silesian University of Technology)
    - WP5 leader!
        - WP5: Report about national solutions of talent management (D14)
        - WP5: Summary about the results of competency tests (D15)

- European Federation of Geologists (EFG)
    - WP1: take part in the kick-off meeting (1 person, 1 night)
    - WP2 leader!
        - Powerpoint presentation about ProSkill (D1)
        - Project website (D10)
        - Project brochure 1 (D11)
        - Social media campaign (D13)
        - Communication Roadmap (D2)
        - Communication and Dissemination Plan (D3)
        - Project logo and stylebook (D7)
        - Templates (D8)
        - Thematic Event 1 (connected to European Researchers' Night) (O1)

- VŠB - Technical University of Ostrava
    - WP1: take part in the kick-off meeting (2 persons, 1 night)
    - Supporting the University of Miskolc

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CHAPTER 5.
Summary of in-depth interviews and focus groups

Krisztina Varga – László Molnár – Simona Matušková – Jiří Švub – Filip Beneš – Bibiana Burdejová – Peter Cuninka – Grzegorz Strozik

EXPERT INTERVIEWS – SUMMARY RESULTS (HUNGARY)

RESEARCH METHOD

During the qualitative research, 11 in-depth expert interviews were con- ducted, of which 5 were conducted by lecturers of the Faculty of Earth Science and Engineering and 6 by lecturers of the Faculty of Economics.
Expert interviews were conducted between 14 August and 14 September 2020. 7 interviews were conducted by colleagues in August and 4 in Sept- ember.
The interviews were conducted in a variety of formats and locations. In three cases, the interviewed experts responded by telephone, while the others responded in person. Most of the interviews were conducted in Miskolc, but there were interviews in Füzesabony, Eger, Budapest, for example in the places where the companies represented by the experts are located.
The companies represented by the interviewed experts were as follows (in one case, the interviewee did not agree to provide the name of the company he represented):

- Aegon Biztosító
- Colas Északkő Kft.
- DAKÖV Kft.
- Emerson Hungary Kft.
- Envirotis Holding Zrt.
- Josb Hungary Kft.
- Joyson
- Musashi Hungary Füzesabony Kft.
- NHSZ Észak-KOM Nonprofit Kft.
- Perlit-92 KFT

Most of the companies involved in the research came from the raw material production or processing sector (e.g., rhyolite, zeolite, quarrying), but there were also companies specializing in drinking water supply or waste management, as well as representatives of mechanical engineering and metalworking.
Most of the invited experts came from the number one manager of these companies (managing directors), but there were also production managers, product development managers and development engineers.
What raw materials are used in their production or what raw materials do they produce?
The interviewed experts described in detail what raw materials are produced: rhyolite, zeolite, andesite, drinking water and what raw materials are used in their activities, for example: clay, sand, gravel, water, natural gas, steel, aluminum, rubber, plastic, and waste.

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EXPECTATIONS FOR RECENT GRADUATES

In what field are graduates expected to have a degree? (technical, economic, etc.) In what proportion do you need graduates with technical, economic, etc. degree?
By the way, companies with a special technical orientation need specialists with a technical degree and only a small proportion with an economic degree, as they provide “background services”. “It can be said that in its proportions approx. 70% have a technical degree and 30% have a law degree” - stated the drinking water sector manager of DA-KÖV Kft. In areas with a less technical orientation, the demand for economic education appears in a higher proportion, either in half, or, for example, one of the service providers requires only economists.
What level of education is expected of them? (BSc, MSc, etc.) In what pro- portion do you need graduates with BSc, Msc, etc. level of education?
Regarding the level of training, there were two types of responses from experts. One half of the respondents stated that they prefer the MSc level: "We prefer the master's degree, 2/3 MSc and 1/3 BSc, if I have to say pro- portions." In contrast, the other half of the respondents - and they were slightly more - did not differentiate between MSc and Bsc, in their own words: “There is no distinction between BSc and MSc degrees in applications.” Or “Not relevant. Ability, willingness to shoot, commitment, technical sense are important. ” Overall, therefore, the level of education will be less important than the competencies, i.e., even a BSc degree can be placed with a good chance.
What kind of training is expected? (full-time training, correspondence training, dual education, international education, etc.)?

In this respect, the view was even more general that "There is no distinction in the form of training either, but experienced recent graduates will have an advantage." or as another expert put it, “It doesn’t matter at all. Each has its advantages and disadvantages. ” There have been positive experiences with dual training, but there is no experience with international training at all.
How would you evaluate the trends in the competences of university graduates in the past 10 years?
The majority of the interviewed experts reported a rather negative trend “Unfortunately, there is a consensus within the company that the competencies of recent graduates in all sub-areas have deteriorated significantly in recent years”. However, there were those who did not see the situation so gloomily: “There was a ‘dark period’, but in the approx. last 3 years the trend has improved; there are more sensible, interested students” and there were also those who were able to report positive experiences: “Due to the expanding internship opportunities, their practical knowledge was strengthened and the ability to socialize at work was also developed.”

GENERAL COMPETENCE REQUIREMENTS
GENERAL COMPETENCE

What are the 5-10 most important general competencies for recent graduates?
During the interviews, respondents listed more than 20 different general competencies combined. The most frequently mentioned competencies were: communication skills (9), language skills (5), problem-solving skills (5), cooperation skills (4), development skills (4), complex vision (4). However, opinions were divided on the latter. There were those who thought, "I think the most important thing is a complex vision." While another expert argued just the opposite, "Complex vision is not an expectation for a recent graduate, it will develop over time."

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LANGUAGE SKILLS

What language skills are expected? (specific languages, if there is ad- vantage knowing more than 1 language, if they can use language both written or spoken)
As language skills also emerged among the general competencies, we explored this issue thoroughly. With one exception, all experts mentioned English as a required language proficiency. A large number (6) considered the German language important. In terms of the form of communication, these languages are needed both in writing and orally. In some companies, other languages have appeared, such as Chinese, French, and once and for all Russian and Slovak. So overall: "Mainly English is the expectation, to a lesser extent German."

SOFTWARE SKILLS

What computer skills are expected? (which specific programs are needed)
There was a consensus that knowledge of the Office suite is a basic requirement, as one expert put it: "Using Office is already defined as basic computer knowledge." In the technical field, AutoCAD is of paramount importance and has been mentioned by several experts. Enterprise management software has also appeared to a lesser extent than SAP. In addition to these, many other specific programs have been mentioned, but these are mostly related to a particular job rather than general expectations.

PROFESSIONAL COMPETENCE REQUIREMENTS IN THE FIELD OF ECONOMICS

What are the 5 most important professional competencies for students graduating in the field of economics and looking for a job in the field of raw material production and user industry?
Some of the experts interviewed agree with the results of the questionnaire:

- “Knows and understands the basic and comprehensive concepts, theories, characteristics and contexts of economics in relation to relevant actors, economic functions and processes, the sectoral structure of the economy and the complex system of the economy.”;
- “Knows the rules, professional and ethical norms of cooperation, planning and management in different projects, teams, forms of work organization.”;
- “Knows and applies the methodologies and functions of corporate management.”;
- "Able to manage and develop processes."

In addition to the above, nearly 30 different general and professional competencies were mentioned, between which there was only rare over- lap. What is worth highlighting, however, is the knowledge of business economics and the ability to work in a team - these are the competencies that several experts have mentioned.
What technical competencies would you consider important for students graduating in the field of economics?
In connection with the next question, each expert listed the specific technical competencies and knowledge that would be expected of a given company. In general, basic technical knowledge is expected, but within it “as many houses as there are customs”. As one expert stated, "Our expectation would be that applicants in the economic field have a basic understanding of the technical processes and problems whose economic aspects they are examining." A representative of another company had a similar opinion: "Have a technical approach: have an insight into the production process, the basic technical characteristics of the machines (equipment, procedures) used."

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What are the 5 most important professional competencies for students graduating in the field of technical sciences (including earth sciences)?
In connection with this question, it is also difficult to determine the 5 most important professional competencies for students graduating in the field of technical sciences (including earth sciences). However, we have met several times that the most important application of the acquired knowledge in practice would be: "The ability to adapt the acquired professional knowledge, to recognize problems in the technical field, the ability to apply the learned knowledge in solving the problem." In addition, specific technical knowledge that is required for the given company to work is mentioned, e.g. GIS knowledge, surveying, mining surveying, technical language skills, 3D software, etc.
What economic professional competencies would you consider important for students in the field of technical sciences (including earth sciences)?
Students graduating in the technical field are also expected to have a basic level of economic knowledge. "The engineer candidate must have enough economic knowledge to provide the right inputs to economists, but also be able to understand what they are saying." - as one of our experts said. Looking at the specifics, cost analysis, project management and risk analysis can be highlighted. There was also an interesting opinion on the issue: "It may be easier for farmers to acquire basic technical knowledge than vice versa."

What are the strengths of the courses at UoM? What is your impression about it?

In connection with the strengths of the University of Miskolc, practice-oriented training, professionally trained lecturers and high-quality (technical) training were mentioned several times. In addition, other strengths include high-quality financial education (SAP, business informatics, corporate cost management), various professional programs, cooperation with the corporate sphere, and the preservation of traditions: generation. "
What are the weaknesses of the courses at UoM? What is your impression about it?

It is very interesting that almost the same factors were mentioned among the weaknesses as before for the strengths (practice-oriented training, trainers). It follows that there is no uniform judgment of the university among the experts we interviewed. What else was mentioned among the weaknesses: e.g., foreign language skills, communication skills.
What are the general competencies of the graduates from UoM that need to be improved?

One of the experts we interviewed said, “The same can be said for the expected general competencies. Although this applies not only to graduates of the University of Miskolc, the students graduating here also have similar competencies as students of other universities. ”If we look at the other answers, we see that the greatest development is needed in communication skills and foreign language skills (English). It is also important for students to gain more practice, and that "Mathematics, physics and technology knowledge for economists and lawyers, legal and economic, sociological knowledge for engineers."
What are the professional competencies (in business courses) that need to be improved?

With regard to economists, a wide range of competencies / knowledge was mentioned, e.g., company knowledge, knowledge of legislation, ac- counting knowledge, micro- and macroeconomics, etc. Experts have repeatedly mentioned foreign language skills and communication skills - which we know to be more of a general competence than a professional one. Respectively, in three cases, the interviewees could not provide an adequate answer to this question, as they do not have relevant experience in this regard.
What are the professional competencies (in technical science courses, including earth science courses) that need to be improved?

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With regard to engineers, several types of professional competencies / knowledge were also mentioned, e.g. engineer consciousness / approach, independent performance of engineering tasks, knowledge of environmental economics, GIS - which need to be developed. General competencies were also mentioned: communication skills, language skills, computer skills. Several considered it important to be able to put professional knowledge into practice, which also needs to be improved, and one of the respondents formulated the requirements of industry 4.0: programming, smart applications, automation.
What forms of cooperation do you consider necessary with UoM in order to meet the expectations of the labour market?

Regarding the forms of cooperation, there was a consensus among the experts that a closer relationship should be established between the university and the corporate sphere. There are several suggestions for ways

to do this, among which we will not find a radical novelty, e.g., internships, involvement of industrial guest speakers, dual contracts, joint development projects, student participation in a short project, factory visit, business club meetings, joint workshops, etc.
What educational and methodological changes do you consider necessary on behalf of our University in order to achieve these goals?
As several valuable suggestions have been received from the experts we interviewed regarding the changes in the teaching methodology, we will communicate them without any changes on the basis of the minutes:

- “Involvement of industry professionals in education as guest speakers for skills development subjects. As well as issuing significantly more independent tasks and complex, real professional tasks to the students.”
- “The development of practical education would be recommended and more factory visits should be organized for students. Involving corporate professionals in education.”
- “Acquisition of practical knowledge during practice. Increasing guest lectures with professionals and topics that are not mastered in school.”
- “A more flexible attitude on the part of individual lecturers as well as the system, as well as the formulation of clearer requirements for students - clear and timely, not constantly changing.”
- "3-4 weeks of industrial internship in companies, at home or ab- road every academic year."
- “Digital education (e-learning) and the digital accessibility of curricula have been very well developed recently. During the contact hours, I would urge the involvement of industry professionals in edu- cation as guest speakers, and students would have to solve significantly more independent tasks and complex, real professional tasks."
- "Students should be sent to attend some lectures and courses of other universities, as well as participate in professional conferences.”
- "Online education in our area will not be able to replace the traditional form of interactive education based on personal presence."
- "New forms have emerged due to COVID-19. New forced knowledge. It has a lot of positive results. Distance learning - recommended in correspondence training. Some subjects are difficult to learn because there is no suitable textbook to explain ppt! Or explain by the instructor normally, which is projected.”
- “Have many practical examples with solutions (derivation + end result) - have elaborated tasks."

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- "Instead of lectures, consultations should be held. In other words, pre-published and processed material would be discussed again in a consultation, focusing on the less comprehensible parts."
- "Opportunity to learn more practical knowledge that helps companies work."
- "With fewer theories, more internships, these are real industry / service jobs, the opportunity for internships abroad."

EXPERT IN-DEPTH INTERVIEWS SUMMARY (SLOVAKIA)

METHODOLOGY

After finishing the collection of the results of the questionnaires, selected companies were approached by Slovak University of Technology in order to arrange with the in-depth interviews focused on their requirements on the graduates.
During the qualitative research 6 in-depth interviews were conducted. The interviews were made by 4 members of the ProSkill project team on Slovak University of Technology, Faculty of Materials Science and Technology in Trnava.
The interviews with the experts in the companies were made between --- 21st August and 8th September. The interviews were conducted either by personal meeting with the company representative or by phone. Two companies were interviewed by the phone, due to the geographical dis- tance of their offices from the Slovak University of Technology. Three companies were personally interviewed in Trnava, Slovak Republic and one company was personally interviewed in Dubnica nad Váhom, Slovak Re- public. The destination of the interviews was selected based on the regis- tered office or place of business of the interviewed companies.
Following companies were interviewed:

- Boge Elastmetall Slovakia, a.s. Trnava
- ZF Slovakia, a.s., Trnava
- MATADOR Automation, s.r.o., Dubnica nad Váhom
- Skartek, Trnava
- Miba Sinter Slovakia, Dolný Kubín
- Schaeffler, Skalica

The interviewed companies were from the areas of production of components, mechanical engineering and automation. The dedicated representatives of the companies were mostly Human Resources (HR) managers, responsible for recruitment of the new employees for the companies, with long experience with the recruitment of the graduates from the Universities and High schools. Other experts were representatives of the companies experienced in leading/coaching of new employees from the departments of R&D, Purchase/Product management and Robotics/Programming.

What raw materials are used in their production or what raw materials do they produce?
The representatives/experts from the interviewed companies indicated which raw materials are used in their productions and activities. All of them mentioned metals mostly iron, copper, different metal alloys like steel, brass, metal powders and metal composites.

EXPECTATIONS FOR RECENT GRADUATES

In what field are graduates expected to have a degree? (technical, economic, etc.) In what proportion do you need graduates with technical, economic, etc. degree?
Based on the area of business of the interviewed companies, they prefer graduates/employees with the technical education. The economical positions in the companies are representing minor proportion and therefore the economic education or degree is not desirable. Proportionally,

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approx. 80% of the experts is having technical education/degree, and 20% of the experts is having economic degree.

What level of education is expected of them? (BSc, MSc, etc.) In what pro- portion do you need graduates with BSc, Msc, etc. level of education?
During the interview, the experts were asked two types of questions related to the level of education. Most of the companies prefer 2nd degree education graduates (engineers), but their answers regarding the proportion between 2nd degree and 1st degree graduates (BSc) were various. Three companies prefer mostly engineers, with proportion varying from 80%-100%. Another three interviewed companies were open to both 1st and 2nd degree candidates, and their preference of 2nd degree is at the level of 50-60%. The respondents mostly answered that it is the overall level of candidate readiness and technical knowledge, which is the key for being successful in the hiring process, and that the education degree level is not necessarily the decisive factor for hiring the graduate.

What kind of training is expected? (full-time training, correspondence training, dual education, international education, etc.)?
The answers regarding the training expectations and preference were also divided in two groups. The first group of answers (3 respondents) was saying, that there is no preference in the training/education form. The second group of respondents (3 companies), support and prefer dual education (both on high schools and universities), they prefer full-time education, but they also support their employees to study externally on the universities in order to deepen their knowledge. For example company representative of Miba Sinter Slovakia said: ”We co-operate with the high schools as well as universities in our region and we are supporting the dual education on those schools in order to prepare the best possible future employees for our company.”

How would you evaluate the trends in the competences of university graduates in the past 10 years?
Four of six interviewed companies replied that the level of the university graduates’ competences is declining. The most significant is their readiness to work; their practical experiences are very few, and on low level, but their expectations from the employer (in terms of salary and benefits) are very high and unrealistic. They also lack communication skills and overall, it is very difficult to find technical graduate with the practical experiences on such level, that he/she is ready to work. Two other companies’ representatives said that they see that graduates’ competences are getting better and that they have their own employee education programmes for a few years, in order to train the employees for the specific needs of their company.

GENERAL COMPETENCE REQUIREMENTS
GENERAL COMPETENCE

What are the 5-10 most important general competencies for recent graduates?
Most of the respondents mentioned the same competencies, which they consider important. They all (6) agreed that the most important for the graduates are communication skills (6) and language skills (5), practical experience and technical thinking was also very demanded (3). Most of the respondents claimed that very important are softs skills such as teamwork (5), assertiveness, presentation skills and time management.
One of the respondents said, that they will prefer the employees who are flexible, willing to travel abroad and to study and develop.

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LANGUAGE SKILLS

What language skills are expected? (specific languages, if there is ad- vantage knowing more than 1 language, if they can use language both written or spoken)
The language skills were as one of the priority skills mentioned in the previous answers. Each of the interviewed companies is expecting from graduates to know at least one language. 2 companies require English, but any other language is taken as an advantage. 2 companies require either English or German language. And 2 companies require both English and German from the graduates. All the companies prefer to have knowledge both spoken and written language.

SOFTWARE SKILLS

What computer skills are expected? (which specific programs are needed)
The basis for all the computer skills expected from the graduates is MS Office. MS Office is therefore essential part of the basic knowledge of the graduates. Most of the respondents (5) also said, that for the technical positions they require knowledge of the programming languages (e.g., C++, Catia, Creo, Siemens, etc.), and some companies require knowledge of SAP.

PROFESSIONAL COMPETENCE REQUIREMENTS IN THE FIELD OF ECONOMICS

What are the 5 most important professional competencies for students graduating in the field of economics and looking for a job in the field of raw material production and user industry?
Majority of the respondents consider the most important competences of graduates in the field of economics the Analytical thinking and Language skills. Then they had different preferences based on the company´s area of interest, such as Statistics and Economic skills, Business management and Financial analysing, Accounting, Communication. One third of the respondents said, that it is big advantage for the economic graduates, if they have technical view of the matter.

What technical competencies would you consider important for students graduating in the field of economics?
As it was mentioned in question above, the technical thinking is highly welcomed. The most important competences which were mentioned are: Work with the computer technology, Work with the technical documentation, Logical and Analytical thinking, and Knowledge of the production processes. Nevertheless, all the companies´ experts responded that Logical/Analytical thinking is more than desirable when applying for the job in their company.

What are the 5 most important professional competencies for students graduating in the field of technical sciences (including earth sciences)?
Most required and important are professional technical competencies, such as programming, and ability to find, analyse and solve technical problems. Among the other demanded competencies there were mentioned for example Independent work, Language skills and Social skills.

What economic professional competencies would you consider important for students in the field of technical sciences (including earth sciences)?
Majority of the respondents (5) agreed that it is good for the technical graduates to have Basics of economics such as Business management, Planning (Time management) and Pricing, Calculations and Financial pre- dictions. As one company representative said: “We are training our engineers to be ready to prepare the inputs for other departments and co- operate with them. Especially from the economical point of view, it is necessary for engineer to be able to analyse the production costs, to under- stand the production process and to be able to predict the risks.”

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What are the strengths of the courses at STU? What is your impression about it?
As STU is technical university, the respondents said that the most impressive is infrastructure and laboratories, and with that related high level of practical technical experiences of the students.
What are the weaknesses of the courses at STU? What is your impression about it?
Based on the discussion with the interviewed experts, 50% of them feel, that the lectures should be more experienced in terms of the real practice in the manufacturing and production companies. Regarding the non-technical weaknesses, it was mentioned that the level of language education is on poor level (English, technical English).

What are the general competencies of the graduates from STU that need to be improved?
We can divide the answers into two groups. First group of answers was related to the soft skills. The respondents said that the communication, teamwork, independence/decision-making, presentation skills and other soft skills should be addressed more. The second group insisted on what was said in previous question, that it is necessary to transform the theory into the practice, as well as it is very important to educate the languages properly.

What are the professional competencies (in business courses) that need to be improved?
Because the STU is mostly focused on technical science, the business courses are not so much perceived as important by the experts. 50% of the experts were not able to answer this question. Another 50% of the respondents said that the development of analytical thinking is the most important for them, and there should be some focus also on heavier use of computer technologies.

What are the professional competencies (in technical science courses, including earth science courses) that need to be improved?
The experts from the interviewed companies had various opinions, on what needs to be improved. 50% said, that the programming languages and design programmes should be addressed with the highest importance in the technical science courses. Other respondents stated that the Practical experiences should be deepened. Again, it was mentioned necessity to develop languages.

What forms of cooperation do you consider necessary with STU in order to meet the expectations of the labour market?
Some of the interviewed companies are already co-operating with STU, so they only answered, that they are very satisfied with the level of cooperation and they would like to continue with it.
Other companies (2) see the opportunity in greater student involvement in the companies, either by co-operation on final thesis/dissertation, or on dual education as well as field trips to the companies. Some companies see the opportunity to evolve together by co-operation on the joint projects and contract research.

What educational and methodological changes do you consider necessary on behalf of our University in order to achieve these goals?
The companies which are already co-operating with STU are very satisfied with the quality of the education. They co-operate on final thesis/dissertations, on study programmes answering the needs of their companies, as well they support field trips. They are involved in many activities dedicated to actual and future students of STU.
Experts from the rest of the companies, we mostly saying what was previously mentioned. There is need to be as close to the real market as possible, which means the orientation of the courses should be more practical and it should be supported by internships, thesis and field trips. The teachers and lecturers should be experienced in practice and involved in the joint projects with the companies. The teachers and researchers should be constantly strengthening their knowledge not only by co-operation with the practice (e.g., field trips, practical courses, new product development), but also by attending technical conferences and technical product launches.

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There should be given greater focus on foreign languages studies – especially on English and technical English, which can be supported by inter- national internships and mobilities. As it was stated by expert from Miba Sinter Slovakia, they prefer the graduates who are willing to travel to different countries and who are experienced in communication in foreign languages.
They also stated that they feel there is necessary to dedicate more study programmes to technical sciences and as well to production quality, logistics and production management, in order to be able to adapt to new technologies. It is also essential to constantly work on study programmes and innovate them.

SUMMARY OF THE EXPERT INTERVIEWS (CZECH REPUBLIC)

In this document we tried to summarize the information gained form the in- depth interviews conducted with the selected Czech companies dealing with raw materials logistics, processing and utilizing included within their business activities. The text below generalizes the data but still preserves and highlights the contrast between various groups if there is any. The document is divided in five main chapters accompanied with sub-chapters

EXPECTATIONS FOR RECENT GRADUATES

NECESSITY OF UNIVERSITY DEGREES

The companies dealing with RM logistics in the way from the mining companies to RM processing state that their professional positions (staff in logistics, management, salesman, freight forwarder) generally require university education (mostly Master's) in the technical, logistical or economic fields. However, this is not a necessary condition, sometimes university education can be replaced by experience gained from practice. In the case of the companies connected with RM processing in our region has answered that higher professional positions in production and maintenance including IT, generally require university education, especially technical. For lower positions as technical secondary school is fully sufficient. They also mentioned that they have own secondary school (e.g., the Secondary School of Třinecké železárny). For administration and in economic positions, they require high schools or universities with an economic focus. The company producing various steel products for machinery and construction require technical secondary education for manual workers in lower job positions such as production, transport and maintenance. For jobs with higher responsibility, they require a university degree in technology. As for business and economic positions, they demand high school or university degree especially of economic focus. Companies focusing on raw material processing in chemical industry say that for manual workers (production operator, maintenance worker, waste management officer, warehouseman), it is sufficient to complete secondary education with a secondary school diploma (so-called maturity diploma). But they already require a university degree for more responsible employees (the ones that work in research and development, managers, safety technicians, engneering maintenance, fire protection unit chiefs, IT specialists, quality controller, chemics). Professional positions (technologist, researcher, laboratory worker) require university education (mostly Master's) in the field of chemical technology, raw material processing, automation, etc. However, this needs to be considered case by case depending on the position. Generally, in terms of highly qualified positions, they usually expect employees with university degrees in the ratio of 70% Master's to 30% Bachelor's. While the ratio of technical and economic employees is roughly the same (70/30) in favour of technical employees. However, this is very individual and may differ in various years. University degree is here not necessary for traders. The Bachelor's degree or Certified specialist degree ("DiS." - gained on higher vocational school) in economical fields are welcome, but usually the company employs graduates of secondary economic schools in business and trade positions. Industrial automation focused company states that the technical

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working positions require specific education. The technical and service department need technical graduates - automation specialists, electronics specialists, mechanical engineers. SW department prefers graduates with programming skills, RFID department require automatic identification specialists. Marketing and sales welcome graduates from economic branches, but they also have a few good salesmen without any university degree. Master's degree is necessary for head positions in technical departments, but they also have a few employees with Bachelor's degree. In economic department the university degree is a plus, but it is not necessary.

PREFERENCE OF FULL-TIME OR PART-TIME EDUCATION

In the terms of full-time training, correspondence training, dual education and international education the companies generally do not usually have any special requirements, they just would prefer students with international communication skills that can be obtained at the Czech universities as well as abroad. In RM processing chemical industry it is reflected that both full-time and part-time education have their advantages. If the graduate has already worked in a similar job position during his or her studies, he or she acquired practical skills and became acquainted with the procedures for the implementation of the established plans. The graduate of full-time programmes often, but not always, has deeper theoretical knowledge and has access to wider network of contacts working in the field gained during the study. For the chemical production companies the preference depends on what activities the student was engaged in during the distance form of education. If he or she has experience in their field and good work habits, they can be certainly more valuable employees than a student without any experience. But the companies have positions suitable for new graduates with full-time training as well as for the already experienced ones. The industrial automation company has some experiences with internship with students from the university and the results were mixed. Sometimes the student got interested in the company and wanted to help so he learned a lot. Other times the trainees got bored and did not learn much nor did they help the company. The experiences caused an impression that both the full-time and combined education works well.

CHANGES IN PAST 10 YEARS

The companies dealing with RM logistics state that in the last ten years, more confident graduates have come to them from universities asking for higher salaries, time flexibility and other company benefits, they are better well-traveled and better language-skilled, but the truth is that the companies still have to teach them a lot about practice. The selected Czech companies connected with RM processing have answered that in recent years, the profile of university graduates has changed a bit, they are generally better equipped theoretically and linguistically. The companies again mentioned that graduates often lack practical knowledge and understanding, they are also more sovereign and self-confident. Also the company producing various steel products consider graduates to be well- educated in theory, but their practical knowledge and skills lag behind. They also mentioned that graduates are more demanding in their salary requirements than 10 years ago. Companies focusing on raw material pro- cessing in chemical industry say that in recent years, for example the knowledge in the field of IT has significantly improved and students that come from universities are better prepared for practice. Their language skills are also at a better level and they often have foreign environment experience thanks to student travel programs. In the last ten years, there has been a clear trend in the attitude of recent graduates. They demand more wages and work benefits more intensively, but at the same time for example their language readiness is also growing. Industrial automation company states that while it cooperates with companies from abroad (automotive, mechanical engineering and other industries) they also welcome the international experience of employee candidates especially because of English or German

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language experience. The foreign language skills in their point of view got much better in last few years (or decades).

MOST IMPORTANT GENERAL COMPETENCIES

The companies dealing with RM logistics usually think that teamwork, an- alytical skills, critical thinking and good communication are very im- portant. Furthermore, real interest in their work and field and the ability of further education and development are essential. The companies connected with RM processing have answered that they definitely prefer graduates interested in work and further education, flexible, hardworking, able to work in a team and to communicate well. They also emphasize independence and the ability to work under pressure, these requirements always depend on the specific job position. The company producing various steel products require generally cooperation skills, oral communication abilities, analytical skills, IT and computer skills and elementary knowledge about new trends in mechanical engineering or IT. Companies focusing on raw material processing in chemical industry say that they basically require cooperation skills, communication abilities, English language, analytical skills, computer skills and at least elementary knowledge about Industry 4.0. At present, graduates often have knowledge only in their field without technical or social overlap, which makes the communication with them more difficult and does not allow them to easily, comprehensively and broadly understand the processes in the company. The most important thing in their workplaces in general is the ability to communicate with each other, supporting the degree of cooperation both between colleagues in the same fields and also different fields across the various stages of the production process. Also important is the ability of employees to develop themselves, the ability to independently study the properties of new raw materials, understand new recipes and put their production into practice. We also welcome comprehensive thinking and any language skills. Industrial automation focused company states that the most important competences in general are analytical skills and complex view (especially for technical departments), because they are specialized in custom-fit applications. The technicians often deal with unclear requirements specified by the customer and they have to find exactly what should be done and how it should be implemented. Oral communication abilities are therefore also important for the work of their employees either to clarify the system requirements or to increase sales as one of the salesmen most important skill. The self-development is usually done while working on real cases, but in technical fields they also need the employee to undergo special courses organized by the producers of automation means as well as the legislation induced certificates (e.g., the professional competence in electrical engineering).

LANGUAGE SKILLS

The companies dealing with RM logistics said that as far as language equipment is concerned, there is a good knowledge of English necessary. But they require at least one additional language for freight forwarders and traders, mainly German, Polish or Russian. The companies connected with RM processing has answered that language skills are important according to the job classification, in general it can be said that in middle management, of course, there is a good knowledge of English needed, knowledge of another language is an indisputable advantage, preferring Polish, German and Russian. The company producing various steel products requires English language, Polish, Russian and German language according to the market segment the employees work in. Companies focusing on raw material processing in chemical industry say that they are mainly expecting English, German and Polish.

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COMPUTER SKILLS

The companies dealing with RM logistics state that in the field of computer skills, they require common knowledge of all our employees (office soft- ware, Excel, Word, e-mail), the advantage is the knowledge of SAP. Czech companies connected with RM processing has answered that they require common user knowledge (office software, Excel, Word, e-mail) from all our employees, and these requirements are incomparably higher for technologists and IT workers. The company producing various steel products need from their employees a basic knowledge of office programs that is required for office employees. 3D modelling and CAD tools are needed in technical positions as well as ability to read technical drawings and documentation. Companies focusing on raw material processing in chemical industry say that from computer skills they require knowledge about basic usage of the operating system, Word, Excel, PowerPoint. Undoubtedly, those who control SCADA and HMI tools have an advantage. They say that with the advent of coronavirus, they are increasingly focusing on online communication and related tools. Therefore, they will also require from future employees a knowledge in the field of creating presentations, telepresence techniques and knowledge of new technologies such as augmented and virtual reality serving as a human-machine interface. Industrial automation focused company states that in general they request basic computer skills, office tools, as well as the ERP SW that is used in all departments of the company (K2 System).

MOST IMPORTANT COMPETENCIES FOR ECONOMICS GRADUATES

The companies dealing with RM logistics state that in general, it can be said that the most important for job seekers is their ability to learn and understand work processes in individual sections, a professional and helpful approach to both customers and other employees. The Czech companies connected with RM processing has answered that the work commitment, loyalty, interest in the company and in the work, the ability to constantly learn and be open to new work procedures and technologies are most important. The company producing various steel products states that the economist should be able to create product presentations in an engaging way. Companies focusing on raw material processing in chemical industry say that a good portion of theoretical knowledge is of course the basis. However, in today's world, where every piece of information can be found quickly, memorizing all the information is not a requirement. They need graduates that are flexible and able to search information, process and analyze information. Definitely important is the ability to work in a team and awareness of project management. For applicants for commercial and economic positions, the most important is the ability to learn and understand how the processes take place in the company, how offers are processed at the specific workplace into orders, how the company offers its services and products to customers. It is also necessary to apply this understanding in practice and not to disturb established processes unnecessarily during their incorporation. Industrial automation focused company states that it is important for the graduate to get to know internal rules of our company, basic ethical norms of cooperation with colleagues (and senior or subordinate employees), ways of the management of different kinds of projects as well as the routine production. Oral communication abilities are essential for the sales and marketing together with the abilities to communicate indirectly (classic and e-mail correspondence or creation of a desirable content for the webpages and social media image of the company). As the analyzed company is quite small where everyone meets the owner and top management at least from time to time, there is no need to develop new methodologies or functions for corporate management.

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TECHNICAL COMPETENCIES OF ECONOMICS GRADUATES

The companies dealing with RM logistics state that in the field of economics, a basic overview of products, competition, prices and the market in which they operate is sufficient. While the companies connected with RM processing answered that they do not require any special knowledge in the field of economics, of course there is a basic overview of our products, the market situation, their suppliers and customers, as well as the prices of the commodities. The company producing various steel products say that the employee should know the technical parameters of the products and have a basic overview. The economic worker should be able to use the SAP system. Companies focusing on raw material processing in chemical industry say that today's world is full of new terms such as the Internet of Things, Industry 4.0, SMART sensors, human-machine interface, digital twin. A graduate applying for an economic position should have a basic idea of what these terms mean. For economic positions, a basic overview of the technical characteristics of the products they offer, the ability to work to the necessary extent with office computer technology is sufficient. Industrial automation focused company states that for the salesmen it is necessary to know core technical specifications of our products to be able to explain possibilities and functionality to potential customers. The accounting department beside of basic office computer skills need to understand ERP system functions (they prefer candidates with the knowledge about K2 system or similar).

MOST IMPORTANT COMPETENCIES FOR TECHNICAL SCIENCES GRADUATES

RM logistics company state that a graduate requesting the work of a logistics or freight forwarder should be able to solve independently assigned tasks corresponding to his job position. Teamwork and communication are also important here. While the companies connected with RM processing in our region has answered that a graduate interested in working in the company should have the desire to work and participate in solving tasks, they need the ability to make independent decisions at work, as well as certain organizational and communication prerequisites and technical thinking. Companies focusing on raw material processing in chemical industry say that a graduate applying for a technical position in our company should be able to perform technical and engineering tasks corresponding to his job position. It is also necessary to apply the acquired expertise in solving emerging problems. The ability to work together in a team is also essential, but has already been mentioned above in the General competencies. Industrial automation focused company states that the graduate that is going to work in one of the technical departments should be able to perform technical and engineering tasks corresponding to his degree and position. For technical employee they usually test the skill via a real-life problem-solving task while having job interview (basic electrical circuits, automation problems, etc.). That helps make sure if the candidate is able to apply his theoretical knowledge form the university to work in the situations that occur in company on a daily basis.

ECONOMIC COMPETENCIES OF TECHNICAL SCIENCES GRADUATES

The companies dealing with RM logistics state that in the field of economic skills, no specific knowledge is required in the job position of logistics or freight forwarder, a common overview is absolutely sufficient. While the Czech companies connected with RM processing has answered that in the field of economic knowledge, they do not demand anything specific, as mentioned earlier. The company producing various steel products would highlight the presentation skills and communication skills that are often necessary for technicians when participating in meetings and negotiations with the customer as an invited expert. Companies focusing on raw material processing in chemical industry say that they place great emphasis on presentation skills. It is not enough that the employee only understands the information, but often has to create various graphs,

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present his outputs to colleagues and it is advisable to use the tools designed for it. Recent graduates are also often aware of progress of modern IT technology, so they expect from graduates a certain overview in the IT world. In the field of other economic skills just a routine overview of the necessary tasks (fill in attendance, understand the difference in raw materials prices and see possible savings, etc.) Industrial automation focused company states that the necessary economical competences from the most of technicians is to use the ERP system to manage contracts – with cooperation with the warehouse add devices and consumables to the specific contract, calculate workhours etc.)

GENERAL COMPETENCIES OF THE GRADUATES FROM OUR UNIVERSITY

The companies dealing with RM logistics in our region state that in general, graduates are generally well educated in theory, but they often lack a general overview, the ability to see things in a broader context, independence and determination. They think that in addition to a lot of theory, more practice in different companies (if possible), solving individual tasks, developing critical thinking should be included in university teaching. Most graduates are not able to work independently immediately after university and their employers have to de facto educate or tutor them. While the companies connected with RM processing in our region has answered that current graduates are usually quite well equipped with theoretical knowledge, but without practical skills, they lack experience and the ability to think independently, solve tasks and work under pressure. As mentioned above, they lack practice, independence, determination, stress management. It would certainly be beneficial to include at the university some practice and also soft skills, especially communication, teamwork, creativity, positive attitude and also critical thinking. The company producing various steel products often hire graduates from VSB-TUO, especially students from the Faculty of Material Engineering, the Faculty of Mechanical Engineering and Electronics and the Faculty of Economics and also some students from the Mining and Geology Faculty. They are satisfied with their knowledge and any missing knowledge can be supplemented during first months of work. Certainly, students would benefit from more practice and more soft skills, self-esteem, determination, resistance to stress. VSB-TUO could send its students to them for practice more often and let them get acquainted with the processes in our plants.
It would also be welcome to intensify the number of jointly solved final theses. If they could influence the VSB curriculum, they would recommend a greater focus on Industry 4.0, SMART sensors, Internet of Things, augmented and virtual reality, control of robots and cobots. Companies focusing on raw material processing in chemical industry say that the advantage of the university is quality of theoretical preparation of students. The weakness is the lack of practical skills, but this is typical for full-time students. More professional internships would help during the study, it is possible also in the company. This way they could select quality students for future employee already in the educational process. Methodological change in deeper cooperation would help as well as communication of university teachers and experts from practice. Graduates are mostly well prepared theoretically, but often lack a general overview or basic manual skills necessary in all positions. The quality of students would benefit from the inclusion of more internships within the study plans in companies such as future employers. On the other hand, they admit that even their employees usually consider the care of the entrusted trainee as an additional workload, and the fact that they are dedicated to the student often results in lower employee performance. Industrial automation focused company states that the University graduates that they have met had quite good theoretical background, but they should be able to work also individually. The graduates should be able to express better their ideas – for example in visual way – schemes, presentation.

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SUMMARY OF EXPERT SURVEYS (POLAND)

INTRODUCTION

Additional to the expert survey forms, a summary table has been prepared to demonstrate main results – Table 1. The purpose of this summary was to help identify similarities or repetitive opinions on the basis of which general conclusions can be drawn.
For the expert survey significant enterprises with as many employees as possible were selected, including a significant number of people with higher education (raw 1 and 2). Also the age of a company was taken under consideration. Young companies were avoided where views on the survey may not be fully developed.
Three out of eight analyzed companies are divisions of mother companies from Western countries. The work ethos and requirements for young graduates may be different in them than in companies derived from the local tradition, which may be reflected in the results obtained.

DEMAND FOR GRADUATES FROM VARIOUS FIELDS OF SCIENCE

The demand for technical engineers ranges from 40% to 90% (raw 3), how- ever, in the case of answers with 70% or more there was no distinction be- tween strictly production engineers and for example IT or logistics. Respondents giving more detailed breakdowns cited the number of technical engineers typically around 50%.
The responses to graduates of non-technical faculties are much more di- verse (raw 3). When considering the total of management, marketing and economy graduates, the given percentage ranges from 10% to 50%. Companies have different needs for marketing specialists depending on the extent to which they are reliant on finding customers themselves and to what extent the production is directed to the retail customer. In the latter, the share of marketing graduates is given at the level of 20%. The share of economics graduates was most often presented as equal to 10% or 20%-25%, including management graduates. In two cases, the IT engineer requirements of 5% and 10% were given separately.

LEVEL OF EDUCATION

The vast majority of the surveyed companies do not have formal recruitment criteria that favour engineer/bachelor or master's degree studies (raw 4). Companies declare that they pay more attention to the actual skills of the candidates, which are often not compatible with the type of education. Some companies prefer full university education for highly specialized

positions (e.g., IT). According to the common opinion, graduates of master's studies are characterized by a higher level of substantive preparation, but in many cases engineers with less theoretical knowledge and better practical preparation do well in production departments.

TYPE OF EDUCATION

Full-time studies are preferred in all analyzed cases. From the other side, correspondence learning it is not taken into account at all. This is an important observation with the growing share of distance learning during the COVID-19 pandemic. At the moment, students are learning in this way for the second semester, which will certainly leave a negative mark on the quality of their education.

International education. Students with international education appear too rarely to be able to form a clear opinion on this form of education. In two opinions, there was a positive voice about people

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educated abroad, where in one case it was about art academies, and in the other - about the subjective experience of the respondent.
Dual education is still a little-known model of education, mainly because it appeared recently in Poland and is present at only a few university departments. However, it can be concluded that due to the high emphasis of companies on the practical skills of graduates, the importance, popularity and demand of graduates of this form of education will grow.

10-YEARS TREND IN COMPETENCE OF GRADUATES

The respondents' answers do not create a completely coherent picture (raw 6). Some say that the knowledge of graduates is increasing, while others suggest their decline. The general view shows an increase in practical skills, novelty (e.g., new technologies), English and computer skills. This process takes place at the expense of theoretical knowledge, such as e.g., mathematical knowledge (the ability to make calculations without a computer). There is also a picture of the growing awareness of graduates in the field of the labor market, the needs of employers, and the realities of personal career development.
In general, it can be stated that trends in changes in the competences of graduates are perceived positively, although in some aspects insufficient in relation to expectations, especially in relation to practical skills and - as shown by further points of the analysis - soft skills.

GENERAL COMPETENCES

Individual respondents mentioned very different sets of the expected general competences of graduates (raw 7). This is partly due to the fact that the first questionnaire proposed a choice of as many as 24 different types of these competences.

The most frequently mentioned general competences are:

- Practical professional knowledge (Practical knowledge in the field of work at the required level) (2),
- Foreign language skills (3),
- Software skills (digital competences) (12),
- Creativity (18),
- Collaboration skills (19).

From this list first three competences belong to the sphere of substantive education. Only creativity and collaboration skills represent typical soft skills. Many other soft skills were expressed quite randomly. This does not necessarily mean that they are unimportant, and may result from forcing respondents to make a choice that limits the number of indicated skills.

- As competences, which are expected to be improved (raw 14), respondents mentioned the following:
- Foreign language skills (3) in 50% of expert surveys,
- Collaboration skills (19) in 50% of expert surveys,
- Leadership skills (6) in 38% of expert surveys,
- Self-monitoring (How much the individual is sensitive to the expectations of social situations and to what extent this shapes one's behaviour) (7) in 25% of expert surveys,
- Ability to work under pressure, stress (11) in 25% of expert surveys,
- Complex problem-solving ability (16) in 25% of expert surveys.

In line with the statements in other points of the survey, the greatest expectations related to the improvement of general skills relate to the knowledge of foreign languages, specifically the English language.

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Among the typical soft skills, the most important skills requiring improvement were the collaboration skills (50% of respondents) and leadership skills (38% of respondents). Three other skills were mentioned by two respondents (25%) and others were indicated once or not at all.

FOREIGN LANGUAGE SKILLS

The great importance of the practical knowledge of the English language was almost unambiguously indicated (raw 8). This is in line with expectations stated in other questions of the survey. At the same time, the language skills of graduates were very often indicated as insufficient. Language courses teach quite passive language skills, while companies expect staff to conduct conversations, read and understand texts and instructions, etc.

COMPUTER SKILLS

Commonly required is a working knowledge of the Office package in the field of data presentation skills in Excel, preparing presentations in Power Point and editing letters in Word (raw 9). At the same time, the respondents

generally admit that the graduates have sufficient preparation in this area. Knowledge of design software (such as AutoCAD) is very often expected when it comes to technical engineers. Here, however, the shortcomings consisting in insufficiently advanced knowledge of working with these programs are noticed.
Some companies declare that they conduct their own training in this area at the necessary level. Moreover, Polish companies commonly use SAP software, which students at universities cannot get acquainted with.

PROFESSIONAL COMPETENCES IN ECONOMY

In terms of the most expected competences in the field of economics, the dominant pattern did not emerge either (raw 10). The following 4 competences were repeated most often (in 5 out of 8 cases):

- The graduate knows the rules, professional and ethical norms of cooperation, planning and managing during different projects, teams and forms of work organization (3),
- The graduate knows and applies the methodologies and functions of corporate management (5),
- The graduate can perform tasks related to logistic management (8),
- The graduate can perform tasks related to international cooperation (11).

The knowledge of innovation development systems was considered quite consistent as the expected skills in the field of economics (raw 15). This may result from the fact that it is currently a frequently used tool in modern company management, eagerly used by Polish enterprises. All employees are involved in its implementation in the company, which results in a natural expectation that the graduates will know these tools well, when in fact they meet them in the company for the first time. Innovation development systems may be considered as practical implementation of competences
(3) and (6) from the list of professional competences in the field of economy:

- The graduate knows the rules, professional and ethical norms of cooperation, planning and managing during different projects, teams and forms of work organization (3),

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- The graduate is able to plan, analyze and develop corporate and organizational strategies and systems (6).

PROFESSIONAL COMPETENCES IN TECHNICAL SCIENCES

In terms of technical competences, the most important respondents mentioned 5 of the following (raw 11):

- The graduate knows and understands the methods, ethical limitations and problem-solving techniques of acquiring knowledge and data collection in the field of professional technical science (2),
- The graduate can apply the acquired professional knowledge in problem solving arising in the field of technical science (3),
- The graduate can apply ICT tools and methods to solve technical problems (4),
- The graduate can perform management and organizational tasks in technical field (6),
- The graduate has adequate professionalism and motivation to perform under the working and social conditions present at the company (9).

Most of the respondents expect that using of ICT tools (computer skills) shall be improved (raw 16). This means a great demand for computer skills, which "there are never too few", because on the other hand, respondents consider graduates well prepared in this respect. For universities, this means an incentive to put a strong emphasis on practical knowledge of operating programs used in industry, including programming.

The second frequently pointed field of improvement among professional competences in technical sciences are practical skills, which in this area can be found inside the competence 5 “the graduate can perform technical and engineering tasks corresponding to his or her degree”.

Highlighting the importance of practical skills also in this point of the questionnaire confirms the great importance of this competence of graduates in companies.

STRENGTHS OF THE UNIVERSITY COURSES

The respondents quite unanimously agreed that the strengths of the university include a high level of specialist education, familiarization with the current state of technology, and a high level of programmer education (raw 12). As part of the answer to this question, there were also observations on shaping the attitude of graduates. Universities are currently educating graduates with a more serious attitude to work and career. At the outset, these are people who are much better prepared to work than before.

WEAKNESSES OF THE UNIVERSITY COURSES

Statements about the weaknesses of contemporary universities are much more specific than about their strengths (raw 13). They show a coherent picture of the disadvantages of university education, consisting in a far too low share of knowledge and practical skills and an almost complete neglect of soft skills development. According to the respondents, graduates of technical faculties go to work on low managerial positions, where they have direct contact with subordinates, with little difference in the hierarchy of the company's structure. The lack of practical skills possessed by the staff they supervise makes it difficult for them to build the authority and manage them, which is also due to the lack of soft skills such as self-confidence and assertiveness.

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A good solution for improving the skills of practical graduates can be dual studies, which are the only ones that offer a very large share of practice and acquisition of real skills necessary to work in the company.

FORMS OF CO-OPERATION AND EXPECTED CHANGES ON THE UNIVERSITIES

In Polish conditions, there is generally a problem of poor cooperation be- tween science and business in various fields. It is therefore not surprising that representatives of Polish companies do not have clearly defined views or concepts of how universities should cooperate with a company in the field of graduate education. Banal offers of student internships are repeated in almost all cases. In their existing form, however, they do not make much sense, because apprentices rarely have the opportunity to learn something adequate to their needs and future education in companies, and are often treated as unqualified helpers for the simplest work. There are contacts between universities and university employees, but they usually concern research cooperation, expertise and research for the benefit of industry, which gives both parties direct tangible benefits.
However, these contacts should be more inclusive of educational issues. It is in the interest not only of companies, which is obvious, but also of universities, which in the period of the demographic decline and increasing competition in terms of attracting people to study, should take care to create the most attractive and guaranteeing work and career programs.
According to the majority of respondents, universities should operate in four following directions:

- Introduce flexibly changing study programs that take into account long-term trends on the labor market, taking into account, for ex- ample, the lack of specialists in certain fields on the market or their excess,
- Strive to ensure a high level of practical skills allowing the graduate to function well in the initial period of work in the company at relatively low positions,
- Provide a high level of English and computer skills,
- Conduct courses and trainings in the field of shaping soft skills ad- equate to the needs of work in modern companies and in managerial positions, especially at lower levels, where an inexperienced graduate interacts with experienced lower-level employees.

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Table 1 Summary of expert surveys conducted among enterprises in Poland – Comparison of the responses obtained

No.	Subject	FAMUR	Electrolux	Logstor	BUMAR	Nextteer	Cerrad	ZPUE	ŚFUP
1	Main products	Heavy mining machinery	Household appli- ances	Pre-insulated pipes	Heavy military vehi- cles	Automotive steering and transmission sys- tems	Ceramic tiles	Equipment for power industry	Machinery for vari- ous industries
2	Age/number of staff/Ownership	100/>250/Poland	100/>250/Swede n	60/>250/Denmar k	103/>250/Poland	115/>250/USA	26/>250/Poland	50/>250/Poland	75/>250/Poland
3	Demand for graduates [%]: • Technical engineers • Management/marketing • Economy • Other	70% 20% 10%	75% 25% (M+E)	90% 10% (M+E)	71% -75% 25% -29% (M+E)	60% 10% 10% 15% logistics, 5% IT	40% 20% (marketing) 20% (Man.+ E+IT) 20% (Design & Lab)	50% 50% - all other than technical	50% 20% 10% IT – 10% Other - 10%
4	Level of education B-BSc/M-MSc	Both levels re- quired	No difference	Production: B/M = 1/1 Non-production: 90% M/MSc	M/MSc graduates strongly preferred	No difference	M/MSc definitely preferred, except art- ists/designers	70% M/MSc 30% B/BSc	65%-70% M/Msc 30%-35% B/BSc
5	Type of education (training) • Full-time • Correspondence • Dual Education • International • Other	Preferred No comment No comment No comment Extramural ac- ceptable	Preferred Not accepted Appreciate d Appreciate d	Accept able Not accepte d No experie nce Accept able Extramural acceptable	Preferred Not accepted No comment No comment Extramural rarely acceptable	Preferred Not accepted No experience No comment Extramural rarely ac- ceptable	Preferred Not accepted No experience Highly appreciated Extramural rarely acceptable	Preferred Not accepted No comment No comment Extramural ac- ceptable	Preferred Not accepted Interesting, new No comment Extramural accepta- ble

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6	10 years trend in competence of graduates	English, state-of-art and IT in-creasing General knowledge de-creasing	English and IT in- creasing, Theoretical and practical knowledge de-creasing	Improving skills related to modern technologies and management	Increasing compe-tence, knowledge of modern technolo- gies, improving English, much more clear vision about career, work, chal-lenges.	Increasing soft skills and abilities to work in international environ- ment	Improvement in use- ful knowledge in practice at the ex-pense of encyclope- dic and often inade-quate theoretical knowledge. Improved program- ming skills	Graduates be-come more men-tally mature, goal-oriented, aware of their possibilities and limitations	Overall knowledge level is decreasing, poor math skills, Increasing IT com- petences and Eng- lish often unrealistic expectations as to working conditions
7	General competences (in order of importance, accordingly list below	2, 13, 11, 12, 14, 19, 6 (alt. 4, 16, 21)	1, 2, 12, 13, 10, 19, 24, 7	1, 21, 18,24, 3, 10, 11, 14, 17	2, 4, 5, 6, 12, 13, 18, 19	3, 10, 12, 2, 5, 19, 11, 23, 18	1, 3, 4, 7, 24, 19, 21,14, 18	1, 2, 3, 4, 7, 15, 18, 19, 23, 12	2, 3, 5, 7, 17, 19, 10, 12, 16
8	Language skills	Not very im-portant	Very important – English	Very important – Eng- lish	Very important – English	Very important – Eng- lish wanted candidates with French and Ger- man	Very important – English Wanted candidates with Portuguese	English – im-portant depend-ing on the posi-tion	Very important – English and Ger- man, useful – Chi-nese, Vietnamese (Search for Asian graduates working in Poland)
9	Computer skills	High expecta-tions (Office, CAD, modeling)	High expectations (Office, SAP)	Fluent Office, basic AutoCAD SAP appreciated	Fluent AutoCAD, average Office	Fluent Office and Au- toCAD	Fluent Office and SAP, graphic design, programming of printing and emboss- ing machines	Fluency in soft-ware for electric and electronic systems design, Office, SAP	Fluency in Auto- CAD and similar, also Office
10	Professional competences in econ- omy (in order of importance, ac- cordingly list below)	3, 4, 5, 2, 8	11, 3, 4, 7, 8	5, 3, 11, 4, 8	1, 6, 2, 8, 4	1, 11, 8, 5, 3	9, 11, 7, 5, 3	1, 4, 6, 11, 5	3, 5, 7, 10, 11

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11	Professional competences in tech- nical sciences (in order of im- portance, accordingly list below)	1, 5, 3, 4, 9	1, 2, 4, 5, 6	3, 5, 9, 2, 6	3, 5, 9, 2, 6	4, 5, 9, 7, 6	2, 3, 4, 6, 8	2, 3, 4, 6, 9	1, 3, 4, 9
12	Strengths of the university courses	Modern knowledge, theo- retical back- ground, Good motivation, striving for de- velopment.	High level of tech- nical knowledge	High level of technical knowledge	High level of pro- fessional knowledge in various special- ties	Realistic expectations in terms of wages and working conditions	Orientation in cur- rent technologies, control systems, pro- gramming Education of good programmers.	High level of pro- gramming courses, electrical engineering and end energy.	High level of educa- tion, willingness to take on challenges and hard work
13	Weaknesses of the university courses	Low level of Au- toCAD course and principles of industrial opera- tion (machinery). No self-criticism	Lack of practical, simplified ap- proach and abilities to achieve robust solutions.	Lack of some practical skills expected by the employers, lack of train- ing in management, building authority	Weak training in practical skills and soft skills (team work, decision mak- ing, leadership) business manage- ment	Weak training in soft (social) skills) – col- lective work, sense of collective responsibil- ity, managing employ- ees	Weak English below ability communicate with foreign clients. Weak orientation in company manage- ment, quality man- agement, manage- ment by projects.	Lack of knowledge about preparing for job interviews. A poor image hides the real value of candidates.	Too little share of developing soft skills.
14	General competences to be im- proved	2, 19, 24, 8	2, 16	6. 19	6, 16, 19, 21, 3 (Eng- lish)	6, 7, 17, 19, 3 (English) Identification with company	3 (English), soft skills - 9, 21,7, 11	3 (English), 12, self-confidence, assertiveness	11, 24, 4, 23
15	Professional competences in busi- ness courses to be improved	7, 3	Innovation Devel- opment Systems (6), Budget Man- agement (6, 10), 4,	Innovation Develop- ment Systems (6), Company law, commer- cial law, domestic and international (EU)	General engineering knowledge	11, 8, 3, Innovation Development Systems	6 (management to- ward savings and in- novation)	11, 5	Distant work, co- op- eration with foreign clients
16	Professional competences in tech- nical courses to be improved	3, 4, 5, 6	Practical skills (5)	SAP and AutoCad skills (4), practical skills (5)	Practical skills (5), 6, 7	4	4 (programming), 1 (multidisciplinar y knowledge)	3, 5 (Practical skills)	4, 8

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17	Forms of cooperation with univer- sities	Apprenticeship, internship, consultancy with academic staff	No experience, ready for offers from universities	Creation of courses pro- grams with cooperation with companies	influencing (consult- ing) the content of study programs or their parts or the content of selected courses	Apprenticeship, intern- ship, consultancy with aca- demic staff	Internships, Presentation of tech- nologies and man- agement methods, which should be in- cluded in courses	Summer and per- manent intern- ships, participa- tion in dual stud- ies, providing equipment for specialized teach- ing and laborato- ries	Formulation of ex- pectations about graduates profile (consultancy be- tween company and university), intern- ships (less im- portant)
18	Expected changes on Universities	No opinion	Task and project based work, fast decision making, less emphasis on educating scientists	Improved co- operation between science and business, ongoing consideration of the needs of the labor market in programs.	Implementation of continuous, flexible modifications in study programs, ac- cordingly expecta- tions of the labor market.	Universities should follow the expectations of the company and adjust their programs.	Universities take care mostly on spe- cialties with recruit- ing problems. They should create more attractive offer for the purposes of actual labor market needs.	Highlighting the elements of knowledge and practical skills at different levels.	Implementation of soft skills courses additionally or at the expense of less sig- nificant activities.

Explanation to the raw 7 - general competences:

1. Theoretical professional knowledge (Theoretical knowledge in the field of work at the required level)
2. Practical professional knowledge (Practical knowledge in the field of work at the required level)
3. Foreign language skills
4. Complex view
5. Analytical skills
6. Leadership skills
7. Self-monitoring (How much the individual is sensitive to the expectations of social situations and to what extent this shapes one's behaviour)
8. Oral communication skills
9. Written communication skills
10. Career ambitions. Clear idea about professional career aspirations and goals / commitment to professional growth)

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11. Ability to work under pressure, stress.
12. Software skills (digital competences)
13. Experience in the field of work / any previous work experience)
14. Personal developmental skills, self-development
15. Ability to work independently
16. Complex problem-solving ability
17. Critical thinking
18. Creativity
19. Collaboration skills
20. Emotional intelligence
21. Decision-making skills
22. Negotiation skills
23. Flexibility of cognitive and thinking
24. Time management

Explanation to the raw 10 - Professional competencies for career starter students graduated in management science:

1. The graduate knows and understands the basic and comprehensive concepts, theories, characteristics and contexts of economic science in relation to relevant actors, economic functions and processes, sectoral structure and complex system of the economy.]
2. The graduate has learned the operating principles and institutional features of the economic system.]
3. The graduate knows the rules, professional and ethical norms of cooperation, planning and managing during different projects, teams and forms of work organization
4. The graduate knows and applies the functions of human resource management.
5. The graduate knows and applies the methodologies and functions of corporate management
6. The graduate is able to plan, analyse and develop corporate and organizational strategies and systems.
7. The graduate can manage and develop corporate processes in his field of activity.
8. The graduate can perform tasks related to logistic management.
9. The graduate can perform tasks related to marketing and PR.
10. The graduate can perform tasks related to finance and accounting.
11. The graduate can perform tasks related to international cooperation.

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Explanation to the raw 11 - Professional competencies for career starter students graduated in technical sciences:

1. The graduate understands and applies general and specific mathematical, natural and social science principles, concepts, rules, contexts, procedures, which are requiring specific technical knowledge.
2. The graduate knows and understands the methods, ethical limitations and problem-solving techniques of acquiring knowledge and data collection in the field of professional technical science.
3. The graduate can apply the acquired professional knowledge in problem solving arising in the field of technical science.
4. The graduate can apply ICT tools and methods to solve technical problems.
5. The graduate can perform technical and engineering tasks corresponding to his or her degree.
6. The graduate can perform management and organizational tasks in technical field.
7. The graduate can review knowledge and activities of social science, legal, and economic fields to optimize their relationships in relation to technical tasks.
8. The graduate has a comprehensive knowledge about the structure of the economic sector of his / her company, about the technologies used in the company and about of the external socio-economic environment and regulatory system of the tasks present at the company.
9. The graduate has adequate professionalism and motivation to perform under the working and social conditions present at the company.

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CHAPTER 6.
Summary results of the questionnaire survey

László Molnár – Anett Tóthné Kiss –Viktor Lates

Research method

In the course of the research, we conducted a questionnaire, the target group of which were companies that extract or use some raw material in the course of their activities, except in the energy sector. The planned sample size was 50 companies, which was exceeded by 20.0%, i.e., a total of 60 companies completed the online questionnaire. A detailed breakdown of respondents is provided in the "Company Data" section. The survey was conducted using an online questionnaire in July and August 2020.

Questions about general competencies

General competencies

In the first block of the questionnaire, we asked questions about general competencies. We examined quite precisely how important the general competencies we defined are considered by the respondents. Respondents were asked to rate the importance of each competency on a four-point scale, with 1 being "particularly important", 2 being "more important", 3 being "not so important" and 4 being not important at all".

The following figure shows the summed (median) results.

	H (Md)
PARTICULARLY IMPORTANT	
Verbal communication skills	4
Ability to cooperate	4
Analytical ability	4
Developmental ability, self-development	4
Complex vision	4
Theoretical professional knowledge (level of theoretical professional knowledge required for the job)	4
MORE IMPORTANT	
Stress tolerance, frustration tolerance (ability to tolerate disappointments)	3
Software skills (digital competencies)	3
Written communication skills	3
Practical professional knowledge (level of practical professional knowledge required for the job)	3
Use of a foreign language	3
Time management	3
Independence	3.5
Complex problem solving ability	3
Creativity	3

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Ability to make decisions	3
Self-monitoring (more precisely: how sensitive the individual is to the expectations of social situations and how much he / she shapes his / her behavior accordingly)	3
Cognitive flexibility (flexibility in cognitive and thinking activities)	3
Critical thinking	3
Negotiation skills	3
Emotional intelligence	3
Professional ambitions (clear vision of professional career plans and goals / commitment to professional development	3
Work experience (experienced in a specific field / any previous work experience)	3
NOT SO IMPORTANT	
Leadership competencies	2

If we look at the overall results, we can see that there are six general competencies that were rated as particularly important by the respondents:

- **Verbal communication skills**
- **Ability to cooperate**
- **Analytical ability**
- **Developmental ability, self-development**
- **Complex vision**
- **Theoretical professional knowledge**

All other competencies fell into the more important category, with the exception of "managerial competencies" - which is not so important in the opinion of Hungarian corporate experts.

Use of a foreign language

As we saw in the previous section, the use of a foreign language was among the "more important" competencies overall based on the median of the responses. In the next section, we examined what specific foreign language skills the interviewed corporate professionals consider important.

	H (Md)
PARTICULARLY IMPORTANT	
English	4
MORE IMPORTANT	
German	3
NOT SO IMPORTANT	
Russian	2
NOT IMPORTANT AT ALL	
French	1
Spanish	1

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The results formed two completely clear facts. The most important (particularly important) language is English. This is followed by the German language. All other languages were categorized as unimportant or not important at all: Russian, French, and Spanish.

Other languages

In addition to the languages listed, respondents were given the opportunity to indicate other languages that may be important for their own organization and activities. Among the answers, the following foreign languages were mentioned in the open question: Chinese in four cases, Japanese, Slovak, Polish, and Italian in one-one case.

Software knowledge

In an open-ended question during the survey, we asked companies what special software knowledge they considered necessary when hiring a fresh graduate. In general, most respondents considered the confident use of office software, knowledge related to some ERP system, CAD knowledge, and possibly programming knowledge to be important. Also: schedule making software, data management, database management software, PLC programming software, as well as knowledge of various IT systems: IOS, Android, etc. Due to the profile of the operation of the responding company, the following were indicated once more: knowledge of network hydraulics modelling software, GIS software

Questions related to professional competencies for students in economics studies

The second major block of our questionnaire included questions related to professional competencies, with a focus on students graduating from economics studies. The figure below summarizes the results of this set of questions.

	H (Md)
MORE IMPORTANT	
Knows the rules, professional and ethical norms of cooperation, planning and management in different projects, teams and forms of work organization.	3
Knows and understands the basic and comprehensive concepts, theories, characteristics and connections of economics to the relevant actors, economic functions and processes, …	3
Able to perform logistics management tasks.	3
Mastered the operating principles and institutional peculiarities of the economic system.	3
Able to participate in international tasks.	3
Able to manage and develop processes.	3
Able to perform financial and accounting tasks.	3
Knows and applies the methodologies and functions of corporate management.	3
Knows and applies human resource management functions.	3
Able to design, analyze and develop corporate and organizational strategies and systems.	3
NOT SO IMPORTANT	
Able to perform marketing and PR tasks.	2

Of the 11 professional competencies listed in the questionnaire, 10 were rated as “more important”. In terms of overall results, the ability to perform marketing and PR tasks has fallen into the “not so important” category.

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Technical competencies

For students graduating in economics, respondents were able to indicate which technical professional competencies they considered important. There were many answers to the question, but there were answers that were not directly related to the question or indicated general competencies that had already been surveyed in other questions.

After reviewing the answers, we can highlight the importance of familiarity with corporate cost management and the general technical and technological background related to the pricing of the organization's products and services, logistics, quality assurance, lean basics, IT, graphics, industry knowledge related to material processing, knowledge of material structure and finally knowledge related to process management.

In addition to the above, the respondents considered the following to be important in the field of specialized technical knowledge: knowledge of pneumatics / hydraulics, knowledge of PLC-controlled production equipment, knowledge of the plastics industry, knowledge of the basics of technical earth sciences.

Questions related to professional competencies for students in technical studies (including earth sciences)

As in the previous block, we examined questions related to the professional competencies of students graduating in the field of economics studies, so now those graduating in the field of technical studies (including the field of earth sciences). The table below summarizes the results.

	H (Md)
PARTICULARLY IMPORTANT	
Able to perform technical and engineering tasks appropriate to his or her degree.	4
Able to apply the acquired professional knowledge in solving problems arising in the technical field.	4
Has the appropriate professionalism and motivation to carry out activities in the work and social conditions that arise in the workplace.	4
Understands and applies the general and specific mathematical, natural and social science principles, concepts, rules, contexts, procedures necessary for the cultivation of the technical field.	4
MORE IMPORTANT	
Able to apply ICT tools and methods to solve technical problems.	3
Knows and understands in detail the methods of acquiring knowledge and data collection in the technical field, their ethical limitations and problem-solving techniques.	3
Able to perform management and organizational tasks in the technical field.	3
Has a comprehensive knowledge of the structure of the economic sector of the workplace, the technologies used in it, and the external socio-economic environment and regulatory system of the tasks.	3
Able to review legal and economic knowledge and activities related to technical tasks, to optimize connections.	3

All in all, four of the nine technical competences surveyed were rated "particularly important":

- Able to perform technical and engineering tasks appropriate to his or her degree.
- Able to apply the acquired professional knowledge in solving problems arising in the technical field.
- Has the appropriate professionalism and motivation to carry out activities in the work and social conditions that arise in the workplace.

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- Understands and applies the general and specific mathematical, natural and social science principles, concepts, rules, contexts, procedures necessary for the cultivation of the technical field.

Overall, all other competencies (5) were rated "more important".

- Able to apply ICT tools and methods to solve technical problems.
- Knows and understands in detail the methods of acquiring knowledge and data collection in the technical field, their ethical limitations and problem-solving techniques.
- Able to perform management and organizational tasks in the technical field.
- Has a comprehensive knowledge of the structure of the economic sector of the workplace, the technologies used in it, and the external socio-economic environment and regulatory system of the tasks.
- Able to review the legal and economic knowledge and activities related to the technical tasks, to optimize connections.

Economics competencies

In the case of technical students, respondents were able to indicate which professional competencies they considered important in the economic field. In the case of the questions, we can also state here that there were answers that were not directly related to the question, or indicated general competencies that had already been surveyed in other questions. After reviewing the answers, we can emphasize that it was important to know the general business processes of the company, the knowledge of management and organization, the basics of team management and project management.

In addition, the answers include the known ones related to corporate cost management, and they consider all the basic economic knowledge and experience important that will help to apply or operate it successfully in the event of a successful tender.

Company information

In the last block of the questionnaire, we included company demographic questions. Based on this, we want to present the composition of the sample.

Number of employees

Our next company demographic question was about the size (number of employees) of the company.

	H (%)
Micro (CB)	6.7%
Small (SB)	11.7%
Medium (MB)	38.3%
Large (LB)	43.3%
Total	**100.0%**

Overall, most of our respondents (43.3%) were large companies (over 250), followed by medium-sized companies (38.3%). Around ten per cent of respondents (11.7%) came from the small business category, while 6.7% were from micro-enterprises.

Activity

	H (%)
Agriculture	-
Industry	51.7%

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Commerce	-
Service	48.3%
Total	**100.0%**

In the case of respondents, the proportion of respondents engaged in industrial and service activities was almost the same (51.7% and 48.3%, respectively). None of the respondents was engaged in agricultural and commercial activities.

Majority owner

We also asked who the majority owner of the company is. The results are shown in the table below.

	H (%)
Domestic	66.7%
Foreign	33.3%
Total	**100.0%**

Overall, two-thirds of respondents (66.7%) are domestically owned, while one-third (33.3%) are foreign-majority-owned.

In which country is the company headquartered?

	H (%)
Austria	3.3%
United Arab Emirates	1.7%
India	1.7%
Hungary	78.3%
Germany	8.3%
Switzerland	3.3%
USA	3.3%
Total	**100.0%**

The headquarters of the participating companies are mainly domestic.

How long have they been present in the domestic market?

	H (%)
1-4 years	1.7%
5-9 years	3.4%
10-19 years	15.3%
20-29 years	30.5%
30-50 years	25.4%
More than 50 years	23.7%
Total	**100.0%**

The examined companies have been present in the domestic markets for 20-29 years in most cases (30.5%). The proportion of companies younger than 10 years is low, and the proportion of companies aged 20 or over is 79.7%.

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CHAPTER 7.
Student competency measurement results

Krisztina Varga – Anett Tóthné Kiss

MAP (Management Potential Analysis)

The MAP test identifies basic attitudes and preferences in work-related areas of behavior. It covers three areas:

Cooperation
The first step in any form of cooperation is initiating contact; even at this stage there are significant differences between individuals, for example in terms of initiative and approach. When cooperating on work-related tasks, the tone may tend to be factual and task-oriented or it may be more emotional and personal. In either case, it is likely that frustrations will sometimes arise and that criticisms will be aired by superiors, colleagues, employees, or customers. This area describes how a person handles such situations when compared with others. Another important aspect described in this section is how someone fits into a team and whether they place a high value on their independence.

Task selection and processing
This area addresses the question of the type of task that the person finds particularly attractive and how they typically approach their tasks. In dealing with work-related tasks there are different ways of utilizing one's personal resources – this is described by the dimension of willingness to work under pressure. Finally, any serious challenge also involves the possibility of failure, so it is also necessary to consider how the person deals with any negative experiences that occur.

Leadership
This first involves the question of whether the person sees themselves as a manager who has a strong impact on others or whether they tend to avoid leadership roles. The individual's attitude to various aspects of management behavior is also reported: this explores whether they regard the task of leadership as one of questioning structures and processes or preserving established ways of doing things, the extent to which managers should have good specialist skills, and finally whether they consider that managers should have a global or a detailed perspective.

Each of these three areas involves four descriptive scales. These are a continuum between opposite poles. For example, the way in which tasks are approached can vary from entirely "planned" to entirely "spontaneous", with many intermediate possibilities.

Testing enables a person's characteristics to be compared objectively and fairly with those of other people. However, when interpreting test results it should always be borne in mind that they represent a self-description and that a person's performance can depend in part on how they feel on the day and on other influences; the results are therefore subject to a certain margin of fluctuation.
INTERPRETING THE NORM SCORES
The candidate's results in the individual areas are quoted in percentile ranks (PR). The percentile

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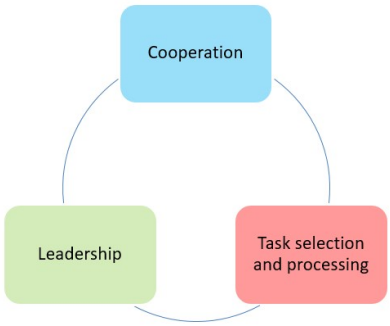
rank indicates what percentage of a particular comparison group achieved the same or a lower score on the scale in question. The comparison group is a representative sample of the general population.

- A **percentile rank of 24 or less** indicates a **below-average** level by comparison with the representative norm sample.
- A **percentile rank of 25 – 75** indicates an **average** score on the characteristic in question by comparison with the representative norm sample.
- A **percentile rank of 76 or more** indicates an **above-average** level by comparison with the representative norm sample.

INTERPRETATION OF THE RESULTS
The MAP test deals with three subject areas:



Cooperation
The area of cooperation comprises the following scales:

- Reaction to frustration and criticism: tolerant/open vs. emotional/defensive
- Striving for contact: active/sociable vs. reserved
- Attitude to others: empathic vs. issue-oriented
- Teamworking: independent vs. collegial

Reaction to frustration and criticism
Reaction to frustration and criticism indicates whether the candidate responds to frustration and criticism with tolerance and openness or emotionally and defensively.

For example:
People who describe themselves as relatively **tolerant and open** enjoy taking other people's views into account in their work and view criticism as an opportunity for learning. People who describe themselves as more **emotional and defensive** have very high expectations of themselves. When frustrated or criticized they are very disappointed and they feel personally attacked by criticism or suggestions for improvement. A person with **average levels** can also tend to feel personally attacked by criticism. However, the factual aspect remains in the foreground and they deal with comments in a professional manner.

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Striving for contact
Striving for contact indicates how much the candidate enjoys being with and working with other people.

For example:
People who describe themselves as relatively **active/sociable** are comfortable even with people they do not know, are happy to be in the spotlight, and have no inhibitions when speaking to larger groups. People who describe themselves as more **reserved** shy away from contact with many people, are not comfortable being at the center of attention, and dislike speaking in front of others. **Average levels** mean that while a person does not voluntarily seek out contact with others, they are able to do so if it is required for their job.

Attitude to others
Attitude to others indicates whether the candidate tends to interact with colleagues and staff empathically or in a more issue-oriented manner.

For example:
People who tend to be **empathic** state that they try to take other people's feelings into account at work. They understand the need to re-motivate staff after failure and believe that they have the skill to work with sensitive people. By contrast, respondents who are "issue-oriented" are more likely to be predominantly task-oriented. Persons who describe themselves as **issue-oriented** enjoy discussing work-related issues, exchanging ideas, and working with others to develop new techniques and methods. For these individuals, personal issues and problems do not belong in the workplace and they focus their attention during working hours on successful completion of their tasks. People with **average levels** describe themselves as sensitive, but at the same time always keep sight of the requirements of their work.

Teamworking
Teamworking describes how strongly the candidate holds to their opinions and attitudes regardless of those of their colleagues.

For example:
People who are **independent** are prepared to face rejection in the course of pursuing their plans. They experience their work situation as a "battle" in which they need to assert themselves against colleagues, sometimes by arguing about principles. People who are inclined to be **collegial**, on the other hand, particularly value a good atmosphere and seek to be accommodating rather than assertive. People with **medium scores** are likely to strive for compromise while also seeking to ensure that any compromise is compatible with their own convictions.

Task selection and processing
The area of task selection and processing comprises the following scales:

- Working style: planned vs. spontaneous
- Task preference: exploratory/intrinsic vs. instrumental/pragmatic
- Reaction to failure: sensitive/hectic vs. stable/relaxed
- Willingness to work under pressure: high/ambitious vs. calm/balanced

Working style
Working style describes whether the candidate approaches their tasks in a planned or in a spontaneous manner.

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For example:
People who describe themselves as relatively **planned** tend toward a working style that emphasizes precise planning with the necessary preparation time. They also attach importance to classical principles of work such as "Work first, play later" and value professional expertise. People who describe themselves as **spontaneous** are happy to act without a considering a specific plan of action, and do so often. They regard themselves as extrovert and cheerful while accepting that they may sometimes lose sight of the longer-term perspective. **Medium scores** indicate that the person sees themselves as someone who plans in advance but who can also handle change that calls for spontaneous action.

Task preference
Under the heading of task preference the candidate specifies whether they prefer to seek out analytical problems and are motivated by tasks themselves (intrinsically), or whether they prefer well-defined tasks and are motivated by external factors (e.g. pay).

For example:
People who describe themselves as relatively **exploratory/intrinsic** are enthusiastic about exploratory and analytical tasks and do not shy away from poorly defined problems. They enjoy being creative, including with regard to working methods, and are motivated by the task itself – for example, by mastering a challenge such as that presented by a very difficult task. People who are inclined to be **instrumental/pragmatic** describe themselves as less attracted by the content of the task and view their job more in instrumental terms – e.g., as a means of earning a living or making social contacts. People with **medium scores** describe themselves as working with creativity and engagement but without losing sight of entrepreneurial, pragmatic objectives.

Reaction to failure
Reaction to failure describes how the candidate behaves when something does not function as planned or when they encounter rejection.

For example:
People who describe themselves as **sensitive/hectic** work best with clear guidelines and may become annoyed if their preparation time is disrupted. Such people often feel somewhat uncertain at first. People who describe themselves as **stable/relaxed** are not unaffected by failure, but setbacks do not perturb them for long. Even in the face of criticism and rejection from colleagues they remain convinced that their opinion is justified and right. They cope well when the pressure of work mounts. Individuals with **medium scores** see themselves as people who may be temporarily disconcerted by unexpected setbacks but can nevertheless deal with them; they are also able to accept being rejected by others.

Willingness to work under pressure
Willingness to work under pressure indicates whether the candidate is comfortable with challenging tasks or feels stressed by them.

For example:
Individuals who score towards the **high/ambitious** end of the range state that they need stress in order to feel good; they experience work without time pressure as boring and are only satisfied with themselves if they have completed a difficult task with energy and commitment. They are prepared to invest a considerable amount of time in top-class performance at work, sometimes view professional achievement as an end in itself and are on occasions dissatisfied even though

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their performance attracts the approval of others. By contrast, individuals who are more **calm/balanced** do not set such high standards for themselves and are less likely to experience negative emotions if they do not consistently exceed their own standards. Instead they state that they do not want to be pushed to the limits of their capacity at work. People with **medium scores** describe themselves as motivated and able to deal with challenging situations, although they also state that they do not constantly seek out such situations.

Leadership

The area of leadership comprises the following scales:

- Leadership motivation: high vs. low
- Leadership dynamic: conservative vs. innovative
- Leadership focus: generalist vs. detailed
- Leadership basis: subject expertise vs. interdisciplinary competence

1.1.1.1 Leadership motivation

Leadership motivation indicates whether the candidate is attracted by the prospect of influencing others.

For example:
People whose motivation is high state that they are normally among the leaders of a group and that they find it extremely easy to influence others. People with **low** scores describe themselves as relatively reserved; they have no desire to manage others. People with **medium scores** are likely to be able to assume a leadership role on occasions. In difficult situations, however, they may not feel confident in this position and would prefer to work with others on an equal footing.

Leadership dynamic
Leadership dynamic describes whether the candidate tends to adopt traditional management methods or to sometimes challenge them.

For example:
Individuals who describe themselves as more **conservative** like to use tried and tested methods, which they employ successfully; they will examine fashions and trends with a critical eye. They will not consider using new techniques and procedures in their company until they have become sufficiently well established and their superiority over traditional methods has been clearly proven. Individuals who describe themselves as **innovative** are very open to new techniques and procedures and believe that they can help them achieve greater success. They are good at seeing where there is potential for improvement and have a lot of innovative ideas for optimizing traditional processes, which they implement energetically. People who have **medium scores** state that they base their approach on traditional method.

Leadership focus
Leadership focus describes whether the candidate considers that as a manager they should concern themselves with matters of detail or whether they should focus on controlling the big picture.

For example:
By contrast, **generalists** consider it inappropriate for managers to burden themselves with details; they define the management task in terms of dealing with structural issues and motivating staff. People who described themselves as **detailed** emphasize the need for detailed information, either in order to expand their own horizons or to have a better understanding of interrelationships.

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People with **medium scores** have a generalist management style; they are able to consider specific issues in detail but do so without losing sight of the big picture.

Leadership basis
Leadership basis describes whether the candidate manages others on the basis of their specialist knowledge or on the basis of trans-disciplinary skills.

For example:
People who regard **specialist expertise** as essential for a manager consider it important for managers to be a step ahead of their staff. People who emphasize **trans-disciplinary skills** in their answers consider flexibility and skill in dealing with people to be significantly more important for success as a manager than specialist knowledge alone. People with **medium scores** state that they consider it important to have a solid background of specialist knowledge but they also rate flexibility and social skills as essential.

Examination of leadership competencies based on self-declaration - using MAP Management Potential Analysis

Country	**Filled tests (piece)**
Hungary	35
Poland	75
Czech Republic	9
Slovakia	42
Total	***161***

In the student competence measurement, 35 questionnaires were received from Hungary, 75 from Poland, 9 from the Czech Republic and 42 from Slovakia, so we could get the result of 161 completed student competence measurement tests.

Competency groups and examined competencies used in Viennatest System

Cooperation	1	Reaction to frustration and criticism: tolerant/open vs. emotional/defensive
	2	Communication and striving for contact: active/sociable vs. reserved
	3	Attitude to others: empathic vs. issue-oriented
	4	Teamworking: independent vs. collegial
Task selection and processing	5	Working style: planned vs. spontaneous
	6	Task preference: exploratory/intrinsic vs. instrumental/pragmatic
	7	Reaction to failure: sensitive/hectic vs. stable/relaxed
	8	Willingness to work under pressure: high/ambitious vs. calm/balanced
Leadership	9	Leadership motivation: high vs. low
	10	Leadership dynamic: conservative vs. innovative
	11	Leadership focus: generalist vs. detailed
	12	Leadership basis: subject expertise vs. interdisciplinary competence

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Aggregate data from the student survey

	Cooperation				Task selection and processing				Leadership			
	1	2	3	4	5	6	7	8	9	10	11	12
1	100	5	20	10	100	10	3	87	51	44	66	100
2	50	33	96	3	93	2	3	12	79	1	77	40
3	77	70	91	3	61	96	15	72	81	2	99	55
4	1	82	90	81	32	11	15	69	48	3	84	40
5	15	11	30	10	31	0	2	4	36	2	100	65
6	87	64	93	51	92	0	2	55	40	10	28	30
7	51	22	90	38	32	7	25	63	27	18	97	60
8	16	29	54	100	34	3	20	65	15	19	79	97
9	56	7	65	96	89	34	3	73	58	12	100	95
10	42	49	16	11	98	0	10	52	98	2	90	71
11	80	100	99	15	88	70	33	98	79	23	32	98
12	5	12	42	21	49	15	8	69	18	2	100	32
13	16	39	67	80	36	6	4	62	20	6	100	38
14	42	13	69	97	86	19	3	85	70	59	89	49
15	5	3	37	99	56	7	4	42	14	7	88	48
16	34	8	46	56	62	17	0	51	65	11	100	98
17	35	39	31	61	64	10	11	29	60	8	96	85
18	27	47	93	71	4	17	41	18	55	2	90	67
19	80	39	92	7	98	17	34	61	90	1	84	97
20	3	52	85	93	81	15	19	79	96	27	98	46
21	46	55	47	71	95	71	14	34	95	15	100	92
22	10	28	65	98	51	7	13	97	12	63	97	85
23	36	59	97	90	88	39	6	76	60	5	100	63
24	9	1	5	76	87	3	1	89	34	2	95	36
25	11	22	97	83	55	14	15	81	64	1	99	13
26	86	49	82	25	93	65	1	74	99	5	99	73
27	38	15	43	86	83	0	2	73	87	12	67	36
28	30	13	98	4	92	82	60	71	77	3	95	95
29	32	32	18	86	13	46	3	37	49	11	60	43
30	22	14	89	85	12	99	19	74	45	18	68	24
31	25	2	99	96	20	6	30	81	32	32	97	97
32	37	2	92	10	39	3	19	19	22	13	90	60

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33	77	1	2	50	29	11	0	36	12	5	73	12
34	29	11	73	98	98	4	2	30	55	3	90	35
35	83	5	66	25	89	5	11	28	31	4	55	21
36	89	11	65	94	29	12	11	2	41	17	46	44
37	29	7	65	94	69	1	64	45	34	6	62	11
38	66	55	55	25	48	16	23	39	68	16	98	77
39	93	44	82	85	66	1	15	15	69	5	92	32
40	16	26	92	98	79	56	35	69	94	9	81	58
41	36	53	70	70	81	7	11	7	38	8	75	50
42	75	33	51	82	76	36	20	33	75	9	97	82
43	38	1	86	76	90	6	100	57	11	32	87	69
44	61	25	100	99	72	27	31	57	11	32	87	69
45	13	28	78	93	29	66	72	51	20	20	12	97
46	37	4	89	100	52	38	78	27	9	37	38	37
47	40	17	72	78	68	55	48	9	23	15	73	53
48	26	3	86	13	75	1	98	7	55	7	57	91
49	9	8	98	92	48	23	57	47	42	10	70	59
50	23	40	21	32	84	6	49	87	90	15	28	89
51	96	35	96	75	54	44	4	2	5	2	32	5
52	72	33	86	6	98	16	4	49	76	0	78	99
53	80	37	11	78	23	33	48	7	33	18	85	94
54	28	23	97	25	96	90	28	84	89	17	95	82
55	42	54	72	93	75	89	15	25	46	2	89	87
56	52	0	39	34	75	6	22	56	25	11	95	65
57	99	6	20	15	97	16	3	22	16	2	78	30
58	81	6	83	5	95	42	15	35	79	3	84	1
59	31	14	98	5	92	78	18	62	38	3	77	50
60	70	3	19	25	94	3	3	6	30	22	46	75
61	24	90	71	26	99	11	35	55	70	5	67	89
62	11	11	36	5	57	82	7	2	12	19	57	81
63	91	63	41	91	92	72	17	89	69	3	80	81
64	91	95	97	15	70	22	41	50	92	39	88	38
65	31	1	21	91	40	3	36	8	4	65	100	63
66	67	66	39	94	13	9	52	27	48	22	100	47
67	15	25	19	95	71	59	4	99	84	25	98	92

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68	85	15	75	98	37	81	6	83	24	19	100	28
69	78	5	65	83	95	92	15	99	79	2	79	69
70	21	74	6	61	99	32	6	43	25	72	100	79
71	7	33	11	53	44	1	9	57	79	7	96	99
72	13	98	99	67	81	75	40	99	100	10	92	72
73	11	42	51	29	73	20	24	80	94	4	100	78
74	39	21	12	53	96	17	33	66	70	25	100	95
75	55	97	21	96	100	65	30	80	89	2	78	55
76	20	64	59	69	76	8	91	99	91	13	46	65
77	78	9	10	72	89	3	4	15	41	4	97	63
78	17	74	53	99	72	93	62	95	90	21	95	66
79	49	48	25	98	73	6	29	72	10	42	100	33
80	50	53	34	91	81	11	34	78	27	10	99	34
81	20	6	36	93	24	7	37	62	47	7	91	15
82	11	33	67	81	64	51	36	61	55	2	100	77
83	3	99	81	37	80	1	20	84	98	65	98	98
84	41	0	14	15	96	6	9	77	40	14	100	74
85	45	43	59	77	91	7	90	83	32	36	43	33
86	10	0	10	96	70	1	54	4	7	3	98	11
87	14	52	43	67	90	11	69	73	54	56	91	89
88	7	3	53	98	40	11	49	74	79	6	100	62
89	88	45	73	78	85	8	74	96	69	43	84	47
90	13	7	78	99	7	45	78	87	47	7	98	83
91	29	56	63	80	93	16	5	77	91	7	95	98
92	8	73	86	91	89	51	31	95	75	8	100	50
93	74	93	12	55	36	3	1	10	50	46	100	84
94	3	52	79	100	93	27	81	93	60	25	98	83
95	17	94	34	71	40	36	3	42	85	46	100	57
96	9	50	100	82	82	53	84	96	69	13	96	95
97	36	6	36	52	47	9	38	78	26	44	97	75
98	44	23	95	58	59	13	75	9	95	14	100	59
99	7	5	79	99	94	6	73	59	32	45	99	76
100	78	65	60	9	93	44	2	64	62	1	100	84
101	24	25	71	66	48	38	41	97	80	43	85	93
102	58	41	39	77	38	26	29	87	66	80	100	84

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103	55	2	2	7	74	90	34	89	63	24	100	59
104	19	41	58	45	22	26	45	81	5	7	100	97
105	99	41	88	91	68	36	79	73	74	25	100	75
106	55	7	96	99	51	1	36	22	28	92	100	94
107	73	11	17	86	86	6	3	30	41	19	89	76
108	75	25	84	84	82	34	8	57	94	4	95	61
109	7	24	91	89	84	17	71	86	52	22	98	88
110	5	20	89	97	64	50	42	99	53	7	98	91
111	10	33	2	96	88	2	13	37	19	32	100	33
112	84	42	57	65	58	25	20	77	27	39	100	52
113	8	11	81	63	4	66	16	35	10	5	91	99
114	100	1	100	92	2	11	16	24	7	17	81	39
115	5	11	82	100	5	66	76	88	9	15	97	91
116	50	11	78	66	29	88	34	69	76	8	100	32
117	69	17	71	93	93	39	29	95	2	61	100	28
118	3	9	19	77	81	2	64	90	38	94	100	99
119	8	8	21	98	52	6	47	67	8	38	100	89
120	11	63	79	100	93	84	69	93	92	24	98	100
121	6	2	49	100	95	57	49	71	15	21	90	49
122	62	0	36	100	22	56	1	28	32	11	100	23
123	50	91	65	94	81	1	7	40	83	99	99	90
124	94	9	40	82	23	29	6	84	1	27	100	35
125	18	83	67	94	78	50	34	97	93	27	38	81
126	26	89	97	100	59	57	61	87	93	23	87	91
127	20	60	94	68	51	13	41	97	77	9	97	90
128	30	91	94	93	97	14	34	44	99	76	100	84
129	17	99	87	11	82	13	20	48	99	27	93	47
130	16	22	82	97	83	23	25	67	76	5	98	3
131	45	2	69	98	84	1	32	78	12	23	99	30
132	97	58	91	87	59	55	73	50	50	75	100	14
133	9	16	40	87	78	4	6	77	99	50	98	85
134	3	19	40	99	88	5	82	73	70	17	100	92
135	41	96	89	39	68	85	5	88	92	2	91	94
136	88	18	77	90	36	50	14	52	1	8	94	11
137	48	97	99	2	100	78	1	94	100	18	97	77

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138	20	14	78	69	93	10	66	65	78	5	98	57
139	6	2	49	100	95	57	49	71	15	21	90	49
140	2	85	99	97	84	100	99	57	85	21	100	98
141	20	60	94	68	51	13	41	97	77	9	97	90
142	88	51	32	59	93	3	2	56	48	9	100	100
143	54	10	69	68	78	86	35	32	8	29	69	32
144	71	16	95	92	71	37	30	28	61	93	95	28
145	5	8	90	76	19	0	65	99	94	81	90	96
146	10	7	67	97	21	4	48	89	38	52	67	89
147	13	62	93	98	79	82	70	100	24	93	93	100
148	8	1	71	97	49	55	50	49	21	95	71	49
149	64	0	28	75	36	54	6	23	11	22	28	23
150	52	90	40	93	65	0	12	90	99	81	40	91
151	91	8	84	81	40	27	4	35	27	23	84	35
152	20	82	97	93	67	48	35	81	27	78	97	81
153	28	88	87	99	97	55	62	91	23	59	87	91
154	22	59	97	67	94	11	42	90	9	51	97	90
155	32	90	44	92	94	12	35	84	76	97	44	85
156	19	98	48	13	87	11	21	47	27	82	48	47
157	18	21	67	96	82	21	26	3	5	83	67	4
158	47	1	78	97	69	1	33	30	23	84	78	30
159	99	57	50	86	91	53	74	14	75	59	50	14
160	11	15	77	86	40	2	6	85	50	78	77	85
161	5	18	73	98	40	3	83	92	17	88	73	91

Unit of measure: percentile rank
Evaluation of results:

High value:	**between 76-100**
Average value:	**between 25-75**
Low value:	**between 0-24**

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Country results
Hungary

	Cooperation				Task selection and processing				Leadership			
	1	2	3	4	5	6	7	8	9	10	11	12
1	100	5	20	10	100	10	3	87	51	44	66	100
2	50	33	96	3	93	2	3	12	79	1	77	40
3	77	70	91	3	61	96	15	72	81	2	99	55
4	1	82	90	81	32	11	15	69	48	3	84	40
5	15	11	30	10	31	0	2	4	36	2	100	65
6	87	64	93	51	92	0	2	55	40	10	28	30
7	51	22	90	38	32	7	25	63	27	18	97	60
8	16	29	54	100	34	3	20	65	15	19	79	97
9	56	7	65	96	89	34	3	73	58	12	100	95
10	42	49	16	11	98	0	10	52	98	2	90	71
11	80	100	99	15	88	70	33	98	79	23	32	98
12	5	12	42	21	49	15	8	69	18	2	100	32
13	16	39	67	80	36	6	4	62	20	6	100	38
14	42	13	69	97	86	19	3	85	70	59	89	49
15	5	3	37	99	56	7	4	42	14	7	88	48
16	34	8	46	56	62	17	0	51	65	11	100	98
17	35	39	31	61	64	10	11	29	60	8	96	85
18	27	47	93	71	4	17	41	18	55	2	90	67
19	80	39	92	7	98	17	34	61	90	1	84	97
20	3	52	85	93	81	15	19	79	96	27	98	46
21	46	55	47	71	95	71	14	34	95	15	100	92
22	10	28	65	98	51	7	13	97	12	63	97	85
23	36	59	97	90	88	39	6	76	60	5	100	63
24	9	1	5	76	87	3	1	89	34	2	95	36
25	11	22	97	83	55	14	15	81	64	1	99	13
26	86	49	82	25	93	65	1	74	99	5	99	73
27	38	15	43	86	83	0	2	73	87	12	67	36
28	30	13	98	4	92	82	60	71	77	3	95	95
29	32	32	18	86	13	46	3	37	49	11	60	43
30	22	14	89	85	12	99	19	74	45	18	68	24
31	25	2	99	96	20	6	30	81	32	32	97	97
32	37	2	92	10	39	3	19	19	22	13	90	60

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33	77	1	2	50	29	11	0	36	12	5	73	12
34	29	11	73	98	98	4	2	30	55	3	90	35
35	83	5	66	25	89	5	11	28	31	4	55	21

Poland

	Cooperation				Task selection and processing				Leadership			
	1	2	3	4	5	6	7	8	9	10	11	12
1	89	11	65	94	29	12	11	2	41	17	46	44
2	29	7	65	94	69	1	64	45	34	6	62	11
3	66	55	55	25	48	16	23	39	68	16	98	77
4	93	44	82	85	66	1	15	15	69	5	92	32
5	16	26	92	98	79	56	35	69	94	9	81	58
6	36	53	70	70	81	7	11	7	38	8	75	50
7	75	33	51	82	76	36	20	33	75	9	97	82
8	38	1	86	76	90	6	100	57	11	32	87	69
9	61	25	100	99	72	27	31	57	11	32	87	69
10	13	28	78	93	29	66	72	51	20	20	12	97
11	37	4	89	100	52	38	78	27	9	37	38	37
12	40	17	72	78	68	55	48	9	23	15	73	53
13	26	3	86	13	75	1	98	7	55	7	57	91
14	9	8	98	92	48	23	57	47	42	10	70	59
15	23	40	21	32	84	6	49	87	90	15	28	89
16	96	35	96	75	54	44	4	2	5	2	32	5
17	72	33	86	6	98	16	4	49	76	0	78	99
18	80	37	11	78	23	33	48	7	33	18	85	94
19	28	23	97	25	96	90	28	84	89	17	95	82
20	42	54	72	93	75	89	15	25	46	2	89	87
21	52	0	39	34	75	6	22	56	25	11	95	65
22	99	6	20	15	97	16	3	22	16	2	78	30
23	81	6	83	5	95	42	15	35	79	3	84	1
24	31	14	98	5	92	78	18	62	38	3	77	50
25	70	3	19	25	94	3	3	6	30	22	46	75
26	24	90	71	26	99	11	35	55	70	5	67	89
27	11	11	36	5	57	82	7	2	12	19	57	81
28	91	63	41	91	92	72	17	89	69	3	80	81
29	91	95	97	15	70	22	41	50	92	39	88	38

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30	31	1	21	91	40	3	36	8	4	65	100	63
31	67	66	39	94	13	9	52	27	48	22	100	47
32	15	25	19	95	71	59	4	99	84	25	98	92
33	85	15	75	98	37	81	6	83	24	19	100	28
34	78	5	65	83	95	92	15	99	79	2	79	69
35	21	74	6	61	99	32	6	43	25	72	100	79
36	7	33	11	53	44	1	9	57	79	7	96	99
37	13	98	99	67	81	75	40	99	100	10	92	72
38	11	42	51	29	73	20	24	80	94	4	100	78
39	39	21	12	53	96	17	33	66	70	25	100	95
40	55	97	21	96	100	65	30	80	89	2	78	55
41	20	64	59	69	76	8	91	99	91	13	46	65
42	78	9	10	72	89	3	4	15	41	4	97	63
43	17	74	53	99	72	93	62	95	90	21	95	66
44	49	48	25	98	73	6	29	72	10	42	100	33
45	50	53	34	91	81	11	34	78	27	10	99	34
46	20	6	36	93	24	7	37	62	47	7	91	15
47	11	33	67	81	64	51	36	61	55	2	100	77
48	3	99	81	37	80	1	20	84	98	65	98	98
49	41	0	14	15	96	6	9	77	40	14	100	74
50	45	43	59	77	91	7	90	83	32	36	43	33
51	10	0	10	96	70	1	54	4	7	3	98	11
52	14	52	43	67	90	11	69	73	54	56	91	89
53	7	3	53	98	40	11	49	74	79	6	100	62
54	88	45	73	78	85	8	74	96	69	43	84	47
55	13	7	78	99	7	45	78	87	47	7	98	83
56	29	56	63	80	93	16	5	77	91	7	95	98
57	8	73	86	91	89	51	31	95	75	8	100	50
58	74	93	12	55	36	3	1	10	50	46	100	84
59	3	52	79	100	93	27	81	93	60	25	98	83
60	17	94	34	71	40	36	3	42	85	46	100	57
61	9	50	100	82	82	53	84	96	69	13	96	95
62	36	6	36	52	47	9	38	78	26	44	97	75
63	44	23	95	58	59	13	75	9	95	14	100	59
64	7	5	79	99	94	6	73	59	32	45	99	76

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65	78	65	60	9	93	44	2	64	62	1	100	84
66	24	25	71	66	48	38	41	97	80	43	85	93
67	58	41	39	77	38	26	29	87	66	80	100	84
68	55	2	2	7	74	90	34	89	63	24	100	59
69	19	41	58	45	22	26	45	81	5	7	100	97
70	99	41	88	91	68	36	79	73	74	25	100	75
71	55	7	96	99	51	1	36	22	28	92	100	94
72	73	11	17	86	86	6	3	30	41	19	89	76
73	75	25	84	84	82	34	8	57	94	4	95	61
74	7	24	91	89	84	17	71	86	52	22	98	88
75	5	20	89	97	64	50	42	99	53	7	98	91

Czech Republic

	Cooperation				Task selection and processing				Leadership			
	1	2	3	4	5	6	7	8	9	10	11	12
1	10	33	2	96	88	2	13	37	19	32	100	33
2	84	42	57	65	58	25	20	77	27	39	100	52
3	8	11	81	63	4	66	16	35	10	5	91	99
4	100	1	100	92	2	11	16	24	7	17	81	39
5	5	11	82	100	5	66	76	88	9	15	97	91
6	50	11	78	66	29	88	34	69	76	8	100	32
7	69	17	71	93	93	39	29	95	2	61	100	28
8	3	9	19	77	81	2	64	90	38	94	100	99
9	8	8	21	98	52	6	47	67	8	38	100	89

Slovakia

	Cooperation				Task selection and processing				Leadership			
	1	2	3	4	5	6	7	8	9	10	11	12
1	11	63	79	100	93	84	69	93	92	24	98	100
2	6	2	49	100	95	57	49	71	15	21	90	49
3	62	0	36	100	22	56	1	28	32	11	100	23
4	50	91	65	94	81	1	7	40	83	99	99	90
5	94	9	40	82	23	29	6	84	1	27	100	35
6	18	83	67	94	78	50	34	97	93	27	38	81
7	26	89	97	100	59	57	61	87	93	23	87	91
8	20	60	94	68	51	13	41	97	77	9	97	90

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9	30	91	94	93	97	14	34	44	99	76	100	84
10	17	99	87	11	82	13	20	48	99	27	93	47
11	16	22	82	97	83	23	25	67	76	5	98	3
12	45	2	69	98	84	1	32	78	12	23	99	30
13	97	58	91	87	59	55	73	50	50	75	100	14
14	9	16	40	87	78	4	6	77	99	50	98	85
15	3	19	40	99	88	5	82	73	70	17	100	92
16	41	96	89	39	68	85	5	88	92	2	91	94
17	88	18	77	90	36	50	14	52	1	8	94	11
18	48	97	99	2	100	78	1	94	100	18	97	77
19	20	14	78	69	93	10	66	65	78	5	98	57
20	6	2	49	100	95	57	49	71	15	21	90	49
21	2	85	99	97	84	100	99	57	85	21	100	98
22	20	60	94	68	51	13	41	97	77	9	97	90
23	88	51	32	59	93	3	2	56	48	9	100	100
24	54	10	69	68	78	86	35	32	8	29	69	32
25	71	16	95	92	71	37	30	28	61	93	95	28
26	5	8	90	76	19	0	65	99	94	81	90	96
27	10	7	67	97	21	4	48	89	38	52	67	89
28	13	62	93	98	79	82	70	100	24	93	93	100
29	8	1	71	97	49	55	50	49	21	95	71	49
30	64	0	28	75	36	54	6	23	11	22	28	23
31	52	90	40	93	65	0	12	90	99	81	40	91
32	91	8	84	81	40	27	4	35	27	23	84	35
33	20	82	97	93	67	48	35	81	27	78	97	81
34	28	88	87	99	97	55	62	91	23	59	87	91
35	22	59	97	67	94	11	42	90	9	51	97	90
36	32	90	44	92	94	12	35	84	76	97	44	85
37	19	98	48	13	87	11	21	47	27	82	48	47
38	18	21	67	96	82	21	26	3	5	83	67	4
39	47	1	78	97	69	1	33	30	23	84	78	30
40	99	57	50	86	91	53	74	14	75	59	50	14
41	11	15	77	86	40	2	6	85	50	78	77	85
42	5	18	73	98	40	3	83	92	17	88	73	91

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Competency measurement results that need to be improved

The competencies indicated in the table prove to be developed for future employment. These competencies are highlighted in the tables.

Reaction to frustration and criticism	High value: It evokes negative emotions much stronger than average if they are unable to have their suggestions accepted by others or someone criticizes their performance. This attitude is often associated with high levels of performance and leadership goals, low tolerance for frustration, and a desire to work independently.
Teamworking	Low value: Their attitudes and value judgments are significantly more independent of the social environment than the average, they often work on the basis of their own principles and norms (self-regulating, internally controlled person). Typically, they prefer to work alone, easily accept rejection when working according to their own plans, and often confront, especially on issues of principle. They usually perceive the situation at work as a "struggle", as a result of which they typically show a self-assertive attitude.
Task preference	High value: For them the tasks themselves are significantly less interesting than the average, they see the work mainly as an opportunity to earn money and build relationships. They consider it much less important than average to be informed about what is new in their field. They rarely look for highly challenging tasks that require creativity and tracing; they are typically more motivated by external rewards.
Reaction to failure	Low value: They handle work failures much less effectively than average, in which case they can become troubled and tense. They are easy to become insecure during performance if they do not have enough time to prepare or if they are disturbed during it. In the vast majority of cases, they like to work along clear guidelines.

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CHAPTER 8.
Skill Ecosystem strategy

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EXECUTIVE SUMMARY

Adopting a 'skill ecosystem' concept requires consideration of the range of skills used in raw material industries, what strategies can work, and what the stakeholders' roles are. The main goal of WP3 is to reveal what skills (both 'soft' and 'hard' skills) are missing or poorly developed on the business side of raw materials ("RM") industries.

The ProSkill project has a double purpose. First, it adopts a 'skill ecosystem' approach to the consideration of what (hard and soft) skills are missing in the RM sector, which skill areas are affected by problems (shortages, mismatches and gaps), and what strategies could work to address these problems. A high-skill ecosystem strategy supplemented with an action plan is developed for four countries (Hungary, Slovakia, Czech Republic and Poland – the "Visegrad Four"). To ensure sustainability, the project focuses not only on students and professionals in the workplace but also on the lecturers, to develop their knowledge about new and innovative educational techniques and to reshape the outdated curricula so as to support the future RM workforce more effectively.

On the other side, a pilot project is launched involving colleges for advanced studies in partner HEIs. Short-term and long-term programmes help to implement the strategy with the targeted development of selected soft skills. To reach the main goal, the Visegrad Four ("V4") countries will formulate their action plans between 2021 and 2022.

INTRODUCTION AND OVERVIEW

Brief summary of the relationship between raw materials and education

The results of the European Union's first in-depth analysis of its raw material supply was reflected in a communication from the Committee of EU[1] COM(2008) 699 published in 2008. Coincident with the deep economic crisis of the same year, this communication has revealed the vulnerability of EU high technology industries to risks associated with the supply of Critical Raw Materials. At that time this was published in a criticality list containing 14 materials. The latest 2020 edition of the list involves 30 critical non-energy, non-agricultural raw materials. Without these materials the high-tech manufacturing industries of the continent's countries would be paralysed. This

[1] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0699:FIN:EN:PDF

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underlines the general importance of a secure and sustainable supply of raw materials for the entire society. The 2008 communication called for a long term strategy to be built to narrow the gap between supply and demand, and covered several segments, a number of which were technological, others were political and social.
The practical step forward was the establishment in 2008 of European Innovation Partnerships ("EIPs"), including the EIP Raw Materials. This partnership has been consolidated into EIT - Institute of European Innovation and Technology, with a separate branch labelled as EIT Raw Materials, now the main umbrella of all raw material related innovation, development and educational programmes within the EU.
Within the frame of this strategy EIT Raw Materials has several main directions of activities, one of which is the EIT Raw Materials Academy[2]. This branch is responsible for all educational activities linked to raw materials, at different levels: "These range from innovative education projects launched via calls and run by the Innovation Community's partners to a number of centrally operated projects. Activities across the entire ecosystem of learners – PhD students, Masters' students, industrial partners, professionals within the raw materials sector, and wider society – foster new ways of learning and teaching by connecting academia, industry and research organisations." (https://eitrawmaterials.eu/eit-rm-academy)
The different levels include high schools (RM@School), universities (EIT Labelled Programmes), and further professional education, like lifelong learning. University of Miskolc is a partner in EIT, and also partner in several of these programmes, including this PROSKILL project (for which it is also the project coordinator).

The main components of the PROSKILL skill-ecosystem of university students

ProSkill has a double purpose. It adopts a 'skill ecosystem' concept, looking at what (hard and soft) skills are missing in raw materials sector, which areas are affected by skill problems (shortages, mismatches and gaps) and what strategies can work. A high-skill ecosystem strategy supplemented with an action plan is developed. To ensure sustainability, the project also focuses on the lecturers, to develop their knowledge about new and innovative educational techniques and to reshape the outdated curricula.
On the other side, a pilot project is launched involving the colleges for advanced studies in partner HEIs. Short-term and long-term programmes help to implement the strategy with the targeted development of selected soft skills[3].
Three main components of our strategy:

- smart selection of talents, their motivation
- training of the trainers and of the students through joint teamwork, intense exchange of knowledge
- modification of study programmes to reflect the needs expressed by the industrial partners- assistance to career building and follow up of career of talents through company collaboration, internship programmes.

Situation analysis - a useful tool for talent development in earth science education

For any career, technical, scientific and functional knowledge is a prerequisite, but some extra professional skills (often referred to as 'soft skills') are also needed for successful contribution of recently graduated engineers and earth scientists to the economic successes of the organisations in which they work. The ProSkill project has been launched with the main objective of mapping

[2] https://eitrawmaterials.eu/eit-rm-academy/
[3] Proskill proposal

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these extra professional skills and developing a Skill Ecosystem Strategy, as a powerful means of enhancing the education of Earth Science and Earth Science Engineering students.
The main direction of the strategy is to bring closer the competency expectations of companies and the existing teaching practices of universities.
Over several months, a questionnaire survey and interviews with industrial managers was conducted by the researchers in each country to identify their expectations concerning the necessary capabilities of graduates. During the interviews, the researchers collected information concerning the knowledge and capabilities of graduates of the participating universities.
A summary conclusion of the questionnaires related to necessary economic competences of graduates is quite common in the four countries, indicating that solutions may also follow a common pattern. In our analysis we highlighted the following areas of required competences by companies:

- practical professional knowledge,
  - sound practical capability
  - decision-making
- foreign language capabilities,
  - English
  - other languages, mainly German, Russian, Chinese
- communicational abilities,
  - written and spoken
  - social platforms
  - management reporting
- critical and analytical thinking,
- creativity,
- cooperation capabilities,
  - teamwork and management
- complex problem-solving capability,
- negotiation skills.

Project activities related to the strategic goals

There should be a two-way process to develop skills. Those working in professions related to Earth Science and Earth Science Engineering should be able to understand the economic and geopolitical aspects and systems of the nations and societies. Those working in the Social and Economic Studies field should improve their scientific and technical knowledge related to raw materials and Earth sciences.
To achieve these objectives, the following activities have been included in the work programmes of the next two project years:

- formation of multidisciplinary teams (minimum one per participating universities) and support them to take part at least in one international competition per year
- organization of workshops
  - Effective ways of mentoring and other best practices;
  - New and innovative teaching methods – reshaping of curricula with focusing on active learning and other solutions'
  - Digital Education Tools for Teachers and Students - Challenges in the education of generation Z and Alpha
- Guest lectures (ALUMNI and OLDTIMER)
- soft skills training
- Inter-university field trips

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- outreach events like European Minerals Day
- Mentoring programme - supporting the students' professional activity
- Spend a day with me! - one day programme with a top manager - Based on the existing project of the European Minerals.

Through the involved V4 partners and EFG the project may serve as an integrating tool for apparently incompatible objectives. Strategy is thought to be long term, being sustainable beyond the duration of the PROSKILL project. Primarily WP4 serves the long-term goals of the project, where we will deliver at least 100 renewed and reshaped syllabuses containing new educational methods. The developed syllabuses will be used after finishing the project. The lecturers will obtain up-to-date information about active learning methods and be aware of the new demands related to skills of graduates.

The tools planned in the project are various, involve all partners, and involve outreach with several levels of the education and the social environment. The realization of these activities was planned dominantly in 2021 and 2022. It is expected that, despite the Covid-19 pandemic, the project will progress according to the original schedule, accommodating any necessary adaptations (e.g. from face-to-face events to online or hybrid online and face to face activities).

1.1.2 Scope and structure of this report

Following this general introduction, this report first describes, for each V4 country in turn, the situation analysis that has been completed and then the action plans (improvement plans) that have been developed and which will be further developed/implemented in 2021 and 2022.

SKILL ECOSYTEM STRATEGY IN HUNGARY

SITUATION ANALYSIS - THE PRESENT SITUATION IN HUNGARY

Appraising the present situation - The questionnaires, competence tests and interviews

Interviews were conducted at 10 Hungarian companies. During the interviews the researchers collected information concerning the knowledge and capabilities of graduates of the University of Miskolc.

The interviewed executives most frequently specified the following general competency needs: communication capability, knowledge of foreign languages, problem-solving capability, cooperation capability, potential for development.

With respect to foreign language capabilities, English was mentioned as the most important foreign language, with German in second place. At some companies, other languages such as Chinese, French, Russian and Slovak were also mentioned.

The above foreign languages were regarded as necessary in both written and oral form.

The interviewees listed important capabilities of business graduates intending to work in the raw material sector as follows:

- acquaintance with general concepts and theories of business administration,
- ability to work in projects and teams and in other organizational units,
- knowledge and application capability of methodology of business administration,
- ability to develop and manage organizational processes.

Concerning engineering graduates, the required competences were more diverse, depending on the profile of the company. The most frequently mentioned answer was that the graduate should be capable of adapting the acquired knowledge in solving the emerging practical problems.

Based on the above information gaps were identified between company expectations and the output of our university education. The gap analysis clarified the requirements for developing the

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education programmes of the university in the professional areas analysed. When developing our educational programmes and formulating their objectives programme, we covered the following areas of education:

- theoretical knowledge,
- practical knowledge,
- interdisciplinary education,
- teaching foreign languages,
- communication knowledge,
- talent management,
- mentoring.

Having formulated a concept for the necessary development of our education system, we specified the necessary actions. Among these actions we developed recommendations in the following areas:

- motivation in talent management
- curriculum development,
- course development – both content and teaching methods,
- further training of teachers,
- advanced use of digital education tools.

ACTION PLAN (IMPROVEMENT PLAN) FOR HUNGARY
Organising Thematic Events

Task 2.4.1. – Thematic event 1 (connected to Earth Day)

This thematic event will conclude the series of events raising awareness of Raw Materials. Earth Day Network's mission is to diversify, educate and activate the environmental movement worldwide. So there is space for us to promote awareness of the possibilities of environmentally friendly use of mineral raw materials.

Action plan:

- to invite lecturers to make presentations
- to invite exhibitors
- recruiting students for the thematic event
- organising the thematic event (i.e. making the schedule, sending the programme)
- implementing the event
- communication/dissemination

KPI: Wider Society Learning
KIC KPI Code: KICN02-09
Target value 2021: 50 people
Target value 2022: -
Deadline: April 2021
Responsible person: professional implementer

Task 2.4.2. – Thematic event 2 (connected to European Minerals Day)

The European Minerals Day thematic event will illustrate the essential role of mineral raw materials in Europe's economy, contributing to innovation and resource efficiency all across the value chain. Typical activities for local communities include guided visits through active and rehabilitated sites, workshops, and entertainment activities for children.

Action plan:

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- to invite a lecturer to make a presentation
- to invite exhibitors to showcase earth science and earth science related aspects of their activities
- to recruit students for the thematic event
- to organise the thematic event (i.e. making the schedule and budget, send the programme etc)
- to implement the event
- to communicate/disseminate information about the event (before, during and after).

KPI: Wider Society Learning
KIC KPI Code: KICN02-09
Target value 2021: 50 people
Target value 2022: -
Deadline: September 2021
Responsible person: professional implementer

Task 2.5. – Wind-up Conference

The ProSkill consortium will organise an international final interdisciplinary conference on promoting the skill-ecosystem strategy and other results. This conference will be organised in close cooperation with existing networks to maximise impact. The aim of the conference will be to stimulate exchange within the international scientific community and other stakeholders (such as policy makers), and to connect with and disseminate the results of ProSkill to the interdisciplinary and international RM community. It is needed to buy an Open Access opportunity in order to publish the article of the participants in a high-ranking scientific journal.
Action plan:

- to invite the lecturers to made presentations during the project
- to invite the mentors who took part in the project
- to invite the students who took part in the project
- to invite the press
- to organise the conference (i.e. making the schedule, sending the programme, catering etc)
- to implement the event
- to organise the open access publication
- to communicate/disseminate information about the event (before, during and after)

KPI: Wider Society Learning
KIC KPI Code: KICN02-09
Target value 2021: -
Target value 2022: 50 people
Deadline: November 2022
Responsible person: project manager (Tamás Bakó)

Improve the education landscape – reshaping of curricula

The main objective of this WP is to rethink, improve and fit the curricula to the changing environment. WP4 ensures the long-term sustainability of ProSkill: the developed syllabuses will be used after finishing the project, so it is very important to create new curricula, designed also to be appropriate to meeting employers' needs. The objectives will be that:

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- lecturers will get up-to-date information about active learning methods, and greater awareness of the new requirements related to additional professional skills of graduated students; and
- Revisions to the curricula will incorporate best practices and knowledge to fill the skills gaps identified.

Task 4.1. – Workshop on 'Effective ways of mentoring and other best practices' organised by EFG

The workshop *"Effective ways of mentoring and other best practices"* will act as a starting point for the international mentoring programme (Task 5.5). Two longstanding mentors will be invited to share best practices with the project partners in a workshop held in Brussels in January 2021[4]. The session will ensure a successful implementation of the mentoring programme within ProSkill and will cover, among other things the following aspects:

- what characterises a successful mentoring programme:
- how to match efficiently mentors with mentees,
- how much time should the mentor foresee for the programme, etc.

The second session will consist of an online training "from mentors for mentors".

Action plan:

- to take part in the workshop

KPI: Lifelong Education
KIC KPI Code: KICN02-08
Target value 2021: 8 partners and 50 mentors
Target value 2022: -
Deadline: January 2021
Responsible person: EFG

Task 4.3. – Workshop 1: 'New and innovative teaching methods – reshaping of curricula with focusing on active learning and other solutions'

Goal: Improving student soft-skills and engagement in-class activities (student XP).

How can we get the students to participate in class discussions? How can we improve their professional (soft) skills in a way that it does not go to the expense of the technical, scientific and functional material (hard skills)? A variety of teaching methods - such as peer-instruction, discussion groups, collaborative problem solving, and visualisation, (so called active learning methods) can create greater student engagement. Each of these methods forces the students to connect, share information, and discuss possible solutions to posed problems, anticipating real life workplace situations where these kinds of activities take place. In this workshop the lecturers will get up-to-date information as to how they can develop the current curricula and fit them to the challenges of 21st century. The workshop will be organisedorganised in national language at the same time in all partner HEIs.

Action plan:

- to create the detailed programme of the workshop
- to invite the experts who will teach the lecturers
- to invite the lecturers
- to implement the event

[4] Rescheduled to April 2021 and to be online due to ongoing pandemic restrictions

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- to communicate and disseminate information about the event (before, during and after)

KPI: Lifelong Education
KIC KPI Code: KICN02-08
Target value 2021: 10 lecturers
Target value 2022: -
Deadline: February 2021
Responsible person: professional implementer

Task 4.4. – Workshop 2: 'Digital Education Tools for Teachers and Students - Challenges in the education of generation Z and Alpha'

Goal: Improving student experience by offering greater variety of digital solutions in courses

Several digital education tools are unexplored and available to enrich the course materials with the newest information technology products. Gen Zed already involves freshmen in Universities, while Gen Alpha refers to the recent high-school population. The workshop is aimed at introducing (1) the digital way of living of these generations to the adult professionals, professors, and (2) introduction of the digital warehouses of geological-geotechnical tools into the course materials in a manner that is attractive to the students coming from these generations. The tools to be used are - among others:

- chat-forums as consultation tools,
- downloadable apps to mobile-phones (for example geological compass etc),
- digital maps and GPS/geocaching for field practices,
- photos and videos for rock/outcrop documentation and archiving incl. selfies and Instagram posts,
- downloadable worksheets, spreadsheets, calculators, and simple 3D modelling tools.

The tools will be complemented by the preparation of a freely downloadable electronic exercise book, ready to be inserted in most Earth Science Engineering technical courses.

Action plan:

- to create the detailed programme of the workshop
- to invite the experts who will teach the lecturers
- to invite the lecturers
- to invite the students
- to implement the event

to communicate and disseminate information about the event (before, during and after)KPI: Lifelong Education
KIC KPI Code: KICN02-08
Target value 2021: 10 lecturers, 20 students
Target value 2022: -
Deadline: September 2021
Responsible person: professional implementer

Task 4.5. – Workshop 3: Oral communication/presentation & analytical skills including complex view of problems

Goal: We decided to organise Workshop 3 in the following topic: oral communication or presentation and analytical skills including complex of problems.
It is needed to improve students' skills in these areas, because the results of the interviews and questionnaire shows that proficiency in these skills is of paramount importance but are sometimes

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sometimes lacking in the students. We think that lecturers can give their experience for the student later.

Action plan:

- to create the detailed programme of the workshop
- to invite the experts who will teach the lecturers
- to invite the lecturers
- implementing the event
- communication/dissemination

KPI: Lifelong Education
KIC KPI Code: KICN02-08
Target value 2021: -
Target value 2022: 10 lecturers
Deadline: February 2022
Responsible person: professional implementer

Task 4.6. – Workshop 4: Collaboration / Team-work skills & self-development – motivation

Goal: We decided to organise Workshop 4 in the following topic: team-work skills and self-development, improving their motivation.

Improvement of student proficiency in these skills is needed, because the results of the interviews and questionnaire shows that these are important but often lacking in the students when they graduate and enter the workplace. We think that lecturers can give their experience for the student later.

Action plan:

- to create the detailed programme of the workshop
- to invite the experts who will teach the lecturers
- to invite the lecturers
- to implement the event
- to communicate and disseminate information about the event (before, during and after)

KPI: Lifelong Education
KIC KPI Code: KICN02-08
Target value 2021: -
Target value 2022: 10 lecturers
Deadline: September 2022
Responsible person: professional implementer

Improving the professional life inside the Colleges for Advanced Studies with specific programmes

Task 5.2. – Guest lectures (ALUMNI and / or OLDTIMER) and soft skills training

The aim of this task will be enhancing both ‘soft’ and ‘hard’ skills of students to achieve higher competitiveness on the international market.

The number of events focusing on hard skills and soft skills should be 50:50. We will invite trainers, ALUMNI, senior managers or OLDTIMERS - professionals with several decades of industrial/institutional practice. The guest lectures will follow predetermined thematic fields.

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Goal: The main goal is that at least two guest lectures have to be organised per semester (in 2021 and in 2022).
Priority areas requiring improvement to be improved (Results of the Competence test)

- Reaction to frustration and criticism
- Communicating and seeking/building effective working relationships
- Teamwork
- Task preference
- Reaction to failure

Action plan (for all trainings):

- to specify the training topic
- to identify possible trainers
- to invite possible trainers, to make appointments
- to communicate the training, to recruit participants
- to provide the background conditions (hall, IT, catering)
- to conduct the training
- to measure the impact of training

KPI1: Participants Wider Society Learning
KIC KPI Code: KICN02-09
Target value 2021: 1 guest lectures and 20 students per training, 4 trainings in 2021
Target value 2022: 1 guest lectures and 20 students per training, 4 trainings in 2022

KPI2: Women graduating from RM-related courses
KIC KPI Code: KICN02-11
Target value 2021: 10 female students
Target value 2022: 10 female students

KPI3: Number of students in PhD Education short courses
KIC KPI Code: KICN02-06
Target value 2021: 2 PhD-students
Target value 2022: 2 PhD-students

KPI4: Number of students in Master Education short courses
KIC KPI Code: KICN02-07
Target value 2021: 15 MA/MSC-students
Target value 2022: 15 MA/MSC-students

Deadline: continuous until early December 2022
Responsible person: professional implementer

Task 5.4. – Reward system

Motivating students is not always easy. Colleges for advanced studies provide us with examples of a number of extra possibilities and benefits in their respective faculties, which would be a resource to acknowledge the outstanding performances of the best students. As a starting proposal, the recent practice of the Miskolc TEKH Special College is a possible model to be applied more widely in Hungarian HEIs.
The submission requirements are 3,5 (out of 5) semester average grade, and sound knowledge of English language. Submission is for 2 semesters, prolongable, until the end of student status of the member. Subsequently she/he may continue in the Alumni Club of the TEKH college.

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Evaluation is in every end of semester. To maintain membership, the following requirements should be met: average grade has to be 3,5 or better; minimum of credits is 3. Credit is given for 1) approved research programme (1); 2) accepted progress report (1); 3) publication - written or oral (2); 4) participation in registered events (1); 5) participation in team competitions (1); 6) prizes won (2). The top 20 % of students will publicly be announced and have first option to choose from TEKH benefits - scholarship, demonstratorship, conference participation, travel grants, research expenditures. The lowest 20 % of students receive warning to enhance their contribution.

Action plan:

- to complete the work started
- to prepare a study on the proposals
- test the system

KPI: reward system
KIC KPI Code: -
Target value 2021: 1 reward system
Target value 2022:
Deadline: January 2021
Responsible person: professional implementer, head of TEKH Special College

Task 5.5. – Mentoring programme - supporting the students' professional activity

Goal: The best performing students (based on the developed reward system) get into an international mentoring programme.
The programme will start in autumn 2021 based on the experiences of spring semester (2020/2021) of WP5. The international mentoring programme aims at creating an international informal network of experienced professionals capable of providing guidance and support to the new generation of geoscientists. Over a fixed period of 9 months, the mentees will receive advice and targeted support from experienced professionals, according to their individual goals. Examples include: feedback and support during the job application process; building up a network, transfer of contacts; development of a career strategy; introduction to informal knowledge and business networks; shadowing (participation in the professional life of the mentor). The cooperation will start with a webinar that will introduce the programme's goals and opportunities to mentees and mentors. Due to the international dimension of the programme, electronic communication tools will be encouraged to keep mentees and mentors in touch. In addition, EFG's membership associations will approach the participants whenever possibilities for face-to-face meetings arise at national level. The programme is coordinated by the EFG.

Action plan:

- to introduce the mentoring programme to the students
- to select students
- to support students' participation in the mentoring programme (eg to provide a flexible learning path, mobility window)
- to share the experiences of mentored students with other students

KPI: Students & Industry - Knowledge Triangle Integration
KIC KPI Code: KICN02-10
Target value 2021: 5 students
Target value 2022: 5 students
Deadline: continuous from September 2021 to December 2022
Responsible person: project manager

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Task 5.6. – Spend a day with me! – One-day- long programme with a top manager

Objective: Managerial and leadership skill-building.

A special one-day-long programme will be organised for the top performing 10% of students involved from each HEI with an operational manager of the respective company/plant/mine. The fundamental purpose of this task is to start developing managerial and leadership skills and gaining managerial experience - both are desired competencies by companies - in those students who have the best abilities to become leaders in teams and workgroups. Objective selection criteria for participation will be determined and announced. The one-day-long project is a well-planned factory tour/site visit under the guidance of a top manager, which will end up with a wind-up meeting with informal lunch/dinner, where the experiences gained, and other observations/opinions can be discussed.

Action plan:

- to set and communicate objective selection criteria
- to select participating students
- to invite a top manager (mentor)
- to organise the one-day programme
- to communicate and disseminate information about the event (before, during and after)

KPI: Wider Society Learning
KIC KPI Code: KICN02-09
Target value 2021: -
Target value 2022: 4 students
Deadline: January 2022
Responsible person: professional implementer

Task 5.7. – Participation in international competitions

Objective: Internationalisation & managerial skill-building.

University of Miskolc will encourage students to form multidisciplinary teams and take part in international competitions. This task will make it possible for our talented students (i.e. students from the college for advanced studies) to gain international exposure. A multidisciplinary team of three students will be formed in UM, which will participate in one international competition per year. The main requirement for international competition is that it should allow the participation of multidisciplinary teams. The potential competitions will be selected by the mentor/supervisor.

Action plan:

- to monitor and select potential international competitions
- to set and communicate objective selection criteria
- to select participating students – forming team(s)
- to mentor the students (preparing them to compete, improving language skills, presentation skills, etc.)
- to participate in international competitions
- to communicate and disseminate information about the event (before, during and after)

KPI: Wider Society Learning
KIC KPI Code: KICN02-09
Target value 2021: 3 students
Target value 2022: 3 students

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Deadline: continuous from January 2021 till end of project
Responsible person: professional implementer

Task 5.8. V4 – SX (simulation of stock trading – international competition)

Goals: Internationalization & managerial skill-building: learning the principles of economics by doing.

A webinar dealing with popular trade tactics (fundamental and technique analysis) will be organised. The teams of three students (mixed students from the Faculty of Economics and the Faculty of Earth Sciences) will create a portfolio of a maximum of five basic raw material related stocks/financial instruments including at least one rare earth metal and one precious metal. Through their participation, students will gain insight into the process of stock trading and will learn about the principles of the stock exchange. The team will compete internationally and, at the end of the semester, a guest trader will assess their performance. They will use trader software (Plus 500, investing.com) in the demo version to enable them to follow their investment (profit and loss) as in real life. The Hungarian team(s) will compete with the teams from the other three project partner institutes for two months. The teams will get immediate feedback. At the end of the semester, the winning team will be announced, but all the participants will get a certification.
Action plan:

- to announce the SX (simulation of stock trading)competition to UM students
- to recruit students to form team(s) of two
- to communicate and disseminate information about the event (before, during and after)

KPI: Wider Society Learning
KIC KPI Code: KICN02-09
Target value 2021: -
Target value 2022 KPI: 3 students (from the Faculty of Economics and the Faculty of Earth Sciences)
Deadline: February-May 2022
Responsible person: professional implementer

Task 5.9. – Inter-university field trips (2 nights, 3-day long) with a dedicated factory/company visit.

Goals: Internationalisation & managerial/leadership skill-building.

Two field trips will be organised: one in May 2021 and another one in May 2022). The University of Miskolc will delegate a group of 20 students and two lecturers. The Slovak and the Polish partner shall compile a professional programme (including workshop focusing on a specific topic, company visit, and social event).
Action plan:

- recruiting students for the factory tour/company visit
- organising the field trip (i.e. renting a bus, booking hostel rooms, etc.)
- implementing the factory tour
- communication/dissemination

KPI: Wider Society Learning
KIC KPI Code: KICN02-09
Target value 2021: 20 students
Target value 2022: 20 students
Deadlines: May 2021 and May 2022

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Responsible person: professional implementer

The Inter-faculty Interface for Skill Ecosystem - an extra tool for raising mutual understanding

Goal: To start building a structure for an inter-faculty interface for a skills ecosystem

To create such an interface, the basement should be constructed first. Such a basement can be an Inter-faculty interface (IFIF). This interface will need to be optimally managed by talent-management organisations of the universities, and may offer informal flexible platform for further work. As a start, the technical and economic faculties should be involved, but Arts and Social Sciences may also be involved in the collaboration. This platform would ensure the cross-education of economy students in Earth Science and earth-science engineering students.
The IFIF teams should include both students and professors to enhance optimal mixing of disciplines required for the efficient joint teamwork. Free discussions and workshop type lecture series would be brought to the platform from all segments of the team. In addition, a joint research work (preferably one with regional interest) with tasks for every research groups and deadlines for completion and publication would be a major tool to develop and disseminate collaborative skills, dictionaries, working protocols etc. A joint Proskill-V4 website should be created to accommodate the actualities, best practices, regional reports etc of the IFIF teams.
These IFIF teams should carry out multi-level activities from high schools through high scientific sections of technical and social professions to the interested general public. At university level the active participation in the IFIF teams could be acknowledged by the host universities giving ECTS credits to those participants who have been actively and usefully participating. For this a joint regulation could be recommended in all participating universities.

Outreach activities as part of the strategic goals
Goal: To develop effective outreach activities

It is expected that game based transfer of knowledge would be probably the most efficient tool for outreach activities aimed at high school students. Minecraft based games would be particularly appropriate to this objective.
The member universities may coordinate their efforts in participating international professional competitions, such as those organised by international professional organisations such as AAPG. IBA, SPE, EAGE, and SEG. These competitions typically require business-oriented professional thinking and decision making capacities.
EFG involvement may ensure the dissemination of these games throughout their member societies, which cover the whole of Europe.
The ProSkill project should also register as partner in the INTRAW Observatory and ERMA initiatives to gain international acknowledgement. Best practice reports to be further refined and should be promoted to publication in international referenced periodicals, like RESOURCES POLICY. Also, reports should be sent to regional authorities, councils to get substantial feedback and promote university based knowledge and increasing connection with/understanding of the soft skills in workplaces to underpin organisational success.

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GANTT CHART AND PDCA CYCLE - HUNGARY

WPs	Task	Task	2020												2021												2022											
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
WP2	Task 2.4.1	Thematic event 1 (connected to Earth Day)																																				
WP2	Task 2.4.2	Thematic event 2 (connected to European Minerals Day)																																				
WP2	Task 2.4.5	Closing action – final conference																																				
WP4	Task 4.1	Workshop on 'Effective ways of mentoring and other best practices'																																				
WP4	Task 4.3	Workshop 1: 'New and innovative teaching methods – reshaping of curricula with focusing on active learning and other solutions'																																				
WP4	Task 4.4	Workshop 2: 'Digital Education Tools for Teachers and Students - Challenges in the education of generation Z and Alpha'																																				
WP4	Task 4.5	Workshop 3 Oral communication/presentation & analytical skills incl. complex view of problems																																				
WP4	Task 4.6	Workshop 4 Collaboration / Team-work skills & self-development – motivation																																				
WP5	Task 5.2	Guest lectures (ALUMNI OLDTIMER) and soft skills training																																				
WP5	Task 5.3	Reveal the national solutions of talent management																																				
WP5	Task 5.4	Development of the reward system																																				
WP5	Task 5.5	Mentoring programme - supporting the students' professional activity																																				
WP5	Task 5.6	Spend a day with me! - one day programme with a top manager																																				
WP5	Task 5.7	Participation in international competitions																																				
WP5	Task 5.8	V4–SX																																				
WP5	Task 5.9	Inter-university field trips																																				

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PDCA CYCLE

PDCA (plan–do–check–act) is an iterative four-step management method used in business for the control and continuous improvement of processes and products. We created this PDCA cycle on project level for ProSkill.

Activity	KPI	Monitoring period	Responsible person
Task 2.4.1 – Thematic event 1 (connected to Earth Day)	Wider Society Learning	April – May 2021	professional implementer
Task 2.4.2 – Thematic event 2 (connected to European Minerals Day)	Wider Society Learning	September – October 2021	professional implementer
Task 2.5. – Wind-up Conference	Wider Society Learning	November – December 2022	project manager
Task 4.1 – Workshop on 'Effective ways of mentoring and other best practices'	Lifelong Education	January – February 2021	EFG
Task 4.3 – Workshop 1: 'New and innovative teaching methods – reshaping of curricula with focusing on active learning and other solutions'	Lifelong Education	February – March 2021	professional implementer
Task 4.4 – Workshop 2: 'Digital Education Tools for Teachers and Students - Challenges in the education of generation Z and Alpha'	Lifelong Education	September – October 2021	professional implementer
Task 4.5 – Workshop 3: Oral communication/presentation & analytical skills including complex view of problems	Lifelong Education	February – March 2022	professional implementer
Task 4.6 – Workshop 4: Collaboration / Team-work skills & self-development – motivation	Lifelong Education	September – October 2022	professional implementer
Task 5.2. – Guest lectures (ALUMNI and / or OLDTIMER) and soft skills training	Wider Society Learning	within one month of the end of the training at the end of the semester	professional implementer local project manager
Task 5.2. – Guest lectures (ALUMNI and / or OLDTIMER) and soft skills training	Women graduating from RM-related courses	at the end of the semester	local project manager
Task 5.2. – Guest lectures (ALUMNI and / or OLDTIMER) and soft skills training	Number of students in PhD Education short courses	at the end of the semester	local project manager
Task 5.2. – Guest lectures (ALUMNI and / or OLDTIMER) and soft skills training	Number of students in Master Education short courses	at the end of the semester	local project manager
Task 5.4. – Reward system	Reward system	February 2021	local project manager
Task 5.5. – Mentoring programme - supporting the students' professional activity	Students & Industry - Knowledge Triangle Integration	December 2021, quarterly in 2022	project manager
Task 5.6. – Spend a day with me! – One-day- long programme with a top manager	Wider Society Learning	January – February 2022	professional implementer
Task 5.7. – Participation in international competitions	Wider Society Learning	continuous from January 2021 till end of project	professional implementer
Task 5.8. V4 – SX (simulation of stock trading – international competition)	Wider Society Learning	February – May 2022	professional implementer
Task 5.9. – Inter-university field trips (2 nights, 3-day long) with a dedicated factory/company visit.	Wider Society Learning	May – June 2021 and May – June 2022	professional implementer

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SKILL ECOSYTEM STRATEGY IN SLOVAKIA

SITUATION ANALYSIS IN SLOVAKIA

What does the employer expect?

Employers generally consider communication skills and language skills to be the most important general competences, but they also require graduates to demonstrate presentation skills. Given the growing global nature of raw materials related businesses, they emphasise the need to communicate in a foreign language and be advanced in both spoken and written language. The most required foreign languages are English and German.

Employers claimed that social skills such as teamwork, collaborative and cooperative behaviour and assertiveness are very important to them.

Graduates are expected to be able to self-organise, self-manage in terms of managing task preferences and time management.

Employers prefer employees who are flexible. They expect their newcomers to be willing to travel abroad for trainings or meetings and to be willing to study and to develop. Openness to new experiences but also the ability to learn is important for developing skills and gaining experience. Given the nature of the business sector, practical experience and technical thinking is also very much valued by employers.

The basis for all computer skills expected from recent graduates is MS Office. Employers also use various ERP systems such as SAP, so the knowledge and skill to process data in these systems is important for them. Some employers also require more advanced skills or programming languages, but they will usually offer specific training systems for these specialist areas. For this, a certain digital literacy, skill and ability to learn to work with the systems that the company uses have the same (or higher) level of importance to employers as the knowledge and mastery of these systems. The ability to search for information is also important.

Professional competencies of students graduated in the field of economics differ based on the company´s area of interest. Based on their preferred area, they attach greater importance to Business management and Financial analysing, Economic skills, Accounting, or Statistics.

The most important competences of graduates in the field of economics are considered to be logical/analytical thinking, language skills and communication.

It is big advantage for the economic graduates, if they have a technical view of the matters they work on; especially knowledge of the production process, and ability to read technical documentation and to work with computer technology.

Required professional competencies of students graduated in the field of technical sciences are abilities to identify, analyse and to solve technical issues. They are expected to understand the production process and to be able to predict the risks. Also they have to be ready to prepare inputs for other departments. A highly sought-after professional competency of graduates in the field of technical sciences is also computer programming/software development.

Desirable ‘soft skills’ competencies of technical graduates are ability to work independently (without close supervision), language skills, social skills and skills in cooperation and collaborative working.

It is good for technical graduates to have a general understanding of the basics of economics and business administration such as business management, planning (time management) and pricing, calculations and financial predictions etc. From the economical point of view, it is necessary for engineer to be able to understand and analyse production costs and work to a budget.

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What we are capable of, what competencies do our students have?

Common university-wide subjects allow graduates to acquire knowledge in the field of natural sciences, technical sciences and engineering, understand the basics of economics, and develop managerial and leadership skills. Basically, there are five main fields of education at our faculty: Materials, Production Technologies, IT technologies and automation, Management, and Safety.
Graduates have a solid foundation of professional knowledge related to a high level of practical technical experiences from laboratories, according to the specialisation of the study programme they are following. As for the programming and problem-solving skills using PC, MATLAB is the basic software used for all study programmes. Three years ago the university obtained TAH (total account headcount) licence for this software, so all students and teachers are able to install and use MATLAB at any PC at the university or at home. Additionally, the students of study programmes focused on IT technology, automation and PC support of production technologies use also other specialised software related to this field (e.g. ANSYS, Catia, SolidWorks, ...).

We have provided below a short description of study programmes at engineering study at our faculty and the obtained competencies of graduates:

1) Process Automation and Informatization in Industry
Knowledge gained during the bachelor's studies (science, technology and engineering basics combined with fundamentals in automation and related fields) is deepened by knowledge in natural science and principal subjects. The most essential subjects are oriented on system modelling, simulation and optimisation; information security management systems; industrial control systems; designing components for complex control systems; advanced control methods; methods for system diagnosis; integrating information and control systems across all levels of control, and methods and techniques of knowledge acquisition for the hierarchical process control.
Graduates are immediately able to enter the labour market as well as to continue education at the doctoral level. They are qualified to analyse, design, implement and maintain monitoring and dispatching systems used for technology and production processes control. They understand system diagnostics methods and are capable of providing creative solutions for control systems and management decision support systems in various enterprises and organizations. They are able to solve problems related to information and control systems integration and understand methods and techniques of knowledge acquisition for the hierarchical control of processes.
They are equipped with managerial, economic, legal, environmental and ethical awareness and are capable of applying it at professional life.
A graduate is competent to be employed in the field of development, design and use of automated control systems in industrial enterprises, but also in institutions providing design and research of control and information systems, as well as at schools and educational institutions.

2) Integrated safety
The masters degree programme in integrated safety focuses on the acquisition of theoretical and practical knowledge based on the present state of science and to manage their use in professional or with continued follow-up doctoral studies. The aim of cross connection between science education, technical and engineering disciplines and the study of health and safety at work is to profile graduates with the knowledge that can later be successfully used in further career growth, continuing studies at doctoral degree or in the technical applications.
Graduates can work in the field of health and safety at the work place and/or the environment, with a particular emphasis on self-management, and assessing the performance of the work environment in working with hazardous substances, reserved technical devices, fire, safety and

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environmental engineering. Graduates can measure the characteristics of hazardous substances and can assess and analyse the risks contained in the working and living environment.
Graduates from this programme could be employed as managers of teams in the field of occupational health and safety, fire protection, management systems, safety and the environment.

3) Materials Engineering
The masters degree programme in materials engineering is based on the present state of science and technology in the field of materials (metallic materials, plastics, ceramics, glasses, composites), used in practice. Graduates from this programme have advanced knowledge about the influence of chemical composition and structure of materials, on mechanical, technological and utility properties of materials of semi-products and final products. He/she has the knowledge about advanced materials and very special materials as nanomaterials, biomaterials, biodegradable materials, memory-shape materials, metallic foams, superconductors, materials for high-temperature applications, and others. He/she knows the advanced methods of materials production and technological processing of materials to form the semi-products, components and final products (vacuum technology, plasma and laser technologies, electron beam technologies, powder metallurgy, surface modifications, nanotechnologies). He/she is educated in modelling of phase equilibria in materials and simulations of production and processing of materials. He/she is skilled in analysis of structure and phase composition of materials (scanning and transmission electron microscopy, X-ray diffraction, and others) and special techniques of testing of materials properties, as fracture mechanics, fatigue testing, creep properties, corrosion testing, and others. He/she knows the main degradation processes and their influence on the properties of materials.
The graduate is ready to enter the labour market in the field of testing of materials using advanced techniques, cooperation with engineers and technology experts in planning and processing of materials to components, tools and products. High-rated graduates can continue in education in doctoral study in the study branch ”materials“ or related study branches.

4) Computer-Aided Design and Production
The study programme includes the up-to-date scientific and industrial knowledge, necessary for engineering practice or as preparation for PhD. study. The major subjects are focused on independent work of students on semestral projects. The graduate has skills to be production engineer.
The graduate can be a team leader of teams making engineering computer analysis, simulations of production processes and projects of production lines. The graduate can be also a team leader of teams for computer technical preparation of production and they can be company managers or entrepreneurs in the area of production application of computers and CA systems. The companies are interested in students during their study and therefore graduates obtain job in the area of their study programme.

5) Industrial Management
The study programme provides the acquisition of knowledge and skills in the field of industrial engineering (particularly the design of production systems, their modelling and simulation, production management, operational analysis, and rationalisation of work, ergonomics, innovation, investment and project management). The study also includes social sciences and the development of language competencies.
The graduate is able to solve complex problems in technical as well as in managerial areas at middle and senior management level. The graduate is able to plan, design, implement, coordinate and monitor engineering projects in manufacturing, logistics, process management, ergonomics, quality and so on. The graduate is also able to execute corrective measures to improve the efficiency of working conditions to increase productivity and reduce production costs. The

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graduate is able to create corporate and business strategies with a focus on sustainable development, and is also able to work in the area of applied industrial research and innovation. The graduate is able to use the methods of project management in the planning and implementation of small and medium-sized projects and work in international and interdisciplinary teams.
The graduate can apply the knowledge in organisations of various industries, especially at middle and senior management levels and wherever it is needed to achieve synergy of managerial, economical, technical, humanitarian and social knowledge and skills in the application of advanced tools, methods and techniques for industrial engineering.
The graduate is able to integrate and optimise processes in an industrial enterprise undertaking techniques to increase the overall efficiency of the organisation activities.
The graduate is also prepared to continue with doctoral study and to build a scientific perspective in a range of industrial engineering areas.

6) Production Devices and Systems
The masters degree programme in production devices and systems aims to obtain theoretical and practical knowledge, based on the present state of science. The main idea behind this is that students may be able to apply such knowledge in their professional life and/or in the possible continuance in higher education through a doctoral programme.
This programme allows students to consolidate and deepen their bachelor's degree in a particular field of study manufacturing technology. The main subjects in the study programme are oriented to applied mechanics, machine, components and modules for the construction of production technology, logistics, automation and programming of production and handling devices, design, operation and maintenance of production equipment and systems, as well as diagnostics, reliability and safety engineering systems. Subjects in the fields of management are included as well.

7) Welding and Joining of Materials
The graduate of this study programme is prepared to immediately enter the labour market, study the 3rd degree programme as well as further professional education. He/she manages the analytical abilities, is capable to critically evaluate today's knowledge of science and technology, to design and implement required technological processing of engineering materials, to assess the quality of weld structures and welding according to international standards, to predict a lifetime of weld structures or other joints made by welding, as well as to judge their safety. During the exercise of his/her profession he/she can simultaneously apply acquired managerial, economical, legal, ecological and ethic awareness.
The graduate can be asserted in an industrial production, designing departments, R&D, as well as service, certification and management fields. He/she can work as technologist, designer, member or leader of R&D team, quality control person, production coordinator, project manager, sales representative etc.

8) Production Technologies and Production Management
The main feature of the master degree study programme production technologies and production management is that the knowledge gained during the first stage of study is developed and supplemented in the field of natural sciences and especially in the area of the profiling technological and managerial subjects. Graduates of this programme will gain knowledge about metallic and non-metallic materials and their processing technologies, including deeper theories. This knowledge combines with the study of profiling subjects, especially from the issues of advanced manufacturing technologies, various managerial disciplines, comprehensive quality management, with emphasis on the theoretical knowledge and practical skills, including technical English. This programme reflects the requirements of manufacturing practice to deeper combine the theoretical and practical aspects.

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The study programme is intended for graduates of the first degree of study in the field of Production Technologies, and also in related fields of Production Engineering, Industrial Engineering and Production Quality.
The graduate will be able to continue the third stage of the study, or to enter the job market. Due to professional skills, she/he will find application as an independent or leading production technologist. Besides this, she/he can work as production engineers for production preparation, member, or leader of the development teams in the different engineering industrial branches. Taking into account the knowledge and skills gained during the study, she/he finds application directly in production facilities as a sector manager or manager of the production department. The complexity of the tasks that each graduate is able to solve is in line with the degree of study and the graduate profile.

9) Machining and Forming Technology
This masters study programme focuses on preparation of specialists in the field of machining and forming technology for employment in industry or in the sector of research and development. The graduates have deep theoretical knowledge in the field of production technologies (machining, welding, forming, foundry and assembly), materials, production machines, tools, process design, metrology and systems of quality assurance supported by the knowledge of CAx technologies. It has predictions for systematic and complex solving of material, technological and managerial problems of production processes with goal to rationalise, modernise and design of new products, processes and systems.
The graduates find employment in the field of product, process and production systems designing, in the technological shop floors, research, development and service as a production technologist, technologist - CNC programmer of machine tools, member or leader of development teams, production coordinator or project manager.

10) Personnel Policy in Industrial Plant
This study programme provides the acquisition of knowledge and skills in the field of industrial engineering (particularly analysis and rationalisation of work, ergonomics, technical preparation of production, quality management, operational analysis, innovation, information and project management), specifically focusing on personnel work in an industrial enterprise (career management and employee development, employee performance management, recruitment services, intercultural management).
The graduate gains knowledge in project management, the economic return on the investment in employees, total quality management in the context of sustainable development and the stabilisation of employees in key positions.
The graduate is able to prepare methodological guidelines for line managers, to provide support for the implementation and adoption of amendments, provide advice on career management and succession, to create systems, tracking and talent management, prepare and organise internal audit personnel, develop competency models and systems, staff evaluation, complex systems for training and the development of employees, and apply the different personnel indicators in the context corporate social responsibility principles. The graduate is able to work in international and interdisciplinary teams.
The graduate can apply the knowledge especially at a middle management level in an industrial plant in HR departments, as a manager of the personnel department, specialised departments in medium and large companies in the area of payroll and financial management, the departments of education and development, career counselling, planning, recruitment and selection of staff or in social work in industrial enterprises. The graduate has a disposition to work as an independent consultant and career coach. The graduate has developed the skills to hold positions at the senior management level in the company, in the position of HR manager or PR manager.

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GAP ANALYSIS - SLOVAKIA

Based on the competency surveys that were carried out, together with expert in-depth interviews and student competency measurement results some differences between expected and developed competencies of graduates were identified. From these investigations, it can be concluded that some differences are caused because of some typical characteristics of the current younger generation. Identified differences have been related to partial components of investigated general and professional competencies.

Gaps in experience:

Acquisition of experience can be considered as a way to develop almost any component of competency. Therefore, for the planned tasks aimed at improving competencies, emphasis should be placed on the implementation of activities that will enable students to provide an active experience with the developed competencies. However, as a specific gap in the term of experience, we have identified a lack of practical experience of graduates in the professional field. The experience gaps that we have identified arise from insufficient real practice in the manufacturing and production companies.

Gap in knowledge:

The analysis showed that the main gap in knowledge was manifested in the level of foreign language education (English, technical English). But, in general, for different competencies, their level can be improved by raising awareness of the possibilities of their development; the first step to learning is to know what are the possibilities and tools to improve one's own skills. So the identified gap in knowledge can be viewed as not knowing one's own shortcomings, limits, possibilities of development, different approaches to work, to performing tasks, etc.

Gaps in skills:

A common shortcoming of graduates that was clear from the analysis was a deficit in soft skills. More concretely, they can be specified as gap in the communication skills, the difficulty in communicating smoothly with others. Gaps in communication skills causes avoidance of contact with others, especially the unknown people, and not striving for contact. Also, there was identified gap in presentation skills, connected to discomfort in being at the centre of attention and a dislike of speaking in front of others. Also, there was identified a gap in teamwork skills manifested as graduates experiencing their work situation as a "battle" in which they need to assert themselves against colleagues, sometimes by arguing about principles. Gaps in teamwork skills influence the perception of common tasks as the reason for asserting oneself at the expense of others instead of perceiving different opinions as a space for modifying one's own opinions and joint support in finding the best solution.

The lack of use of digital technologies can also be considered a certain shortcoming. The younger generation is used to being surrounded by digital technologies. Very often they use these technologies to communicate with each other. However, it is important for them also to be able to use digital technologies in their professional development. In order for this to be possible, it is necessary for teachers to be able effectively to integrate these technologies into the educational process.

Gaps in attitudes:

The young generation tries to present itself as independent. However, they are strongly influenced by the opinion of their friends or peers. Due to their lack of experience, they are nervous about taking on the responsibilities that are expected of them in working life with the consequence that they avoid responsibilities and the possibility of failure and frustration. So, this the gap in attitudes can be considered to compromise independence in acting and thinking.

Also, the young generation react emotionally and manifest defensive behaviour when frustrated or criticised. Usually they are disappointed when criticised. The gap in the attitudes of the young

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generation is the ability to view criticism or suggestion for improvement as an opportunity for learning and not as personal attack.

Gaps in attitudes were also reflected in preferences for tasks, especially where the task itself and its content were not perceived to be interesting enough for the young generation. This causes a lack of internal motivation in the performance of tasks, as the perception of a task as interesting and worthwhile is an important factor influencing the willingness to make efforts to fulfil it. If they are only interested in external motivation and reward in terms of earning or making social contact, it can make them unwilling to do anything extra, and they will not be extra rewarded. The low perception of the attractiveness of a task in terms of its content is limiting for the development of the skills of the young generation, because they do not feel the inner need to fulfil the task well, as they are not interested in the task as it is.

The attitudes and their expressions change slowly. However, they can be influenced because people form and correct their attitudes based on past experience. It is therefore important for the young generation to provide a space for action-based learning and to provide constructive feedback for improvement.

Gaps in abilities:

Based on the analysis gaps (deficits) in abilities were identified analytical thinking and independent decision-making. Analytical thinking is one of the forms of logical thinking and reasoning. The process of analytical thinking involves analysis of the whole problem, then the examination of individual aspects of the problem, selection of important information and finally these smaller parts are combined into a solution. In the work environment, analytical thinking is the valuable ability to recognise and solve problems. A gap was also identified in the ability to react flexibly and adapt to new conditions, especially under pressure in hectic work conditions. People who perform better with clear guidelines become annoyed if they have not enough time for preparation or their preparation is disrupted. Changing environments requires flexible reactions and flexible adaptation as well the ability to include new information and use the new information for decision making on the way forward.

Based on the performed analyses, it can be stated that there are a number of areas in which the competencies required of university graduates could be improved. To improve and develop these competencies, a range of specific activities are proposed, designed so as to deliver consistent content. The specific tasks relevant to each of the skills gaps identified are shown in the table.

Area of intervention	**No of task**	**Task**	**Responsible person**	**Deadline**
Professional knowledge and experience	1	Guest lectures	Principal investigator of the project	11/2022
	2	Support for students´ professional activity	Principal investigator of the project	12/2022
Communication	3	Workshop 1: “New and innovative teaching methods”	Principal investigator of the project	2/2021
	4	Participation in international competitions	Principal investigator of the project	12/2022
Teamwork	5	Faculty activities/competitions for students	Principal investigator of the project	12/2022
	6	Soft skills training	Principal investigator of the project	11/2022

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Area of intervention	No of task	Task	Responsible person	Deadline
	7	Inter-university field trip	Principal investigator of the project	5/2022
Computer and digital skills	8	Workshop 2: “Digital Education Tools for Teachers and Students”	Principal investigator of the project	9/2021
	9	Workshop 4: “Computer skills for teachers”	Principal investigator of the project	9/2022
Task processing	10	Workshop 3: “Effective teaching”	Principal investigator of the project	2/2022
	11	Participation in professional competitions	Principal investigator of the project	12/2022

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ACTION PLAN (IMPROVEMENT PLAN) - SLOVAKIA

No	Task	2021												2022											
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	Guest lectures																								
2	Support for students´ professional activity																								
3	Workshop 1: “New and innovative teaching methods”																								
4	Participation in international competitions																								
5	Faculty activities/competitions for students – not financed by ProSkill project – activities realized by STU MTF																								
6	Soft skills training																								
7	Inter-university field trip					CZ												SK							
8	Workshop 2: “Digital Education Tools for Teachers and Students”																								
9	Workshop 4: “Computer skills for teachers”																								
10	Workshop 3: “Effective teaching”																								
11	Participation in professional competitions																								

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PDCA CYCLE - SLOVAKIA

The PDCA cycle will be used as the basic cycle of continuous process improvement and will enable the systematic implementation of tasks, the effect of which should be evaluated after implementation. In this iterative method of management partial sequences may be followed if needed.

Plan

In this phase it is important to identify the target group of students; 'smart selection' of talents will be provided.

It will also be necessary to recognise opportunities (e.g. upcoming competitions for students) and to identify suitable companies for cooperation (e.g. for guest lectures, soft skills training, workshops).

In this phase, it will be necessary to plan the fulfilment of individual tasks on the basis of the formulated strategy.

Also, it will be necessary to prepare a schedule of all planned tasks, to assign responsibility and allocate resources. All administrative formalities connected with planned task should also be considered and included in the schedule.

Do

All planned tasks will be performed according to planned schedules. In carrying out the tasks, it will be necessary to ensure coordination with other project partners and compliance with the project intent.

In this phase guest lectures should be provided under the auspices of ALUMNIs and OLDTIMERs. Students will be provided with mentoring and support for their professional activity. For students, faculty activities or competitions will be organised or secured on an ongoing basis, as well as opportunities for participation in professional and international competitions. Selected students will take part in inter-university field trips.

A very important part of the implemented tasks will be activities focused on training the trainers. Two of the four planned workshops will be focused on digital technologies and tools for teachers and students. Other two workshops should be focused on soft skills development as well as planned soft skills training.

During and after completion of each task, an archived of all the related documentation should be created.

Check

Upon completion of activities with students feedback from participants will be collected, in the form of feedback questionnaires completed by all those involved in the activities.

Based on the feedback on experiences and outcomes, benefits arising from the fulfilment of the planned tasks will be identified. These findings should be useful in education process improvement.

Act

If needed, corrections can be implemented following completion of activities to avoid recurring mistakes in the implementation of future tasks. Based on the identified findings, the necessary recommendations for career advancement and professional development will be developed. Based on systematic work with students and the feedback collected, t possible areas of improvement in common work and support for students will be identified, and recommendations for reshaping of curricula, for supplementing education, and for support focusing on active learning and innovative teaching method use will be formulated. The possibility of implementation of digital education tools will also be considered, and the benefits of modifications to study programmes should be analysed or proposed.

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SUMMARY - SLOVAKIA

In general, it can be concluded that graduates in the field of technology receive excellent theoretical and professional education. The equipment of the laboratories makes it possible to provide practical exercises that support the development of the necessary professional 'hard' skills. The composition of study programmes enables the comprehensive development of professional skills based on technical foundations, supplemented by foundations from economic basics and knowledge and training from the field of management and business management.
The identified shortcomings were identified mainly in areas related to the maturity of students and their experience with task performance (their 'soft' skills). These competencies are best developed in assigning tasks, verifying acquired knowledge in practice and developing experience. It is necessary that the planned tasks are aimed at improving areas that allow the development of the necessary competencies and personal growth. It is important to set themselves open to opportunities for development and learning, new experiences, the ability to learn from failures and to perceive every experience as an opportunity for development and self-improvement. Therefore, there is a need to create a culture of providing constructive feedback and a constant focus on development and improvement. It is important that teachers also have the necessary competencies to be able to provide students with tools to effectively manage their tasks, and understand the importance of developing proficiency in 'soft' as well as 'hard' skills in the workplace.

SKILL ECOSYTEM STRATEGY IN THE CZECH REPUBLIC

THE PRESENT SITUATION IN THE RAW MATERIALS LABOUR MARKET - CZECH REPUBLIC

In the beginning we would like to describe the general situation in the raw materials in the Czech Republic and in particular the situation in its share of the Czech labour market. For this chapter we used the most up to date official Ministry of Industry and Trade material dealing with the RM strategy for the Czech Republic. [5]

Brief summary of the Czech labour market in raw materials field

Approximately 1.2% of the total value added of the entire Czech economy is produced in the Mining Industry sector. From this point of view, it is the 3rd smallest industry in the Czech Republic. According to the size of exports, it is the 9th smallest and according to the volume of imports, on the contrary, it is the 10th largest industry in the Czech Republic.
Labour productivity is the 4th largest of all branches of the Czech economy in the Mining Industry sector. It is at the level of 178% of average labour productivity in the whole Czech Republic. However, in comparison with labour productivity in the sector in the EU28, labour productivity in the Czech Republic is lower (and this is the same, with one exception, in all sectors). Labour productivity in this sector in the Czech Republic is at the level of 34% of labour productivity in the same sector in the EU28. This is 18 percentage points less than the total labour productivity of the entire Czech economy compared to the labour productivity of the EU28.

[5] Ministry of Industry and Trade. Raw materials policy Czech Republic in the field of mineral and their sources. Prague, 2017

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Number of employees

Whilst growth in labour productivity in the Czech Republic Mining Industry sector was higher than the growth in total production, there was a decrease in the number of persons employed between 2000 and 2014. Since 2000, their number has decreased by almost 35,000, i.e. by about 49.3%. In 2014, less than 36,000 people were employed in this sector in the Czech Republic. The share of the sector in total employment in the Czech Republic decreased from 1.5% to 0.7% between 2000 and 2014. Compared to the share of this sector in total employment in the EU28, the share of the Mining Industry sector is higher in the Czech Republic; in the EU28 this sector has a share of 0.3% of total employment. The following graph compares the share of this sector in total employment in individual EU28 countries.

The outlook in the above-mentioned policy is that the number of jobs in the Mining Industry is expected to reduce further by 2025. Their number should fall by about 2,000 between 2014 and 2025, i.e. by about 6%. However, this does not mean that there will be no need to fill any new jobs in this sector by 2025. By 2025, around 7,000 people should have left their jobs in this sector (mainly due to retirement). Overall, it can be expected that by 2025, the Mining Industry sector will need to fill some 5,000 new jobs.

Structure of occupational groups

In the Mining Industry sector, there were five groups of occupations in the Czech Republic in 2014, which accounted for at least 5% of the total number of employees in this sector. The largest group of occupations is the operation of mining and processing equipment (ISCO 811), which has a share of about 29% of persons employed in the whole sector. The concentration of occupations is high in this sector.

Educational structure

The largest proportion of people in this sector has a high school graduation education. Persons with this level of the highest level of education make up almost 61% of all employed persons in the Mining Industry. The second largest part in this branch consists of people with a high school diploma. Their share of employees in this sector is almost 25%, and almost 9% are people with tertiary education. Among persons with tertiary education, the largest part, 73%, is made up of persons with a master's education. Another 15% are people with a bachelor's degree.

The average length of education of all persons employed in this sector is 11.3 years. This is 1.1 years less than the average length of education of all employed persons in the Czech Republic. Compared to other sectors, the average length of education of persons from this sector is the 4th lowest.

If we focus not only on the level of education, but also on the field of study, it turns out that in this branch the largest group of people (more than 17%) have followed a field of study in Mechanical Engineering, Metal Production and Metallurgy. The second largest group in this sector (more than 14%) are people who have a degree in Mining and Extraction. Other strongly represented educational groups are persons:

- with a secondary school non-graduate education with a field of study Electrical Engineering and Power Engineering,
- with a secondary school non-matriculation education with a field of study Civil Engineering and Civil Engineering,
- with a high school diploma with a field of study Electrical Engineering and Power Engineering,

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- with a secondary school non-secondary education with the field of study Motor Vehicles, Ships and Aircraft,
- with basic education in the field of General Education,
- with a high school diploma with a field of study in Mechanical Engineering, Metal Production and Metallurgy,
- with a high school diploma with a field of study Mining and Extraction,
- with tertiary education in the field of study Mining and Extraction.

Necessary qualification of jobs

The qualification intensity of jobs is an indicator that includes not only the education needed for the job, but also further training in the form of practice. The higher the degree, the higher is the qualification requirements for a given job. The total level of qualification intensity (requirements) of jobs in the Mining Industry sector in 2013 in the Czech Republic was 3.32 points (on an eight-point scale). This is 0.75 points less than the qualification intensity of all jobs in the whole Czech Republic. In the EU28, in 2013 the level of qualification requirements for jobs in this sector was 3.07 points, i.e. it was 0.25 points lower than the qualification intensity of jobs in this sector in the Czech Republic. Compared to all jobs in the EU28, the skill intensity of jobs in the Mining sector is lower than the skill intensity of jobs in the EU28 by 1.88 points.

Gender and age characteristics

In the Mining Industry sector, men predominate among those employed in the Czech Republic. They make up almost 90% of all employees in this group of occupations. This is 33 percentage points more than the share of men among all employees in the Czech Republic.

The average age of persons employed in this sector is 45.3 years. This is 2.8 years more than the average age of all employees in the Czech Republic. The mining industry is the 2nd oldest of all industries in the Czech Republic.

Of those employed in the sector, 5% are recent graduates, i.e. those who have left the education system in the last five years. This is four percentage points less than their share among all employees in the Czech Republic. Compared to other industries, the attractiveness of this industry for recent graduates is below average.

THE QUESTIONNAIRES, COMPETENCE TESTS AND INTERVIEWS – CZECH REPUBLIC

In our previous activity we tried to summarise the information gained from the in-depth interviews conducted with the selected Czech companies dealing with raw materials logistics, its processing and utilising included within their business activities. The text below summarises the data but still preserves and highlights the contrast between various groups if there is any.

Necessity of university degrees and preference of full-time or part-time education

The RM logistics companies state that their professional positions (staff in logistics, management, salesman, freight forwarder) generally require university education (mostly Master's degrees) in the technical, logistical or economic fields. However, this is not a necessary condition; sometimes university education can be replaced by experience gained from practice. In their responses to the questionnaire, companies connected with RM processing in our region have reported that higher professional positions in production and maintenance (including IT) generally require university education, especially in technical fields of study. For lower positions, a technical secondary school education is fully sufficient. They also mentioned that they have own secondary schools (e.g. the Secondary School of Třinecké železárny). For administration and in economic positions, the

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requirement is for high school or university education with an economic focus. A company producing steel parts for machinery and construction as well as a raw material processing company in the chemical industry require technical secondary education for manual workers in lower job positions such as production, transport and maintenance. For jobs with higher levels of responsibility, they require a university degree in technology. As for business and economic positions, they demand high school or university degrees, especially with economic focus. Professional positions (technologist, researcher, laboratory worker) usually require university education (mostly Master's degrees) in the field of chemical technology, raw material processing, automation, etc, but this varies on a case by case basis depending on the position. Generally, in terms of highly qualified positions, the usual expectation is that employees will have university degrees in the ratio of 70% Master's degrees to 30% Bachelor's degrees. While the ratio of technical and economic employees is roughly the same (70/30) in favour of technical employees. However, this is very individual and may differ in from year to year. A university degree is not usually necessary for traders, for whom a Bachelor's degree or Certified specialist degree ("DiS." - gained on higher vocational school) in economical fields are often acceptable. An industrial automation focused company stated that the technical working positions require specific education. The technical and service department needs technical graduates - automation specialists, electronics specialists, mechanical engineers. SW department prefers graduates with programming skills, RFID department requires automatic identification specialists. Marketing and sales welcome graduates from economic branches, but they also have a few good salesmen without any university degree. A Master's degree is necessary for head positions in technical departments. In the terms of full-time training, correspondence training, dual education and international education the companies generally do not usually have any special requirements. Most companies just would prefer students with international communication skills that can be acquired at the Czech universities as well as abroad. For example, in RM processing chemical industry it is reflected that both full-time and part-time education have their advantages. If the graduate has already worked in a similar job position during his or her studies, he or she acquired practical skills and became acquainted with the procedures for the implementation of the established plans. Graduates of full-time programmes often, but not always, have deeper theoretical knowledge and have access to wider network of contacts working in the field gained during the study. The preference depends also on what kind of job the student was engaged in during the distance form of education. If he or she has experience in their field and good work habits, they can be more valuable employees than a student without any experience. The industrial automation company reported some mixed results and experiences with university student internships. Sometimes the students were highly motivated and interested in the company and the assigned tasks and wanted to help and so learned a lot. Other times the trainees lacked motivation and enthusiasm and did not learn much nor did they help the company.

Recent changes in graduates' qualities

The companies dealing with RM logistics found that in the last ten years, more confident graduates have come from universities asking for higher salaries, time flexibility and other company benefits, and that they are better well-travelled and better language-skilled. However the companies find that they still have to teach them a lot about practical aspects of work. The selected Czech companies connected with RM processing have answered that in recent years, the profile of university graduates has changed a bit; they are generally better equipped both theoretically and linguistically. The companies also mentioned that graduates often lack practical knowledge and complex understanding, whilst also being more independent and self-confident. Companies focusing on raw material processing in chemical industry say that in recent years the knowledge

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in the field of IT has significantly improved and students that come from universities are better prepared in this field, although nowadays this should be even more intensive. Graduates' language skills are also at a better level and they often have foreign environment experience thanks to student travel programmes.

Most important general competencies of graduates

The logistic companies usually think that teamwork, analytical skills, critical thinking and good communication are very important. Furthermore, real interest in their work and field and the ability of further education and development are essential. This together with being flexible and hardworking was also important for the companies connected with RM processing. The desirability of having a certain level of independence and the ability to work under pressure was also emphasised, but these requirements always depend on the specific job position. The company producing steel components for machinery requires generally all the above-mentioned, but also stressed oral communication abilities, IT and computer skills and elementary knowledge about new trends. The RM processing chemical industry company stated the need for at least elementary knowledge about Industry 4.0. and certain lack of technical - social overlap, which makes the communication more difficult. This company also mentioned the need for employees who can further develop themselves, to independently study the properties of new raw materials, to understand new recipes and put their production into practice. The industrial automation focused company states that the most important competence, in addition to those already mentioned, is the ability to take a complex view (especially for technical departments) because they are specialised in customised applications. The technicians often deal with unclear requirements specified by the customer and they have to use their social-analytical skills to find exactly what should be done and how it should be implemented.

Language skills required

The companies said that, as far as language skills are concerned, a good knowledge of English is necessary. But they usually require at least one additional language for example for logistic employees and traders (mainly German, Polish or Russian according to the market geographical section). The companies connected with RM processing and production of steel products and chemical industry company mentioned English, while knowledge of another language is an indisputable advantage, preferring Polish or German.

Computer skills required

The companies dealing with RM logistics state that in the field of computer skills, they require common knowledge of computer skills from all employees (OS, office software, e-mail), the advantage is the knowledge of SAP. In addition to the above-mentioned, the company producing steel parts also look for 3D modelling and CAD tools from staff in technical positions as well as ability to read technical drawings and documentation. Companies focusing on raw material processing in the chemical industry say that, undoubtedly, those graduates who are familiar with SCADA and HMI tools have an advantage. They also say that with the advent of coronavirus, they are increasingly focusing on online communication and related tools. Therefore they will also require from future employees some knowledge in the field of creating presentations, telepresence techniques and knowledge of new technologies such as augmented and virtual reality serving as a human-machine interface. The industrial automation focused company among others highlighted need of knowledge about ERP SW that is used in all departments of the company (K2 System).

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Most important competencies for economics graduates

The companies dealing with RM logistics state that in general, it can be said that the most important for job seekers is their ability to learn and understand work processes in individual sections, and a professional and helpful approach to both customers and other employees. The Czech companies connected with RM processing state that work commitment, loyalty, interest in the company and in the work, the ability to constantly learn and to be open to new work procedures and technologies are most important. The company producing steel components says that the economist should, among other skills, be able to create and deliver product presentations in an engaging way. An RM processing company in the chemical industry states that a good portion of theoretical knowledge is of course the basis however, in today's world, where every piece of information can be found quickly, memorising all the information is not a requirement. They need graduates that are flexible and able to search information, and process and analyse information. Of particular importance is the ability to work in a team and awareness of project management. For applicants for commercial and economic positions, the most important competency identified is the ability to learn and understand how the processes take place in the company and to apply this understanding in practice, so as not to unnecessarily disturb established processes. The industrial automation company adds that it is important for the graduate to get to know internal rules of our company, basic ethical norms of cooperation with colleagues (and senior or subordinate employees), and appropriate approaches to management of different kinds of projects as well as management of routine production. Oral communication abilities are essential for those working in sales and marketing together with ability to communicate indirectly (classic and e-mail correspondence or creation of a desirable content for the web pages and social media image of the company). As the analysed company is quite small where everyone meets the owner and top management at least from time to time, there is no need to develop any new methodologies or functions for corporate management.

Technical competencies of economics graduates

The logistic companies state that in the field of economics, a basic overview of products, competition, prices and the market in which they operate is sufficient. The steel parts producing company also states that the employee should know the technical parameters of the products and have a basic overview of production. The economic worker should be able to use the SAP system. Chemical industry company say that today's world is full of new terms such as the Internet of Things, Industry 4.0, SMART sensors, human-machine interface, digital twin. A graduate applying for an economic position should have a basic idea of what these terms mean. The industrial automation focused company stated that, for the salesmen, it is necessary to know core technical specifications of products and services to be able to explain possibilities and functionality to potential customers.

Most important competencies for technical sciences graduates

The RM logistics company states that a graduate willing to work in logistics or as a freight forwarder should be able to solve independently assigned tasks corresponding to his job position. Teamwork and communication are also important here. The companies connected with RM processing in our region have answered that a graduate needs the ability to make independent decisions at work, as well as certain organisational and communication prerequisites and definitely be a technical thinker. The company in chemical industry stated that a graduate applying for a technical position should be able to perform technical and engineering tasks corresponding to his job position. It is also necessary to apply the acquired expertise in operative solving of emerging problems. The industrial automation focused company stated that the graduate in one of the

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technical departments should be able to perform technical and engineering tasks corresponding to his degree and position. For technical employees, they usually test the skills via a real-life problem-solving task during a job interview (basic electrical circuits, automation problems, …). That helps to establish whether the candidate is able to apply his theoretical knowledge to work in the situations that occur in the company on a daily basis.

Economic competencies of technical sciences graduates

The companies mostly say that a common overview of economics is sufficient. The company producing steel parts also would highlight the presentation skills and communication skills that are often necessary for technicians while participating in meetings and negotiations with the customer as an invited expert. Companies focusing on raw material processing in the chemical industry also say that they place great emphasis on presentation skills. It is not enough that the employee only understands the information, but should also be able to create various graphs and present his outputs to colleagues, using the tools designed for these tasks. Recent graduates are also often aware of the progress of modern IT technology, so the companies expect from graduates a certain overview in the IT world. In the field of other economic skills just a routine overview of the necessary tasks is required (fill in attendance, understand the difference in raw materials prices and see possible savings…). The industrial automation company states that the necessary economical competences from most of technicians is to use the ERP system to manage contracts –add devices and consumables to the specific contract, calculate workhours etc.)

General competencies of the graduates from our university

The companies usually said that graduates are generally well educated in theory, but they often lack a complex overview, the ability to see things in a broader context, independence, and determination. They think that, in addition to a lot of theory, more practice in different companies (if possible), solving individual real-life tasks, developing critical thinking should be included in university teaching. Most graduates are not able to work independently immediately after finishing university and their employers therefore have to educate or tutor them. The RM processing companies said that students sometimes lack practical skills as well as experience and the ability to think independently, solve tasks and work under pressure and to manage their stress. The companies also stated that it would certainly be beneficial to include at the university some practice and also soft skills, esp. communication, teamwork, creativity, positive attitude and also critical thinking. If they could influence the VSB curricula, they would recommend a greater focus on Industry 4.0, SMART sensors, internet of things, augmented and virtual reality, control of robots and cobots. The graduates should be also able to express better their ideas – for example in visual way – schemes, presentation etc.

IDENTIFICATION OF THE GAPS AND IDEAS FOR IMPROVEMENT - CZECH REPUBLIC

Based on the gap analysis between expectations of employers and the Management Potential Analysis (MAP) performed with our students we identified some further requirements for improvement of the education processes. As most of the employers do not see any significant lack of theoretical knowledge, we should be more focused on other aspects of the educational activities. In our plan for the rest of the ProSkill project as well as for the future we will have to involve more practical experiences in the form of field trips to companies, real life problem discussions and solving and adding some practical background to the courses.

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While having practical problem-solving events, we should help the students react properly to the constructive criticism as a big part of our students had quite high values in the 2nd column. At the same time, the students should learn how to provide feedback to others constructively with a positive effect on the results of teamwork.
In relation to communication knowledge and experience, the shyness in communication should not be a big issue for Czech students as the results from the MAP were quite low compared to the others. Also, the high values of the 4th row show a good readiness for teamwork, however it should be further developed because the ability to work in a team is highly appreciated by employers.
A few of the students in our sample had quite high values of the 6th column that implies more pragmatic point of view on the work tasks. For this reason, we should show them, that while their work is important for themselves, they can even like their job and realise they can be valuable for the employer or society in general.
Most of our students had quite low values in the 7th column that may imply problems with operational control of performed tasks, therefore we should show the student that conditions in real life problems can change easily and often, teach them methods of decision making based of continuous problem analysis, how to react to constantly changing conditions and how to plan their activities in a probability domain. Most of the actions planned in this strategy also involve tasks that are touched by more technical and social disciplines. This way the students will learn how to gain from the multiplicative effect of the interdisciplinary teamwork.
As ProSkill is an international project the students are going to improve their communication skills in general and especially in English and nowadays they also have to learn how to use modern communication platforms for online communication, team control and project management.
In addition to direct work with students, we plan also to improve the quality of courses that are taught by us via involving state of the art teaching methods or use of modern educational tools based on information technologies and also improving the course contents taking account of the lacks found in the employer interview analysis. We are also going to organise events that could help teachers to improve their teaching methods and to learn modern ways of education process.
The existing talent management system at our university should be utilised more intensively, while the methods should be furtherly developed, especially smart selection of talented students. We also have to find the optimum way to motivate more and more students to cooperate on development of their talents.

ACTION PLAN 2021 – 2022 (CZECH REPUBLIC)
The tools planned in the project are various, involve all partners, and involve outreach at several levels of the education and the social environment. The realisation of these activities is planned dominantly in 2021 and 2022, and it is expected that despite of the Covid-19 pandemic, the project may progress according to the original schedule. We decided to sort these activities chronologically and so we divided the strategical action plan into two subchapters of year 2021 and 2022.

Strategy for 2021
Workshop 1: 'New and innovative teaching methods – reshaping of curricula with focusing on active learning and other solutions'

Goal: Improving student soft-skills and engagement in-class activities (student XP).
A variety of teaching methods - such as peer-instruction, discussion groups, and collaborative problem solving, visualisation, so called active learning methods - can improve greater student engagement. Each of these methods forces the students to connect, share information, and discuss

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possible solutions to posed problems, anticipating real life workplace situations. In this workshop the lecturer gets up-to-date information on how they can develop the current curricula and fit them to the challenges of 21st century. The workshop will be organised in national language at the same time in all partner HEIs.

Action plan:

- to create the detailed programme of the workshop
- to invite the experts who will teach the lecturers
- to invite the lecturers
- to implement the event
- to communicate/disseminate information about the event (before, during and after)

KPI: Lifelong Education
KIC KPI Code: KICN02-08
Target value 2021: 10 lecturers

Guest lectures (ALUMNI and / or OLDTIMER) and soft skills training

Aim of this task will be enhancing soft skills of students and hard skills to achieve higher competitiveness on the international market. The number of events focusing on hard skills and soft skills should be 50:50. We invite trainers, ALUMNI, senior managers or OLDTIMERS - professionals with several decades of industrial/institutional practice. The guest lectures follow predetermined thematic fields. The main goal is at least two guest lectures have to be organised per semester (in 2021 and in 2022).

Needs to be improved (Results of the Competence test)

- Reaction to frustration and criticism
- Communicating and seeking relationships
- Teamwork
- Task preference
- Reaction to failure

Action plan (for all trainings):

- to specify the training topic
- to identify possible trainers
- to invite possible trainers, to make appointments
- to communicate the training, to recruit participants
- to provide the background conditions (hall, IT, catering)
- to conduct the training
- to measure the impact of training

KPI1: Participants Wider Society Learning
KIC KPI Code: KICN02-09
Target value 2021: 1 guest lectures and 20 students per training, 4 trainings in 2021

Inter-university field trip of all HEIs to CZECH REPUBLIC (Ostrava) (2 nights, 3-day long) with a dedicated factory/company visit.

Goals: Internationalisation & managerial skill-building. All HEIs will delegate a group of 20 students and two lecturers. The Czech Republic will compile a professional programme (including workshop focusing on a specific topic, a company visit, and a social event).

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Action plan:

- to recruit students for the factory tour/company visit
- to organise the field trip (i.e. renting a bus, booking hostel rooms, etc.)
- to implement the factory tour
- to communicate/disseminate information about the event (before, during and after)

KPI: Wider Society Learning
KIC KPI Code: KICN02-09
Target value 2021: 20 students
Target value 2022: 20 students
Deadlines: May 2021
Responsible person: Field trip manager

Workshop 2: 'Digital Education Tools for Teachers and Students - Challenges in the education of generation Z and Alpha'

Goal: Improving student experience by offering greater variety of digital solutions in courses. Several digital education tools are unexplored and available to enrich the course materials with the newest products of information technology. Gen Zed involves now the freshmen in Universities, while Gen Alpha refers to the recent high-school population. The workshop is aimed at introducing (1) the digital way of living of these generations to the adult professionals, professors, and (2) introduction of the digital warehouses of geological-geotechnical tools into the course materials in attractive manner to the students coming from these generations. The tools to be used are - among others: chat-forums as consultation tools, downloadable apps to mobile-phones (for example geological compass etc), digital maps and GPS/geocaching for field practices, photos and videos for rock/outcrop documentation and archiving incl. selfies and Instagram posts, downloadable worksheets, spreadsheets, calculators, simple 3D modelling tools. The tools will be complemented by the preparation of a freely downloadable electronic exercise book, ready to be inserted in most Earth Science Engineering technical courses.

Action plan:

- to create the detailed programme of the workshop
- to invite the experts who will teach the lecturers
- to invite the lecturers
- to invite the students
- to implement the event
- to communicate/disseminate information about the event (before, during and after)

KPI: Lifelong Education
KIC KPI Code: KICN02-08
Target value 2021: 10 lecturers, 20 students
Target value 2022: -
Deadline: September 2021
Responsible person: professional implementer

Thematic event 2 (connected to European Minerals Day)

The European Minerals Day thematic event will illustrate the essential role of mineral raw materials in Europe's economy, contributing to innovation and resource efficiency all across the

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value chain. Typical activities for the local community will include guided visits through active and rehabilitated sites, workshops, and entertainment activities for children.

Action plan:

- to invite the lecturers who will make some presentations
- to invite the exhibitor
- to recruit students for the thematic event
- to organise the thematic event (i.e. making the schedule, sending the programme)
- to implement the event
- to communicate/disseminate information about the event (before, during and after)

KPI: Wider Society Learning
KIC KPI Code: KICN02-09
Target value 2021: 50 people
Target value 2022: -
Deadline: September 2021
Responsible person: professional implementer

Guest lectures (ALUMNI and / or OLDTIMER) and soft skills training

Aim of this task will be enhancing soft skills of students and hard skills to achieve higher competitiveness on the international market. The number of events focusing on hard skills and soft skills should be 50:50. We invite trainers, ALUMNI, senior managers or OLDTIMERS - professionals with several decades of industrial/institutional practice. The guest lectures will follow predetermined thematic fields. The main goal is at least two guest lectures will be organised per semester (in 2021 and in 2022).

Needs to be improved (Results of the Competence test):

- Reaction to frustration and criticism
- Communicating and seeking relationships
- Teamwork
- Task preference
- Reaction to failure

Action plan (for all trainings):

- to specify the training topics
- to identify possible trainers
- to invite possible trainers, to make appointments
- to communicate the training, to recruit participants
- to provide the background conditions (hall, IT, catering)
- to conduct the training
- to measure the impact of training

KPI1: Participants Wider Society Learning
KIC KPI Code: KICN02-09

Mentoring programme - supporting the students' professional activity

The best performing students (based on the developed reward system) get into an international mentoring programme. It starts in autumn 2021 based on the experiences of spring semester (2020/2021) of WP5. The international mentoring programme aims at creating an international informal network of experienced professionals capable of providing guidance and support to the

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new generation of geoscientists. Over a fixed period of 9 months, the mentees will receive advice and targeted support from experienced professionals, according to their individual goals. Examples include: feedback and support during the job application process; building up a network, transfer of contacts; development of a career strategy; introduction to informal knowledge and business networks; shadowing (participation in the professional life of the mentor). The cooperation will start with a webinar that will introduce the programme's goals and opportunities to mentees and mentors. Due to the international dimension of the programme, electronic communication tools will be encouraged to keep mentees and mentors in touch. In addition, EFG's membership associations will approach the participants whenever possibilities for face-to-face meetings arise at national level. The programme is coordinated by the EFG.

Action plan:

- to introduce the mentoring programme to the students
- to select students
- to support students' participation in the mentoring programme (eg to provide a flexible learning path, mobility window)
- to share the experiences of mentored students with other students

KPI: Students & Industry - Knowledge Triangle Integration
KIC KPI Code: KICN02-10
Target value 2021: 5 students
Target value 2022: 5 students
Deadline: continuous from September 2021 to December 2022
Responsible person: project manager

Strategy for 2022
Spend a day with me! – One-day- long programme with a top manager

Objective: Managerial skill-building. A special one-day-long programme will be organised for the top performing 10% of students involved from each HEI with an operations manager of the respective company/plant/mine. The fundamental purpose of this task is to start developing managerial skills and gaining managerial experience (both desired competencies by companies) in those students who have the best abilities to become leaders in teams and workgroups. Objective selection criteria for participation will be determined and announced. The one-day-long project is a well-planned factory tour/site visit under the guidance of a top manager, which will end up with a wind-up meeting with informal lunch/dinner, where the experiences gained, and other observations/opinions can be discussed.

Action plan:

- to set and communicate objective selection criteria
- to select participating students
- to invite a top manager (mentor)
- to organise the one-day programme
- to communicate/disseminate information about the event (before, during and after)

KPI: Wider Society Learning
KIC KPI Code: KICN02-09
Target value 2021: -
Target value 2022: 4 students
Deadline: January 2022

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Responsible person: professional implementer

Guest lectures (ALUMNI and / or OLDTIMER) and soft skills training

Aim of this task will be enhancing soft skills of students and hard skills to achieve higher competitiveness on the international market. The number of events focusing on hard skills and soft skills should be 50:50. We invite trainers, ALUMNI, senior managers or OLDTIMERS - professionals with several decades of industrial/institutional practice. The guest lectures follow predetermined thematic fields. The main goal is at least two guest lectures have to be organised per semester (in 2021 and in 2022).
Needs to be improved (Results of the Competence test)

- Reaction to frustration and criticism
- Communicating and seeking relationships
- Teamwork
- Task preference
- Reaction to failure

Action plan (for all trainings):

- to specify the training topics
- to identify possible trainers
- to invite possible trainers, to make appointments
- to communicate the training, to recruit participants
- to provide the background conditions (hall, IT, catering)
- to conduct the training
- to measure the impact of training

KPI1: Participants Wider Society Learning
KIC KPI Code: KICN02-09

Inter-university field trip to SLOVAK REPUBLIC (Bratislava) (2 nights, 3-day long) with a dedicated factory/company visit.

Goals: Internationalisation & managerial skill-building. All HEIs will delegate a group of 20 students and two lecturers. The Czech Republic will compile a professional programme (including a workshop focusing on a specific topic, company visit, and social event).
Action plan:

- to recruit students for the factory tour/company visit
- to organise the field trip (i.e. renting a bus, booking hostel rooms, etc.)
- to implement the factory tour
- to communicate/disseminate information about the event (before, during and after)

KPI: Wider Society Learning
KIC KPI Code: KICN02-09
Target value 2021: 20 students
Target value 2022: 20 students
Deadlines: May 2021
Responsible person: Field trip manager

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Workshop 3: Ways of communication between teacher and student to encourage students for better results

We decided to organise Workshop 3 in the following topic: Ways of communication between teacher and student to encourage students for better results. It is needed to improve students' communication skills, because the results of the interviews and questionnaire shows that these skills are sometimes missing in the students. We think that lecturers can give their experiment for the student later.
Action plan:

- to create the detailed programme of the workshop
- to invite the experts who will teach the lecturers
- to invite the lecturers
- to implement the event
- to communicate/disseminate information about the event (before, during and after)

KPI: Lifelong Education
KIC KPI Code: KICN02-08
Target value 2021: -
Target value 2022: 10 lecturers
Deadline: February 2022
Responsible person: professional implementer

Workshop 4: Utilisation of new technologies for better presentation and improvements in the education process

We decided to organise Workshop 4 in the following topic: Utilisation of new technologies for better presentation and improvements in the education process. It is needed to improve these students' skills in these topics, because the results of the interviews and questionnaire shows that these skills are sometimes missing in the students. We think that lecturers can give their experiment for the student later.
Action plan:

- to create the detailed programme of the workshop
- to invite the experts who will teach the lecturers
- to invite the lecturers
- to implement the event
- to communicate/disseminate information about the event (before, during and after)

KPI: Lifelong Education
KIC KPI Code: KICN02-08
Target value 2021: -
Target value 2022: 10 lecturers
Deadline: September 2022
Responsible person: professional implementer

Thematic event 1 (connected to Earth Day) – switched with researchers' night in 2020

This thematic event will conclude the series of events raising awareness of Raw Materials. Earth Day Network's mission to diversify, educate and activate the environmental movement

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worldwide. So, there is space for us to promote awareness of the possibilities of environmentally friendly use of mineral raw materials.

Action plan:

- to invite the lecturer who make some presentation
- to invite the exhibitor
- recruiting students for the thematic event
- organising the thematic event (i.e. making the schedule, sending the programme)
- implementing the event
- communication/dissemination

KPI: Wider Society Learning
KIC KPI Code: KICN02-09
Target value 2022: 50 people
Deadline: April 2022
Responsible person: professional implementer

Guest lectures (ALUMNI and / or OLDTIMER) and soft skills training

Aim of this task will be enhancing soft skills of students and hard skills to achieve higher competitiveness on the international market. The number of events focusing on hard skills and soft skills should be 50:50. We invite trainers, ALUMNI, senior managers or OLDTIMERS - professionals with several decades of industrial/institutional practice. The guest lectures will follow predetermined thematic fields. The main goal is at least two guest lectures to be organised per semester (in 2021 and in 2022).
Needs to be improved (Results of the Competence test)

- Reaction to frustration and criticism
- Communicating and seeking relationships
- Teamwork
- Task preference
- Reaction to failure

Action plan (for all trainings):

- specifying the training topic
- identification of possible trainers
- to invite possible trainers, to make appointments
- to communicate the training, to recruit participants
- to provide the background conditions (hall, IT, catering)
- to conduct the training
- measure the impact of training

KPI1: Participants Wider Society Learning
KIC KPI Code: KICN02-09

At the same time, it is part of our strategy to attend joint events of other HEIs – like Mentoring programme in Brussels or Participation in international competitions.

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			2021												2022											
WPs	**Task**	**Task**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
WP2	Task 2.4.1	Thematic event 1 (connected to Earth Day)																								
WP2	Task 2.4.2	Thematic event 2 (connected to European Minerals Day)																								
WP2	Task 2.4.5	Closing action – final conference																								
WP4	Task 4.1	Workshop on 'Effective ways of mentoring and other best practices'																								
WP4	Task 4.3	Workshop 1: 'New and innovative teaching methods – reshaping of curricula with focusing on active learning and other solutions'																								
WP4	Task 4.4	Workshop 2: 'Digital Education Tools for Teachers and Students - Challenges in the education of generation Z and Alpha'																								
WP4	Task 4.5	Workshop 3 Ways of communication between teacher and student to encourage students for better results																								
WP4	Task 4.6	Workshop 4 Utilisation of new technologies for better presentation																								
WP5	Task 5.2	Guest lectures (ALUMNI OLDTIMER) and soft skills training																								
WP5	Task 5.3	Reveal the national solutions of talent management																								
WP5	Task 5.4	Development of the reward system																								
WP5	Task 5.5	Mentoring programme - supporting the students' professional activity																								
WP5	Task 5.6	Spend a day with me! - one day programme with a top manager																								
WP5	Task 5.7	Participation in international competitions																								
WP5	Task 5.8	V4–SX																								

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PDCA cycle

PDCA (plan–do–check–act) is an iterative four-step management method used in business for the control and continuous improvement of processes and products. We created this PDCA cycle on project level.

Activity	KPI	Monitoring period	Responsible person
Task 2.4.1 – Thematic event 1 (connected to Earth Day)	Wider Society Learning	April – 2022	professional implementer
Task 2.4.2 – Thematic event 2 (connected to European Minerals Day)	Wider Society Learning	September 2021	professional implementer
Task 2.5. – Wind-up Conference	Wider Society Learning	November – December 2022	project manager
Task 4.1 – Workshop on 'Effective ways of mentoring and other best practices'	Lifelong Education	January – February 2021	EFG
Task 4.3 – Workshop 1: 'New and innovative teaching methods – reshaping of curricula with focusing on active learning and other solutions'	Lifelong Education	According to Gantt chart	professional implementer
Task 4.4 – Workshop 2: 'Digital Education Tools for Teachers and Students - Challenges in the education of generation Z and Alpha'	Lifelong Education	September – October 2021	professional implementer
Task 4.5 – Workshop 3: Ways of communication between teacher and student to encourage students for better results	Lifelong Education	February – March 2022	professional implementer
Task 4.6 – Workshop 4: Utilisation of new technologies for better presentation and improvements in the education process	Lifelong Education	September – October 2022	professional implementer
Task 5.2. – Guest lectures (ALUMNI and / or OLDTIMER) and soft skills training	Wider Society Learning	According to Gantt chart	professional implementer local project manager
Task 5.2. – Guest lectures (ALUMNI and / or OLDTIMER) and soft skills training	Women graduating from RM-related courses	According to Gantt chart	local project manager
Task 5.2. – Guest lectures (ALUMNI and / or OLDTIMER) and soft skills training	Number of students in PhD Education short courses	According to Gantt chart	local project manager
Task 5.2. – Guest lectures (ALUMNI and / or OLDTIMER) and soft skills training	Number of students in Master Education short courses	According to Gantt chart	local project manager
Task 5.4. – Reward system	Reward system	February 2021	local project manager
Task 5.5. – Mentoring programme - supporting the students' professional activity	Students & Industry - Knowledge Triangle Integration	December 2021, quarterly in 2022	project manager
Task 5.6. – Spend a day with me! – One-day-long programme with a top manager	Wider Society Learning	According to Gantt chart	professional implementer
Task 5.9. – Inter-university field trips (2 nights, 3-day long) with a dedicated factory/company visit.	Wider Society Learning	May 2021 May 2022	Field trip manager

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SKILL ECOSYTEM STRATEGY IN POLAND

The skills ecosystem in Polish conditions (represented in the project by the Faculty of Mining, Safety Engineering and Industrial Automation) must reflect the state of industrial development in the region, which is one of the largest industrial centres in Europe, practically from the beginning of the industrial revolution. Like other old European industrial centres, its base was rich deposits of hard coal and - to a lesser degree - metal ores (mainly iron, zinc and lead). From the point of view of the management of mineral resources, the use of coal as a fossil fuel to produce heat and energy must be considered separately from the use of coking coal, which is the raw material for the production of steel.

The twilight of heavy industry based on production aimed mainly at other industries, the defence sector and other recipients (heavy machinery, low-processed materials, semi-finished products, etc.), which was characterised by a strong devastation of the natural environment, initiated a number of new trends and tendencies, the effects of which are also seen today. Important features of this transition have been:

- Liquidation of a significant number of large workplaces with several thousand employees operating mainly in the field of heavy industry,
- Creation of new jobs, mainly private enterprises from the SME sector and branches of large international corporations.

The source of this transformation is a natural tendency to use available human resources, industrial potential, existing infrastructure, etc.

From the point of view of the labour market of graduates of technical universities, these changes result mainly in:

- Drastic decrease in the demand for engineers educated for the needs of traditional industries (mining, metallurgy, machine industry),
- The emergence of a demand for education enabling employment in very diverse areas of industrial activity,
- The cultural and organisational evolution of companies and the growing demand for non-vocational skills,
- Internationalisation of the economy requiring good knowledge of foreign languages from the staff,
- Digitisation and networking of work manifested, in, for example:
    - The need for the ability to quickly find and process the necessary information,
    - Efficient use of office and specialist software,
    - The ability to programme, convert data, use databases, etc.

In the practice of universities so far, the above-mentioned needs were mainly addressed through the multiplication of specialisations, which resulted both from the deficit of students in traditional fields of study and the observed demand for new fields of study.

Currently, concepts of creating more general education programmes are being considered, with less detailed theoretical knowledge and more emphasis on the ability to independently acquire the necessary knowledge and use IT tools.

SITUATION ANALYSIS - POLAND

The labour market of technical university graduates is determined by two areas - skills and qualifications offered by graduates (supply side) and employers' demands (demand side).

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Skills and competences of graduates in the point of the view of employers

1 Most wanted competences

In the result of analysis of survey data in regard to expectations of the employers, five most important competences have been identified as critical:

- Practical professional knowledge,
- Foreign language skills,
- Software skills (digital competence),
- Creativity,
- Collaboration skills.

The first three of these competences belong to the sphere of substantive education. Only creativity and collaboration skills represent the sphere of 'soft skills'.

2 Competences required improvement

As competences, which are considered as required to be improved, the employers have declared most frequently:

- Foreign language skills,
- Collaboration skills,
- Leadership skills,
- Self-monitoring,
- Ability to work under stress conditions,
- Complex problem-solving ability.

3 Engineering (B/BSc) versus Master (M/MSc) studies

The division of studies into engineering and master's studies seems to be adequate to the needs of the labour market. For some employers, the type of the diploma is not significant, or it is important only for selected job offers (positions) requiring more advanced knowledge.

4. Full time (intramural) versus extramural studies

There is a widespread belief that the level of knowledge of extramural students is substantially lower. For the needs of many positions offered on the labour market, the diploma of completing the 1st degree of extramural technical studies is sufficient.

Both graduates and employers find it convenient to be able to complete their education through extramural second-cycle studies.

Companies in the field of high technology and in positions requiring special expertise in all companies, however, are convinced of the superiority of full-time master's studies.

On the other hand, in many cases full-time graduates are perceived as people with a lot of theoretical knowledge, but without adequate practical knowledge. Although it is perceived that graduates of extramural studies at both levels usually already have practical work experience, which is highly appreciated by the employers.

5. Practical skills versus theoretical background

In the case of graduates of the Silesian University of Technology, which is one of the best universities in Poland, employers usually do not comment on the substantive (theoretical) professional preparation of graduates. The feeling of the graduates themselves is similar, as most of them do not find that they have knowledge gaps that make it difficult for them to start work.

However, employers have great reservations about the practical scope of graduates' skills.

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Generally speaking, graduates of even the best faculties and specialisations are perceived as candidates who have been deprived of sufficient practical preparation to work in relatively low-level positions, which they find immediately after graduation.

Competences of graduates of the Faculty of Mining, Safety Engineering and Industrial Automation

The Faculty, which currently operates under the name of the Faculty of Mining, Safety Engineering and Industrial Automation, has been continuously working for several years to adapt the educational offer to the changing needs of the labour market. From the beginning of its existence (1951), the Faculty functioned mainly as a training centre for engineering staff for the hard coal mining industry in Upper Silesia. Until the beginning of the 1990s, over 70 hard coal mines were active in the Upper Silesian Coal Basin, and employment in the entire sector amounted to half a million people. Under the initial name of the Faculty of Mining, changed in the early 1990s, tens of thousands of engineers and master engineers were educated within its walls to become the Faculty of Mining and Geology.

As a result of political and economic changes, the demand for engineers for the coal industry began to gradually decrease. This process continues today. As a result of activities undertaken to adapt the educational offer to the needs of the regional labour market, the Safety Engineering (2015) field of study was established, followed by the practical (dual studies) Automation and Industrial Information Technology. In 2018, the name of the Faculty was changed to reflect the fields of study being offered.

It should be added that both new fields of study are completely independent of the primary orientation of the education offered in the past to the mining industry. The study plans for new specialisations (courses) are designed with the graduates' job opportunities in various areas of the economy and industry in mind.

At present, preparations are being completed for the creation of another new field of study Geodesy and Cartography, based on the currently existing specialisation course in Mining Surveying, giving it a universal character; this should be launched in 2021.

Within the field of study Mining and Geology, a new specialisation is being created, Revitalisation of Post-Industrial Areas, reflecting the current need for specific education related to activities in the field of environmental protection and broadly understood expectations of local societies as well as economic and institutional circles, which can be generally classified as a post-industrial society and post-industrial economy. The aim is to face up to the devastating impacts of heavy industry for many years and the reorientation of the industries and labour market on the technologically advanced branches.

Also, the oldest and strictly mining-oriented specialisation (course) will soon be transformed into Industrial Engineering and Mineral Resource Management, with the transfer of educational emphasis to a more universal education, enabling graduates to navigate the labour market created by modern economic entities, with a drastically decreasing share of the traditional sector of hard coal mining.

Work on changing the programme of the current course Mining Technology and Waste Management into Industrial Engineering and Mineral Resource Management, is underway. The new course is expected to start operating in October 2021.

From the point of view of the implementation of the ProSkill project, the ongoing work on new specialities, in particular on Industrial Engineering and Mineral Resource Management, creates the possibility of practical implementation of the conclusions and programme proposals created under the ProSkill project. It is a unique opportunity to quickly and effectively influence the curriculum by including new specialisations, which would be practically impossible after their

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official acceptance and approval (at the level of the university rector and the Ministry of Education and Science).
At present, the Faculty offers 3 fields of study with 14 specialisations. After introducing the specialisation Revitalization of Post-Industrial Areas and transforming the current specialisation Mine Surveying into the field of study Geodesy and Cartography, the number of fields of study will increase to 4, but the total number of specialisations will not change. The last of the typically geological specialities, Mining Geology and Exploration, will probably be closed due to the lack of interest, while in the specialisation of Engineering Geology and Geotechnics, the topic of construction geotechnics will be given more emphasis than geology, which results from the expectations of the labour market.
Most of the specialisations are taught on a full-time and extramural basis with the offer of 1st and 2nd degree studies. As shown by the previous experience, confirmed by the surveys carried out in the ProSkill project, the possibility of flexible choice between full-time and part-time studies as well as at the engineering and master's level meets the expectations of both students and employers.
Currently, the Faculty offers the following study specialities:

- Field of study MINING AND GEOLOGY
  - Electrical engineering and automation in mining
  - Underground construction and surface protection
  - Mining technology and waste management*)
  - Mine surveying**)
  - Mining geology and exploration
  - Engineering geology and geotechnics
  - Opencast mining
  - Machinery for mining and construction works
  - Mining and drilling machinery and equipment
  - Solid mineral processing and marketing
  - Revitalisation of post-industrial areas***)
- Field of study SAFETY ENGINEERING
  - Public safety
  - Occupational health and safety and fire protection
  - Protection engineering and crisis management
- Field of study INDUSTRIAL AUTOMATION AND INFORMATICS (dual study course, currently without subdivision)

*) will be converted into Industrial engineering with management of mineral resources
**) will be converted into field of study Geodesy and Cartography, start in 2021
***) start in 2021

A short description of the scope of competences obtained by graduates of each specialisation at the Faculty:

1 Electrical engineering and automation in mining (EEAM)
In modern mining, the role of engineers who know thoroughly the issues related to the operation of reliable and safe power supply systems for mining machines, mining automation systems,

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telecommunication systems and dispatcher safety systems operating in specific environmental conditions is growing.
A graduate of the EEAM specialisation is particularly prepared for the following areas of work:

- Design and operation of power supply systems for mining machines and devices,
- Selection of selected elements of drive systems,
- Operation of control and automation systems for electric drives,
- Design and operation of telecommunications systems,
- Operation of dispatch security systems,
- Operation of automation systems, control and production quality assurance,
- Assessment and reduction of electrical hazards in the safety management system.

Graduates of the 1st degree studies in the EEAM specialisation obtain qualifications in solving interdisciplinary problems in the field of safety of electricity supply and automation of technological processes in mining plants. The main place of employment for graduates of the 1st degree studies in EEAM specialisation are underground, opencast and borehole mining plants, especially in the energy-mechanical division, in electrical and communications departments, as well as in processing plants. Moreover, graduates of the EEAM specialisation can find employment in specialised service, repair and production companies working for the mining industry. Graduates with appropriate internship and qualifications may also work in mining supervision authorities and apply for obtaining qualifications necessary in the operation of electrical power equipment.
Graduates of the second-degree studies in the field of EEAM course obtain thorough and structured knowledge of issues related to the design and operation of reliable and safe power supply systems for mining machines, mining automation systems, telecommunications systems, microcomputer controllers, power electronic devices and safety dispatch systems operating in specific environmental conditions.
Non-technical and technical directional subjects allow students to learn the specificity of mining technology as well as natural and energy-related hazards encountered in mining plants. IT-related subjects enable the graduate to use and operate specialised software, including in the field of electrical engineering.
As part of second-cycle studies, a graduate of the EEAM specialisation receives education, among others in terms of:

- Selection of electrical power protection automation devices,
- Operation of mining process control systems,
- Design and software of microprocessor controllers,
- Selection and operation of power electronic systems,
- Operation of electric drives,
- Assessment and reduction of electrical hazards,
- Undertaking and conducting scientific, measurement and research works in the scope of the above-mentioned issues.

2. Underground construction and surface protection (UCSP)

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Studies in the field of UCSP have a wide profile and prepare specialists with extensive theoretical knowledge, appropriate practical preparation and high qualifications, especially in the following areas:

- Geomechanics and mining geotechnics,
- Underground and opencast mining of useful mineral deposits,
- Design and construction of underground mining facilities,
- Design and construction of underground structures serving public utility purposes,
- Forecasting and minimizing the impact of mining operations on the rock mass and land surface,
- Securing underground and surface facilities to the effects of mining exploitation,
- Protection of the natural and underground mining environment due to the impact of underground mining,
- Modernization and reconstruction of existing mines and closure of mines after depletion of the deposit,
- Drilling for the needs of exploration of deposits, geological and engineering conditions and mining rescue.

A graduate of the 1st degree studies in this specialisation has the basis for obtaining the required qualifications and is prepared for professional work in the fields of:

- Solving interdisciplinary problems in the field of mining and geology, with particular emphasis on issues related to the design, construction and maintenance of corridor and chamber workings and their connections, as well as surface protection in mining areas,
- Performing appropriate functions at the positions of all levels of supervision over underground and opencast mining plants in the departments related to the conduct of mining works,
- Works related to the application of mining techniques and technologies in civil engineering and water construction companies,
- Performing appropriate functions in administration units dealing with environmental protection in mining areas.

As part of second-cycle studies, a UCSP graduate receives education, among others in terms of:

- Use of the most modern methods and tools for solving specialized problems in the field of geomechanics and underground construction and surface protection,
- Modelling of geotechnical and technological processes for the purposes of underground mining, underground construction and surface protection,
- Selection and design of underground structures, including those located in complex geological and mining conditions,
- Diagnostics and methods of assessing the technical condition of the construction of underground structures,
- Forecasting the impact of mining operations on the surface and objects located on it, taking into account continuous, discontinuous deformations and rock mass tremors,
- Designing underground exploitation of deposits in the conditions of minimizing its impact on the rock mass and surface and in the conditions of natural hazards,
- Design and construction of mines, their expansion, reconstruction and modernization,

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- Undertaking and conducting scientific and research and development works in the scope of the above-mentioned issues.

A graduate of the second-degree studies in UCSP specialisation is prepared to perform managerial functions in the mining division, in particular in departments conducting mining works, production preparation department, surface protection cells in underground and opencast mining plants. In addition, UCSP graduates can find employment in specialised service enterprises (mining works, shaft construction, underground construction companies) working for mining and public administration. Graduates with appropriate internship and qualifications may also work in mining supervision authorities and apply for obtaining the qualifications necessary to perform all functions related to the design and implementation of mining works.

3. Mining technology and waste management (MTWM)

The MTWM specialisation prepares graduates to work in enterprises extracting minerals that are traded internationally (coal, ores, salts, sulphur, etc.) and raw materials of national or local importance (construction stone, road stone, limestone, etc.).

Education in this specialisation is exceptionally broad-based, so that the graduate of the 1st degree study obtains professional qualifications enabling work in various mining plants and enterprises. He or she obtains this knowledge by studying a wide range of technical subjects, such as: general geology, mineralogy and petrography, geology of deposits, drilling, mining geodesy and metrology, underground and opencast mining of deposits, closure and rehabilitation of excavations, mining machinery and machine mechanical systems, ventilation, air conditioning and fires underground, the impact of mining on the surface and rock mass, and mining of ores and rock raw materials. In addition to specialised subjects, the graduate also obtains knowledge of general social subjects such as: work safety and ergonomics, selected elements of law, sociology and the basics of environmental protection. The graduate also acquires practical knowledge in the act of completing two four-week professional internships (semester IV and VI) in mining plants.

Graduates of the MTWM are prepared to solve engineering problems with the use of computer techniques and methods. A graduate may apply for employment in underground hard coal mines, opencast mines, mines of ores and other minerals, as well as in waste disposal companies using mining methods and in land and water construction companies using mining techniques in the construction of facilities.

A graduate of the MTWM specialisation at the second degree (master's) level acquires extensive knowledge by studying a wide range of technical subjects, such as: project management, management and marketing, operation of power systems in mines, operation in conditions of natural hazards, waste storage and management technology, design and restructuring of mines, diagnostics of mining excavations, protection of mining areas, mine ventilation, rescue systems, and quality management and coal sales. In addition to specialist subjects, the graduate also obtains knowledge of general social subjects such as: ethics, environmental management, mining production economics, intellectual property protection as well as geological and mining law. The graduate also acquires practical knowledge during a two-week diploma internship (semester III) in mining plants and enterprises. water construction companies using mining techniques in the construction of facilities.

4. Mine surveying (MS)

In the MS course students learn about the problems of conducting geodetic works on the surface and in underground and opencast mines. Graduates of the 1st degree studies are particularly prepared to perform:

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- Situational and height measurements, implementation, and inventory measurements as well as geodetic investment service,
- Demarcation and divisions of real estate and cartographic work related to the editing of maps,
- Analysis of the harmful effects of mining operations on the surface of the mining area,
- Studies in the field of Spatial Information Systems (also referred to as Geographical Information Systems (GIS)),
- Preparation of surveying and geological documentation of mines.

A graduate of the second degree studies is in particular prepared to perform:

- Situational and height measurements, implementation and inventory measurements as well as geodetic investment service,
- Demarcation and divisions of real estate and preparation of documentation for legal purposes,
- Work related to the editing of maps and studies in the field of Spatial Information Systems,
- Geodetic measurements using modern measurement techniques,
- Geodetic service of underground and open-pit mines,
- Numerical maps and surveying and geological documentation of mines using computer techniques,
- Measurements of the displacement of the land surface and objects,
- Forecasts of the impact of underground mining on the land surface and objects,
- Rational management of useful minerals.

A graduate of MS specialisation is prepared to work in the surveying and geological departments of underground and opencast mines as well as in geodetic enterprises and in state bodies of the geodetic and cartographic service. He or she may apply for a mining surveyor's licence and professional qualifications in the field of geodesy and cartography.

5. Mining geology and exploration (MGE)

A graduate of the MGE specialisation in first degree study acquires well-established knowledge about the structure of the Earth's lithosphere and the processes that shape it and their effects, as well as the history of the Earth. He or she knows the geological structure of Poland and the methods of its recognition, including exploration for useful mineral deposits. He or she also knows the genesis and construction of deposits in Poland and in the world, and has knowledge in the field of rational management of them. He or she can conduct research with the use of basic mineralogical and petrographic methods, and has knowledge in the field of hydrogeology and water hazards in mining, including the ability to examine the physical-chemical properties of surface and ground waters. He or she can recognise the conditions of the soil and water environment for the purposes of construction, and knows the principles of geological and mining law.

In particular, he or she is prepared to undertake work in the following areas:

- Recognition of the geological structure, including exploration and recognition of deposits and determination of the quality of solid minerals,
- Conducting rational management of deposits and mineral resources occurring in them,
- Recognition of water conditions in the rock mass,

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- Identification of natural hazards occurring during the opening and exploitation of deposits,
- Recognition of geological and engineering conditions of land for construction purposes,
- Identification of mining and engineering conditions in industrially degraded areas for the purposes of their rehabilitation.

Graduates of the 2nd degree specialisation of MGE have in-depth knowledge of the structure of the Earth's lithosphere, and mineral deposits. They know the principles of designing and conducting research for the recognition of the geological structure, especially of mineral deposits, identification of resources and quality of groundwater, hydrogeological conditions, geological and engineering conditions and geological conditions for obtaining the Earth's heat. They can calculate resources, design protection zones and define guidelines for the proper use of groundwater and surface waters. They can conduct research on minerals, rocks and industrial waste, and can forecast the formation of minerals and optimise the conditions of the process of their extraction. They know the methods of processing mineral resources and waste disposal, including their impact on the environment. Graduates know Polish environmental law and are able to design an algorithm to proceed for obtaining environmental decisions. In particular, graduates are prepared to:

- Recognition and documentation of the geological structure, with particular emphasis on solid mineral deposits,
- Conducting rational deposit management,
- Identification and documentation of groundwater reservoirs, including their protection,
- Assessment of the quality, suitability and possibility of substitution of mineral resources for modern technologies,
- Recognition and use of industrial waste of mineral origin.

A graduate of this specialisation may be employed in geological and drilling enterprises, mining and processing plants, local government bodies, state geological, hydrogeological and ecological services and many others.

6. Engineering geology and geotechnics (EGG)

A graduate of the 1st degree specialisation in EGG possesses elementary knowledge of selected areas of basic sciences: mathematics, physics and chemistry, as well as technical sciences, such as mining, construction and geodesy. He or she is educated in a wide range of Earth sciences: structural geology, historical geology, mineralogy, petrography, environmental geochemistry, geomorphology, hydrogeology and hydro-geochemistry. He or she knows the basics of the regional geology of Poland and the geology of mineral deposits. The graduate also knows the methods of geophysical research used in engineering geology and environmental protection, and are specialists in the field of soil science, engineering geology, geomechanics and geotechnics. Graduates are able to use computer programs in analytical work, e.g. for numerical modelling of geo-dynamic processes and interpretation of geological and engineering results of laboratory and field tests. The graduate has an extensive knowledge of specialist subjects, preparing him / her to design, supervise and document geological works in the field of engineering and geotechnical geology, in the field of determining the geotechnical conditions for the foundation of buildings and designing specialised geotechnical works. he or she is prepared to design, carry out and interpret the results of both surface and underground geological and engineering works for the construction of waste dumps, substance storage, geological and engineering services for opencast and underground mining plants, and has the practical ability of computer processing and analysis, also in GIS systems, of data obtained as a result of environmental monitoring.

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These graduates can be employed in enterprises dealing with the assessment of geological, engineering and geotechnical conditions for the needs of construction and mining activities, waste storage or environmental protection, design offices as well as state and local administration bodies. After obtaining the required professional practice, they can apply for professional qualifications in the field of geological and engineering documentation, evaluation of the impact of investments on the environment and a certificate of the Polish Geotechnics Committee.
Second-cycle studies in the field of EGG have not been initiated yet. They will be launched when the first generation of first cycle graduates appears.

7. Opencast mining (OM)
The OM specialisation prepares graduates to work in enterprises extracting mineral resources with the opencast method that are subject to international and domestic trade, such as broad and construction aggregates, rock and chemical materials etc. A graduate of the 1st degree OM specialisation acquires a thorough knowledge of the techniques of extraction and use of solid minerals, studying such subjects as: general geology, mineralogy and petrography, geology of deposits, drilling, mining surveying and metrology, opencast and underground mining, liquidation and reclamation of opencast workings, construction and operation of mining machinery, blasting technology , soil mechanics and slope stability, geotechnics of dumps, and transport in opencast mining. In addition to specialised subjects, the graduate also obtains knowledge of general social subjects such as: work safety and ergonomics, selected elements of law, sociology and the basics of environmental protection. The graduate also acquires practical knowledge during two four-week professional internships (semester IV and VI) at opencast mining sites. Graduates are prepared to solve engineering problems with the use of computer techniques and methods. A graduate may apply for employment in opencast mines, enterprises related to the trade of aggregates and rock raw materials, and in enterprises using mining techniques in the construction of land and water facilities.

8. Machinery for mining and construction works (MMCW)
A graduate of the first degree studies in MMCW obtains theoretical and practical preparation in the field of:

- Computer-aided design of technological systems for mining useful minerals, mining excavation supports and transport machines used in mining,
- Use of machinery in the mining, construction and engineering industries.

A graduate obtains qualifications allowing application for positions of the supervisors of the operation of mining plants in mechanical and other departments, in working machine factories and in road and highway construction companies.
A graduate of the second degree studies, specialising in MMCW possess theoretical and practical preparation in the field of:

- Construction and testing of machines and their elements, with particular emphasis on machines for digging, drilling, loading and casing, vertical and horizontal transport, construction and road machines,
- Computer-aided design of elements of mining machines and technological systems for mining useful minerals, transport devices used in underground and opencast mining, machines used in construction and road construction,
- Safe operation of construction and road mining machinery,
- Production and repair of mining, construction and road machinery and equipment.

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A graduate of 2nd cycle MMCW course obtains qualifications required for applying for positions of higher supervision of mining plant operations in mechanical and other departments, is prepared to work in mining, construction and road machinery factories, in all kinds of plants producing machinery or mechanical devices, in R&D institutions, in road and highway construction companies, civil engineering works and building construction companies.

9. Mining and drilling machinery and equipment (MDME)

A graduate of the first degree studies in MDME possesses theoretical and practical preparation in the field of:

- The use of machinery and equipment in the mining and engineering industries,
- Production and repair of machines and devices.

The knowledge acquired by graduates of the MDME course is suitable for employment in the following work areas:

- Applying for the position of a supervisor in the mechanical and energy, drilling and other departments in mines and mining plants,
- Performing managerial functions in the mining industry, machine factories and construction offices,
- Providing various services for the mining and machine industry in the field of construction and operation of working machines.

A graduate of the second degree studies in MDME obtains theoretical and practical preparation in the fields of:

- Construction and testing of working machines, with particular emphasis on machines for mining and loading, drilling, horizontal and vertical transport, supports and mechanized working complexes,
- Computer-aided design of machine elements and assemblies, technological systems for mining useful minerals, mining excavation supports and transport equipment used in mining,
- Operation of machinery and equipment in the mining and engineering industries,
- Undertaking and carrying out scientific, measurement and research works in the scope of the above-mentioned issues.

The knowledge acquired by graduates of the MDME specialisation entitles them to:

- Apply for the position of a supervisor in mechanical and energy and other departments in mines and mining plants,
- Perform managerial functions in the mining industry, machine factories, construction offices as well as research and implementation institutions,
- Provide various services for the mining and machine industry in the field of construction and operation of working machines.

10. Solid mineral processing and marketing (SMPM)

A graduate of the 1st degree of the SMPM specialisation has an education covering practical aspects of techniques and technologies of enrichment with gravity, flotation, magnetic, electrostatic and chemical methods. He or she also has practical knowledge about the processes of preparing the spoil for enrichment and the operations necessary to give the spoil the required quality characteristics. The graduate's knowledge includes knowledge of machines and devices used in these processes and operations.

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The graduate of the specialisation has knowledge in the field of environmental impact of processing plants, economic use of waste in accordance with current standards and recommendations, practical knowledge of machine and natural hazards occurring in processing plants, knowledge of identifying the properties of raw materials, sampling standards, conducting qualitative and quantitative analyses, and selected issues of organisation, management and economics.
A separate group of graduate knowledge issues is knowledge of the automation of enrichment processes, preparation of raw material mixtures, loading and shipping.
The graduate of the second degree of SMPM studies has an education in the field of problems related to the use of differences in the physical, physical-chemical and chemical properties of individual minerals in a fossil or waste raw material in order to obtain concentrates for further processing technologies. His or her knowledge covers the technique and technology of enrichment by gravity, flotation, magnetic, electrostatic and chemical methods, or a combination of these methods. A graduate of this specialisation has knowledge in the field of preparatory and supplementary operations in the technology of mineral processing. The requirements of environmental protection impose on the graduate knowledge of issues related to water management in processing plants (closed water circuits), economic use of waste in accordance with the principle of comprehensive use of all components and the requirements of the natural environment. A graduate must skilfully combine knowledge in the field of processing technologies with the ability to meet market requirements and obtain maximum economic benefits. Knowledge in the field of modern marketing of raw materials and products of the extractive industry is very important for the graduate.
The knowledge obtained after graduation will allow the graduate to work in the mining industry in such plants as: coal and lignite mines, copper, zinc, lead, barite, salt mines, in quarries, in the processing of road and construction aggregates, in environmental protection in the field of deposition and centralisation of mineral waste and marketing departments in mineral and industrial waste processing plants.

11. Revitalisation of post-industrial areas (RPIA)

The programme for first-cycle studies in the RPIA specialisation is still in the final consultation phase. It will cover industrial processes leading to the generation of waste and environmental damage (including underground mining and deformation of the ground surface), environmental protection issues and environmental remediation technologies, including protection of facilities in post-mining areas, neutralisation of pollutants, reclamation of waste landfills, soil and leachate treatment. The knowledge of the graduate will be supplemented by the knowledge of waste-free technologies in industry, circular economy, spatial management, valorisation and urbanisation of post-industrial areas, principles of sustainable development of local communities in communes affected by industrial transformations.
Much emphasis will be placed on using the widest possible range of computer programs. Project based learning method (PBL) will also be introduced, which will educate students in skills related to creativity, teamwork, work organisation, etc.

12. Public safety (PS)

Studies at the PS specialisation have been aimed at educating specialists with knowledge about the functioning of the public security system of the modern state, skills in the field of activities to ensure the safety of persons and property, and social competences to work in structures subordinate to the Ministry of Internal Affairs.

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The proposed educational PS course is a response to the needs of public administration bodies, as well as social and economic policies. Here, civil defence, economic services, police, border guards, fire brigades and other specialized agencies play a responsible role. The dynamic international and internal situation of individual countries made it necessary to establish faculties in universities that would be able to prepare specialists in the field of state security and public order, equipped with professional knowledge and practical skills.
The diploma of the first degree studies in PS speciality allows the graduate to be employed in government or self-government services, established to protect law and order, as well as in public safety institutions with an international range.
The main subjects being taught during the PS course are:

- Security and public order,
- Quantitative and qualitative methods of risk assessment,
- Systems for monitoring and securing the functioning of facilities, areas and infrastructure,
- Threats of terrorism and defence education of citizens,
- Energy security and fuel management information security,
- Negotiation techniques,
- Construction hazards,
- Outline of civil, administrative and criminal law
- Power security systems.
- Threats of terrorism and defence education of citizens,
- Protection of the population, people and property,
- National security strategies and emergency states,
- Gas and bioecological threats,
- Natural disasters.

Second-cycle studies in the field of PS study have not been initiated yet. They will be launched when the first generation of first cycle students graduate.

13. Occupational health and safety and fire protection (OHSFP)

The graduate of first cycle OHSFP study is prepared to undertake work related to the organisation and functioning of the broadly understood occupational safety system, contractually referred to as occupational safety and health (OSH).
The graduate acquires the necessary preparation to work in the field of safety engineering as a health and safety service in workplaces - a senior health and safety inspector (immediately after graduation) and an occupational health and safety specialist (after one year of work experience). They have the knowledge, skills and social competences necessary to understand technical and non-technical (including organisational, legal and other) conditions of engineering activities to the extent necessary for the effective protection of human life and health in the work environment and social environment, both in the individual dimension (individual safety) and the group dimension (security of society).
Second-cycle studies in the field of OHSFP study have not been initiated yet. They will be launched when the first generation of first cycle students graduate.

14. Industrial automation and informatics (IAI)

In modern production and service companies in various industries, interdisciplinary, practical knowledge in the field of broadly understood automation of industrial systems and processes is indispensable. An automation engineer must acquire skills for creative activity in the field of

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analysis, design and practical construction of control systems and systems, as well as software for industrial and service automation systems, programming of industrial controllers, use of computer networks and industrial networks. Engineers with such skills are educated at first-cycle studies of IAI course. The graduate possesses knowledge and skills in the field of automatic control, computer science, signal analysis, decision and computing algorithms, competencies in the use of computer hardware, various types of industrial controllers and professional engineering software. In particular, this programme of study prepares graduates for employment in the following:

- Operation of automation systems for machines, devices and electric drives in various industries, including the mining industry,
- Selection of elements and automatic control systems, taking into account their power supply and safe use,
- Selection of sensors and elements of measuring lines, coupling of industrial controllers with actuators,
- Programming of industrial controllers, use and reconfiguration of computer networks and industrial networks,
- Practical use of professional software in the field of automation and computer graphics,
- Operation of telecommunications systems and wireless control systems, with particular emphasis on systems used in the mining industry,
- Operation of automation and production control systems, taking into account functional safety issues.

The places of employment for graduates of the 1st degree studies in IAI are industrial plants, service companies (including IT companies) dealing with software for industrial automation systems. Graduates can also find employment in the field of automation and computer science in small and medium-sized enterprises. Graduates are also qualified to work in various R&D centres.

GAP ANALYSIS - POLAND

The rapidly developing world of the twentieth and twenty-first centuries has created an environment in which traditional education in the field of engineering, characterised by knowledge acquisition (having its origins in French universities of the Middle Ages) and the educational and research concept of the Humboldt University), has become insufficient to meet the needs of the external environment; in particular the economy, largely industry, and recently also services. As well as transferring knowledge, it has become clear that it is also necessary to transfer skills and shape attitudes, initiated by the introduction of the National Qualifications Framework. All this, however, does not shape graduates sufficiently for the needs of industry and/or who are able to create their own jobs and companies. Contributary factors to this change include: a tendency to educate in narrowly understood specialisms, offering traditional teaching instead of education, the lack of business subjects and elements of independent learning and shaping the economic reality. The gaps exist in: teamwork skills through the ability to analyse the market, the feasibility of the project, the manner of its implementation, evaluation and self-assessment up to the ability to present and self-present.

There are several aspects to consider when changing approach to engineering education. The first and most obvious one is the gap between the needs of the economy and the profile of the graduate. The emergence of engineering studies, limited in Poland to 7 semesters (and in many European countries to six) makes it advisable to change the education process to a more general one, whilst emphasising typical engineering content and qualifications, sought and proposed by the industry. General education leads to a strong unification of the first years of study and at the same time a large share of speciality subjects; the traditional division into basic, major and specialisation subjects disappears in this model.

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In the modern world, an engineer is forced not so much to have enormous knowledge, which can be easily found on the Internet and databases, but also to acquire professional skills necessary for work and shaping the right attitudes, especially teamwork and team management skills, also interpersonal communication and communication in foreign languages. The new system must take into account these elements of the education process to a much greater extent than the current one.
An important problem is the shaping of the study programme in such a way that the student becomes the subject and not the subject of education. The teacher should be a guide in the learning process, developing independence, not suppressing curiosity, allowing the perception of the need for lifelong learning.
In section 6.11. it was mentioned that, according to the employers, the most important skills that should be improved are primarily:

- Foreign language skills,
- Collaboration skills,
- Leadership skills,
- Self-monitoring,
- Ability to work under stressful conditions,
- Complex problem-solving ability.

Improvement in foreign language teaching can be relatively easy to achieve by extending the duration of language courses during studies, which would provide students with a longer exposure to the language and the opportunity to achieve a better level of knowledge of at least one foreign language.
The rest of the competences mentioned above belong to the sphere of ‘soft skills’.
Contemporary companies increasingly define the rules of recruitment not on the basis of professional qualifications, but on a competency model defined for each position.
Apart from the fact that in practice, competency models are often created ineffectively, on the basis of handbook and short courses, they are often far too detailed and often contain psychologically opposite expectations, which may be a source of frustration for a university graduate.
Most study programmes do not explicitly take into account the development of soft skills. Training skills such as organisational skills, teamwork or the ability to independently acquire and analyse knowledge is carried out during various types of project classes. However, if these activities are not consciously aimed at developing these abilities, the benefits will not be fully realised (or not realised at all).
Most of the wide range of soft-skill competences presented in job advertisements for technical university graduates are not subject to training at universities. On the other hand, a graduate, after leaving the university, should feel convinced that he has all the competences that make him a full-fledged "product" on the labour market. He devoted a lot of time and effort and often financial resources in good faith that he entrusts his fate to competent teachers.
The implementation of the ProSkill project creates the opportunity to propose several important types of activities that should support the didactic process with the elements of shaping soft skills, including providing a broader view on a number of issues related to the functioning of a modern enterprise, the work of people in managerial positions, or the operation of modern organisational and management structures.

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ACTION PLAN 2021 – 2022 (POLAND)

The tools planned in the project are various, involve all partners, and outreach at several levels of the educational and the social environment. The realisation of these activities was planned predominantly in 2021 and 2022. It is expected that, despite the Covid-19 pandemic, the project will progress broadly according to the original schedule, with some adaptations where needed (e.g. substituting wholly or partly on-line for in-person activities). We decided to sort these activities chronologically and so we divided the strategic action plan into two subchapters of year 2021 and 2022.

Strategy for 2021

The development of the Proskill Skills Ecosystem Development Strategy to be implemented in 2021 includes the following main tasks included in the individual work packages.

1. Workshop on "Effective ways of mentoring and other best practices" organised by EFG

Aim: The workshop will act as a starting point for the international mentoring programme (Task 5.5). Two longstanding mentors will be invited to share best practices with the project partners in a workshop held in Brussels in May 2021 (the date is subject to change depending on the Covid19 situation in Europe). The session will ensure a successful implementation of the mentoring programme within ProSkill and will cover among others the following aspects: what characterises a successful mentoring programme, how to match efficiently mentors with mentees, how much time should the mentor foresee for the programme, etc. The second session will consist of an online training "from mentors for mentors".

Action plan:

- Taking part in the workshop.

KPI: Lifelong Education, KIC KPI Code: KICN02-08, Target value 2021: 8 partners and 50 mentors

2. Workshop 1: 'New and innovative teaching methods – reshaping of curricula with focusing on active learning and other solutions

The workshop will be organised in national language at the same time in all partner universities. The workshop is aimed on improving student soft-skills and engagement in-class activities. The ***action plan*** assumes:

- Creating the detailed programme of the workshop,
- Inviting the experts who will teach the lecturers,
- Inviting the lecturers,
- Implementing the event,
- Communication/dissemination before, during and after the event.

KPI: Lifelong Education; KIC KPI Code: KICN02-08; Target value 2021: 10 lecturers

3. Workshop 2: 'Digital Education Tools for Teachers and Students - Challenges in the education of generation Z and Alpha'

Aim: The workshop is aimed at introducing the digital way of living of these generations to the adult professionals and professors, and introduction of the digital warehouses of geological-geotechnical tools into the course materials in an attractive manner to the students coming from these generations. The tools to be used are - among others: chat-forums as consultation tools, downloadable apps to mobile-phones (for example geological compass etc), digital maps and

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GPS/geocaching for field practices, photos and videos for rock/outcrop documentation and archiving incl. selfies and Instagram posts, downloadable worksheets, spreadsheets, calculators, simple 3D modelling tools. The tools will be complemented by the preparation of a freely downloadable electronic exercise book, ready to be inserted in most Earth Science Engineering technical courses. The ***action plan*** for this activity assumes:

- Creating the detailed programme of the workshop,
- Inviting the experts who will teach the lecturers,
- Inviting the lecturers,
- Implementing the event,
- Communication/dissemination before, during and after the event.

KPI: Lifelong Education; KIC KPI Code: KICN02-08;
Target value 2021: 10 lecturers, 20 students.

3. Guest lectures (ALUMNI and / or OLDTIMER) and soft skills training

Aim of this task is enhancement of soft and hard skills of students to achieve higher competitiveness on the international market. The number of events focusing on hard skills and soft skills should be half and half. Trainers, ALUMNI, senior managers or OLDTIMERS - professionals with several decades of industrial/institutional practice - shall be invited The guest lectures will follow predetermined thematic fields. The main goal of this action is to organise at least two guest lectures per summer and winter semester in 2021 and in 2022.

Action plan (for all trainings):

- Specifying the training topic,
- Identification of possible trainers,
- Inviting possible trainers,
- Recruiting participants,
- Providing necessary measures (room, IT, catering)
- Conducting the training,
- Assessment the impact of the training

KPI1: Participants Wider Society Learning, KIC KPI Code: KICN02-09
Target value 2021: 1 guest lectures and 20 students per training, 4 trainings in 2021.
KPI2: Women graduating from RM-related courses, KIC KPI Code: KICN02-11
Target value 2021: 10 female students
KPI3: Number of students in PhD Education short courses, KIC KPI Code: KICN02-06
Target value 2021: 2 PhD-students
KPI4: Number of students in Master Education short courses, KIC KPI Code: KICN02-07
Target value 2021: 15 MA/MSC-students

4. Inter-university field trip of all to Ostrava with a dedicated factory/company visit.

Each partner university will delegate a group of 20 students and two lecturers. The 3 day visit will be arranged by the University in Ostrava. The visit will include thematic workshop, company visit, and a social event. The main goal of the visit is internationalisation & managerial skill-building. The ***action plan*** for this event includes:

- recruiting students for the factory tour/company visit
- organising the field trip (i.e. renting a bus, booking hostel rooms, etc.)
- implementing the factory tour

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- communication/dissemination

KPI: Wider Society Learning, KIC KPI Code: KICN02-09, Target value 2021: 20 students.

5. Thematic event 2 (connected to European Minerals Day)

The European Minerals Day thematic event will illustrate the essential role of mineral raw materials in Europe's economy, contributing to innovation and resource efficiency all across the value chain. Typical activities for local communities will include guided visits through active and rehabilitated sites, workshops, and entertainment activities for children. The action must be prepared with active co-operation with site owner or operator.

Action plan for the event:

- Inviting adequate lecturer, expert,
- Inviting the site owner – operator,
- Recruiting students, participants,
- Technical organization of the event,
- Implementing the event,
- Communication/dissemination.

KPI: Wider Society Learning, KIC KPI Code: KICN02-09, Target value 2021: 50 participants

6. Mentoring programme - supporting the students' professional activity

The best performing students (based on the developed reward system) will be encouraged to participate in the international mentoring programme. It will start in autumn 2021 based on the experiences of spring semester (2020/2021) of WP5. The international mentoring programme aims at creating an international informal network of experienced professionals capable of providing guidance and support to the new generation of engineers. Over a fixed period of 9 months, the mentees will receive advice and targeted support from experienced professionals, according to their individual goals. Examples include: feedback and support during the job application process; building up a network, transfer of contacts; development of a career strategy; introduction to informal knowledge and business networks; shadowing (participation in the professional life of the mentor). The cooperation will start with a webinar that will introduce the programme's goals and opportunities to mentees and mentors. Due to the international dimension of the programme, electronic communication tools will be encouraged to keep mentees and mentors in touch. In addition, EFG's membership associations will approach the participants whenever possibilities for face-to-face meetings arise at national level. The programme is coordinated by the EFG.

Action plan:

- Introducing the mentoring programme to the students,
- Selecting students,
- Supporting students' participation in the mentoring programme (eg. to provide a flexible learning path, mobility window),
- Sharing the experiences of mentored students with other students.

KPI: Students & Industry - Knowledge Triangle Integration, KIC KPI Code: KICN02-10
Target value 2021: 5 students, Target value 2022: 5 students

7. Participation in international competitions

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Objective: Internationalisation & managerial skill-building. SUT will encourage students to form multidisciplinary teams and take part in international competitions. This task will make it possible for selected talented students to gain international exposure. A multidisciplinary team of three students will be formed in SUT, which will participate in one international competition per year. The main requirement for international competition is that it should allow the participation of multidisciplinary teams. The potential competitions will be selected by the mentor/supervisor.
Action plan:

- Monitoring and choosing potential international competitions,
- Setting and communicating objective selection criteria,
- Selecting participating students – forming team(s),
- Mentoring the students (preparing them to compete, improving language skills, presentation skills, etc.),
- Participating in competitions,
- Communication/dissemination.

KPI: Wider Society Learning, KIC KPI Code: KICN02-09, Target value 2021: 3 students

Strategy for 2022

8. Spend a day with me! – One-day- long programme with a top manager

One-day-long programmes will be organised for the top performing 10% of students from each university with an operations manager of the respective company/plant/mine. The fundamental purpose of this task is to start developing managerial skills and gaining managerial experience - both are desired competencies by companies - in those students who have the best abilities to become leaders in teams and workgroups. Objective selection criteria for participation will be determined and announced appropriately. The one-day-long project is a well-planned factory tour/site visit under the guidance of a top manager, which will end up with a wind-up meeting with informal lunch/dinner, where the experiences gained, and other observations/opinions can be discussed.
Action plan for this activity contains:

- Setting and communicating objective selection criteria,
- Selecting participating students,
- Inviting a top manager (mentor),
- Organising the one-day programme,
- Communication/dissemination

KPI: Wider Society Learning, KIC KPI Code: KICN02-09, Target value 2022: 4 students

9. Guest lectures (ALUMNI and / or OLDTIMER) and soft skills training (2022)

This action has been described in the chapter describing activities in 2021.
The same activities will be conducted in 2022.
KPI1: Participants Wider Society Learning, KIC KPI Code: KICN02-09
Target value 2022: 1 guest lectures and 20 students per training, 4 trainings in 2021.
KPI2: Women graduating from RM-related courses, KIC KPI Code: KICN02-11
Target value 2022: 10 female students
KPI3: Number of students in PhD Education short courses, KIC KPI Code: KICN02-06
Target value 2022: 2 PhD-students
KPI4: Number of students in Master Education short courses, KIC KPI Code: KICN02-07

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Target value 2022: 15 MA/MSC-students

10. Inter-university field trip of all to Bratislava with a dedicated factory/company visit.

Each partner university will delegate a group of 20 students and two lecturers. The 3 days visit will be arranged by the University in Bratislava. The visit will include thematic workshop, company visit, and a social event. The main goal of the visit is internationalization & managerial skill-building. The ***action plan*** for this event includes:

- recruiting students for the factory tour/company visit
- organising the field trip (i.e. renting a bus, booking hostel rooms, etc.)
- implementing the factory tour
- communication/dissemination

KPI: Wider Society Learning, KIC KPI Code: KICN02-09, Target value 2022: 20 students.

11. Workshop 3: "Collaboration and Leadership – how to help students to discover their talents?"

The decision was made to devote Workshop 3 to above mentioned topic on the basis of the analysis of the questionnaires, which show that collaboration and leadership skills are often missing by the students and emphasised by the employers. The action plan for this event assumes:

- Creating the detailed programme of the workshop,
- Inviting the experts who will teach the lecturers,
- Invite the lecturers,
- Implementing the event,
- Communication/dissemination.

KPI: Lifelong Education, KIC KPI Code: KICN02-08, Target value 2022: 10 lecturers

12. Workshop 4: "Creativity and Complex Problem Solving: how to reveal the intellectual potential of the students?"

As for Workshop No. 3 the subject has been selected in accordance with the survey results, combining the skills most frequently expressed as highly expected by the employers and simultaneously required to be improved among the graduates.

The ***action plan*** for this event contains:

- Creating the detailed programme of the workshop,
- Inviting the experts who will teach the lecturers,
- Invite the lecturers,
- Implementing the event,
- Communication/dissemination.

KPI: Lifelong Education, KIC KPI Code: KICN02-08, Target value 2022: 10 lecturers

13. Thematic event 1 (connected to Earth Day) – switched with researchers' night in 2020

This thematic event will conclude the series of events raising awareness of Raw Materials. Earth Day Network's mission is to diversify, educate and activate the environmental movement worldwide. So, there is space to promote awareness of the possibilities of environmentally friendly use of mineral raw materials.

Action plan:

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- Inviting an adequate lecturer, expert,
- Inviting the exhibitor,
- Recruiting students for the thematic event,
- Organising the thematic event,
- Implementing the event,
- Communication/dissemination.

KPI: Wider Society Learning, KIC KPI Code: KICN02-09, Target value 2022: 50 people

14. Participation in international competitions

Description of the activity identical as in the year 2021. Action will be continued in 2022.
KPI: Wider Society Learning, KIC KPI Code: KICN02-09, Target value 2022: 3 students

15. V4-SX (simulation of stock trading – international competition)

A webinar dealing with popular trade tactics (fundamental and technique analysis) will be organised. Goals: Internationalisation & managerial skill-building: learning the principles of economics by doing. The team will compete internationally, and at the end of the semester, a guest trader will assess their performance. They will use trader software (Plus 500, investing.com) in the demo version, but it enables them to follow their investment (profit and loss) as if in real life. The teams will compete with the teams from the other three project partner institutes for two months. The teams will get immediate feedback. At the end of the semester, the winning team will be announced, but all the participants will get a certification.

Action plan:

- Announcing the SX competition to UM students,
- Recruiting students to form team(s),
- Communication/dissemination.

KPI: Wider Society Learning, KIC KPI Code: KICN02-09, Target value 2022 KPI: 3 students

16. Final interdisciplinary conference

The conference will be organised in close cooperation with existing networks to maximise impact. The aim of the conference will be to stimulate exchange within the international scientific community and other stakeholders (such as policy makers), and to connect with and disseminate the results of ProSkill to the interdisciplinary and international RM community. It is needed to buy an Open Access opportunity in order to publish the article of the participants in a high ranking scientific journal.

Action plan:

- Inviting the lecturer,
- Inviting mentors,
- Inviting students who took part in the project,
- Inviting the press,
- Organising the conference,
- Implementing the event,
- Organising the open access publication,
- Communication/dissemination before, during and after the event.

KPI: Wider Society Learning, KIC KPI Code: KICN02-09, Target value 2022: 50 people

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The Gantt chart for 2021 – 2022 activities - Poland

			2021												2022											
WPs	**Task**	**Task**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
WP2	Task 2.4.1	Thematic event 1 (connected to Earth Day)																								
WP2	Task 2.4.2	Thematic event 2 (connected to European Minerals Day)																								
WP2	Task 2.4.5	Closing action – final conference																								
WP4	Task 4.1	Workshop on 'Effective ways of mentoring and other best practices'																								
WP4	Task 4.3	Workshop 1: New and innovative teaching methods – reshaping of curricula with focusing on active learning and other solutions																								
WP4	Task 4.4	Workshop 2: Digital Education Tools for Teachers and Students - Challenges in the education of generation Z and Alpha																								
WP4	Task 4.5	Workshop 3: Collaboration and Leadership – how to help students to discover their talents?																								
WP4	Task 4.6	Workshop 4: Creativity and Complex Problem Solving: how to reveal the intellectual potential of the students?																								
WP5	Task 5.2	Guest lectures (ALUMNI OLDTIMER) and soft skills training																								
WP5	Task 5.4	Development of the reward system																								
WP5	Task 5.5	Mentoring programme - supporting the students' professional activity																								

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			2021												2022											
WPs	**Task**	**Task**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
WP5	Task 5.6	Spend a day with me! - one day programme with a top manager																								
WP5	Task 5.7	Participation in international competitions																								
WP5	Task 5.8	V4–SX (Simulation of stock trading)																								
WP5	Task 5.9	Inter-university field trips																								

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PDCA CYCLE - POLAND

The PDCA cycle as the basic cycle of continuous process improvement will enable the systematic implementation of tasks, the effect of which should be evaluated after implementation. In this iterative method of management there may be a need to follow partial sequences.

Plan
In this phase is important to identify target group of students; i.e. that smart selection of talents will be provided.
It will also be needed to recognise opportunities (upcoming competitions for students) and to identify suitable companies for cooperation (guest lectures, soft skills training, workshops).
In this phase, it will be necessary to plan the fulfilment of individual tasks on the basis of the formulated strategy.
Also, it will be necessary to prepare a schedule of all planned task, to assign responsibility and allocate resources, and administrative formalities connected with planned task will need to be carried out.

Do
All planned tasks will be performed according to planned schedules. In carrying out the tasks, it will be necessary to ensure coordination with other project partners and compliance with the project intent.
In this phase guest lectures will be provided under the auspices of ALUMNIs and OLDTIMERs. Students will be provided with mentoring and support for their professional activity. For students, there will be organised or secured on an ongoing basis faculty activities or competitions, as well as participation in professional and international competitions. Selected students will take part in inter-university field trips.
A very important part of the implemented tasks will be activities focused on training the trainers. Two from four planned workshops will be focused on a digital technologies and tools for teachers and students. The other two workshops should be focused on soft skills development as well as planed soft skills training.
During and after task performance evaluations should be processed and the related documentation archived.

Check
Upon completion of activities, feedback will be required from students.
Following each workshop, a report will be prepared by those responsible for its organisation and implementation. Based on these outcomes the benefits arising from the fulfilment of the planned tasks will be identified and documented. These findings should be useful in education process improvement.

Act
If needed, there corrections will be made to avoid recurring mistakes in the tasks that are carried out. Based on the identified findings, the necessary recommendations for career advancement and support will be developed Based on systematic work with students and the feedback provided, there possible areas of improvement in common work and support for students will be identified. Also, recommendations will be formulated for: reshaping of curricula, supplementing education, support focusing on active learning and innovative teaching methodologies. It is also expected to be possible to propose implementation of digital education tools, and study programme modifications should be analysed or proposed.

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SUMMARY - POLAND

Enterprises have switched to employee recruitment systems based on competence profiles. This is the result of introducing complex systems of work organisation, in which employees are expected not only to be professional, but also (and often above all) to show specific attitudes and behaviours.
It can be said that universities have lagged significantly behind the changes that have taken place in the economy of economy. This is particularly evident in post-communist countries, where the economy has changed very quickly over the past three decades, and companies have quickly followed the path that the Western economy has evolved since the end of World War II.
In the conditions of modern competitive struggle, the employer expects from the graduate a very comprehensive knowledge, covering both the theoretical and practical side of the profession, but also numerous soft skills.
In order to achieve profitability, companies often have to operate in conditions of extremely high perfection, where there is no room for beginners' mistakes and training employees, who are expected to quickly and smoothly adapt to the company's structure.
The ProSkill project should help identify ways to reveal, strengthen and train the needed mental and intellectual skills and characteristics.

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CHAPTER 9.
Performance measurement system for colleges of advanced studies

Daniella Kucsma – Gábor Béla Süveges – Norbert Németh

Higher education uses a credit system in each semester to measure performance. This proven scheme can be transformed and used for the assessment of special college members. In this specialized model, credits can be absolved by taking part in educational, knowledge disseminating, R&D and social activities. Personal development is maximized in all four areas, by creating a personal work plan and assigning a professional mentor to each member. Members collecting the most credits can benefit from the system several ways, including extra opportunities, scholarships, and financial support in R&D. On the other hand, members collecting the lowest number of credits can receive extra help or can be dismissed depending on their case.

INTRODUCTION

A college for advanced studies (CfAS) in the context of the present study is a special organisational form within the institutional frames of the Hungarian higher education (Demeter 2012), aiming to provide extended personal development possibilities for its student members. The membership implies talent and diligence beyond the average level of students at the host university or institute. Effective selection and assessment of the participant students requires the establishment of a special reward system.
University education traditionally uses elaborate gradual assessment and reward systems based on tests and exercises with a certificate as the outcome (e.g., Carless 2015; Winstone & Carless 2019). Academic reward systems are more focused to published research results and the quantification of their impact, leading to career steps in terms of merits, position, and salary (e.g., Blume & Sinclair 1973, Smart & McLaughlin 1978, Grant 2021). A CfAS shares the characteristics of both areas, therefore, it must adapt a system which amalgamates both approaches. The present paper provides a possible framework of a universal CfAS reward system.

REQUIREMENTS OF A REWARD SYSTEM

The reward system of a CfAS should serve multiple purposes.

- *As a primary goal*, it has to motivate the students to achieve the best academic performances in the frame provided by the university where they study, utilizing the facilities and opportunities exceeding the basic requirements of regular university programmes. Means of this help may be opening additional possibilities of studies (also at other institutions, industrial partners or in fieldwork), financial and professional support of educational or research and development (R&D) activities.
- *Secondly*, it should give feedback to the students about their performance. Students should identify their strengths and weaknesses as well. Means of this feedback can be challenges and competitive tests where they can try out themselves, so attendance of such events has to be promoted and supported.
- *Thirdly,* beyond these, it also has to help to find the most appropriate career paths for each student according to their abilities and preferences. Means of this can be involvement into real professional tasks and activities. Simultaneously,

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professionals controlling these activities may be able to recruit the rising generation for institutions or companies represented by them.

All these aims can be achieved more effectively if a reward system works with quantitative indices of participation and performance, also allowing objective comparison between college members in decision situations. This can be realized by adapting a credit system, similarly to the standards of the higher education, but taking more factors than in the normal education into consideration.

SYSTEMS AS THE BASICS OF PERFORMANCE MANAGEMENT

In the following, we will read about performance systems in general, as this can be a good basis for the development of a vocational college talent evaluation system. We need this section to map out how we can develop Kpi indicators in the college. This will appear later in the design.

Through them, we can express facts, information, relationships with a value. However, because we compress the data so the information can be corrupted, some of their elements can be lost. To avoid this, we can use resolution, substitution, and expansion of individual indicators. By resolution is meant the division of the denominator and/or numerator of a fraction into parts. In the case of substitution, the denominator and/or the numerator are replaced by another value. When expanding, the denominator and/or numerator of the original pointer is expanded with the same value. Based on these, the indicators can be broken down into two or more sub-indicators, so that a well-functioning indicator system can be obtained (Kucsma 2019).

The condition of indicator systems is that the indicators must be numerical, they must take on a numerical value. There must be no contradictory relationship between the indicators, they must be simultaneous, and their structure cannot be changed arbitrarily. The cost of processing information in the indicator system should be commensurate with the use of the information.

Types: Traditional finance, Return on indicators, Value creation indicators, Scorecard type indicators, BSC indicators.

For selection, we need to examine models that are considered fundamentals in the literature and both the public and business sectors apply these. We can see a summary of these models in Fig 1.

Figure 1.: Comparison of performance framework models

Balance Scorecard	Novelty: Organizational strategy broken down to individual levels
	Advantage: Flexible application options
	Disadvantage: Difficult grouping of indicators
EFQM/CAF	Novelty: It can be developed through cyclic innovation projects
	Advantage: Highlights the key performance factors
	Disadvantage: It focuses on individual interests rather than the organization
SZTÉR	Novelty: Model used in public sector
	Advantage: Examines the organization completely
	Disadvantage: Custom metrics are not of paramount importance
Performance-prizm	Novelty: Multi-purpose optimizsation
	Advantage: Organizational ability is displayed as a value
	Disadvantage: Performance indicators are not consistent with strategy in all respects
Hosin Management	Novelty: Focus on critical process
	Advantage: PDCA Development Cycle
	Disadvantage: Emphasis on time factor

Source: Kucsma 2020, Kucsma 2019

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The Figure summarizes the results of previous research, as I have compared methods that are widespread and have proven their practical application for specific organizations. SZTÉR model, which is used by public service bodies, could not be left out of this part of my research, although I did not select this model. The Balanced Scorecard system is best matched to the hospital specification, so I conducted an extensive study of this model. During this examination and after a review of the literature, we had to face the challenges that this model contains. Balanced Scorecard (BSC) is a well-balanced indicator system that can be designed and implemented with several challenges.
The biggest challenge is to motivate employees. This risk can be reduced if stakeholders are involved. The second most significant issue may be in the area of Key Performance Indicators (KPIs). Performance indicators should be based on the organization's strategy, and importing indicators from other, possibly different, organizations will not produce the desired results. Performance indicators should support specific business objectives designed to support management activities.
Challenges also appear during the design and development of a Balanced Scorecard and its strategy, which together may pose a similar risk factor to a motivational problem. During the development and planning of the strategy, the risks are reduced by the use of experienced experts, the utilization of international and domestic experience, and the early involvement of end-users in the process.
The implementation process and the breakdown of performance indicators into groups and individuals may pose additional risks. We can reduce risks by focusing on results, rather than tuning performance metrics to processes. Other key success factors are simple metrics, measurability, accountability, timely updating, ensuring data flow, and proper visualization (BSC Designer, 2014).
After assessing the risks and problems, our objective is to develop a general indicator system, so in the following, this will be formulated.

After reviewing the literature, it can be stated that it is worthwhile to work on the structure of these systems, as they contain a number of factors that can be incorporated into the student system. In the next section, we examine which goals, to which a student assessment system should adapt, and which elements are essential in the design process.

STRUCTURE OF THE REWARD SYSTEM

Every member of the CfAS should have a personal work plan, containing perspectives, aims to be reached during the period covered by the plan and possible means needed for reaching the aims. Aims must be specified, e.g., an exam taken, or an article accepted for publication. Critical aim requirements can be specified by the college according to the educational level of the member. A professional mentor should be chosen for controlling the work of the member. Performance of the member has to be evaluated in accordance with the plan primarily.

Admission and maintenance of the membership in a CfAS can be bound to reaching critical aims and certain minimum requirements as follows:

1. Educational performance thresholds of gained credits per semester in regular BSc/BLA/MSc/MLA courses and a minimum grade, calculated according to the rules of the training programme the student attends.
2. Facultative educational, R&D, and social activity thresholds of participations in the programmes of the CfAS.
3. Special requirements according to the characteristics of the area (science, arts, or humanities) and social organization of the CfAS (e.g., exclusion of certain business, social or political activities incompatible with the college membership; social disadvantage of the applicants etc).

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All indices of these factors with possible values exceeding the threshold can be part of the credit system. As the regular education is organized into semesters, evaluation of the CfAS also must be made in half year periods. Nevertheless, there should be a threshold value of the credits for maintaining the college membership. Also, there should be a possibility to suspend the membership for a semester if the requirements cannot be met during this period.

The contents of the credit system in details are as follows:

1. **Credits for academic performance**

The college can organize short courses, field trips or any other forms of educational activities for the college members. Also, the college may adapt in its programme the same type of educational activities organized by other parties (colleges, institutes, or associations) open for the college members – and, as well, open its activities for members of partner colleges, institutes, or associations. Standards of these activities should be established by the CfAS. Credits for attendance and for grades of an end-course test are determined according to the regulations of the CfAS.
It is a good practice if the CfAS also acknowledges the high-level performance in studies beyond the frames of the college. A CfAS integrates students participating various university training programmes which may differ significantly in their credit systems and the actual achievable values of the credits and grades. Here the quality of the individual performance can be measured by comparison with the observed distribution of the number of credits and the mean grades on the relevant study group. In the case of regular university programmes, the uniform reference group are the students of the faculty with the same number of finished semesters on the same level programmes, possibly also involving results from the previous three or five years into the calculation. If the college member attends parallel programmes, a main programme has to be chosen for credit accounts, and the performance on the additional programmes should be rewarded with limited credits.
In the case of studies organized in a different manner than regular university programmes but acknowledged by the CfAS as a contribution to the development of the college member (e.g., language course), certificates are the basis of credit account after successful completion of the study.

2. **Credits for R&D activities**

To be involved in R&D activities is essential for a CfAS member, therefore, similarly to the practice of the PhD programmes, credits can be ordered to the monitoring stages of the research projects in the form of approved semi-yearly research plans at the start and progress reports after finishing each semester. Credits can be given based on documented research results: on accepted publications, on conference presentations, on competition awards, on R&D reports and on other forms of documentation according to the characteristics of the research area (e.g., patents). Care should be taken to separate the achievements of the college member from the total performance of the group reaching the published results.

3. **Credits for educational cooperation**

The contribution of college members to knowledge dissemination may be realized in the following ways:

- Co-working as presenter or guide in public events (e.g., Researchers Night),
- Co-working as demonstrator in courses and field trips,

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- Co-working in development of knowledge dissemination websites, exhibitions, or other facilities (e.g., an educational trail),
- Mentoring fellow college members on lower programme levels or undergraduate students.

These activities can be documented by outreach indices (e.g., number of participants, accesses) or performance improvement of the mentored students (e.g., successful exam).

4. Credits for social activities

Members of the college may take part in the organization of college events and joint events of the college and other parties (e.g., the university hosting the college). Professional (e.g., short courses, conferences) and non-professional events (e.g., alumni meetings) can be acknowledged by the college as well. Levels of the cooperation should be credited separately; each member may be working on

- idea and plan of the event,
- preparation and background support of the event,
- arrangement of the event,
- follow-up of the event.

Participation in the presidium or committees of the CfAS, and facultative activity for the college (e.g., contribution to the development and maintenance of a homepage) also can be acknowledged by credits.

The framework of the credit system has to be applied to the actual makings of each CfAS. Acknowledgement of certain activities and weighting of the factors has to be a decision of the community in the ways regulated in the statutes of the CfAS.

BENEFITS THROUGH THE REWARD SYSTEM

Credits gained can be used for ranking the college members and to open various possibilities in the continuation, from dismissing the members if a threshold sum of the credits was not exceeded to offering extras to the best ones: e.g., joining to a R&D project as a paid research fellow, or obtaining a scholarship for the next period. Final evaluation and certificate grades of the CfAS will be based on the credits gained through the whole period of membership. It is a good practice if partners of the CfAS also can also offer additional benefits, like the CfAS acknowledges the performance on the regular programmes of the faculty to which it belongs, in turn, the faculty also grants credits for the performance in the CfAS in the form of a virtual facultative course open for CfAS members.

If the CfAS has financial sources to support activities of the members, the distribution of this support also can also be arranged so, that the members can exchange their gained credits to a personal budget which covers the costs of their activities planned for the next semester. An important aspect of this could be financing costs which are not covered by usual tenders but essential for effective R&D activity: e.g., costs of field work and buying standard laboratory tests not available at the research site of the student. New members for their first semester, of course, can reach that only if they have got a fixed number of starting credits on their admittance, possibly differentiated according to their parameters. However, limiting the use of this start package to supporting educational and R&D activities the college is advisable, while gained credits can be used for all costs the college is able to account for, including participation fees of social events or scholarships with no obligatory report.

INDICES FOR THE REWARD SYSTEM

To measure the performance in an objective and quantitative way indices are required. It is important to bear in mind that there is no possibility to make every aspect of the individual

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performances comparable. However, if at least a considerable part of it is formulated, it will help both the presidium getting an overview of the membership and the members pursuing their aims. In the Table 1, general indices are summarized which can be applied for each CfAS.

Table 1: Indices for the reward system

Index	**Weighting**
Academic performance	
credits absolved in a regular education programme	expected credits/semester in the programme
average grade in a regular education programme	average grade of a relevant study group
number of certificates obtained during the semester in acknowledged educational programmes	grade and level of certificates
R&D activities	
share in accepted publications	type and extents of the publication quality/rank of the publishing medium
conference presentation	quality of the conference type of the presentation
competition participation (share in teams)	rank and awards level of competition
Educational cooperation	
outreach (number of participants/accesses during the event)	type of the event expected level of outreach feedback on quality of the event
contribution	level, duration, work intensity feedback on quality from participants
Social activities	
attendance	level, duration, work intensity

Source: Own edition based on BSC model (Kaplan & Norton 2002) and based on analyses performed

Members are obliged to fill in a questionnaire, which primarily takes into account the participation in the given event and the various awards and recognitions. We then assign a score to each event and aggregate them. Based on the scores, an order can be established among the members. With the bottom 20%, the least accomplished members, the college management will have an evaluation discussion early next semester, it is important to understand why the score is so low or discuss how we can change in the future. Students who are in the worst 20% for two consecutive semesters are no longer members of the college.

The following figure shows a basic model of reward system, its application allows for the application of the system and individual assessment. The use of this system is important, as not only an individual survey can be carried out but also an organizational evaluation.

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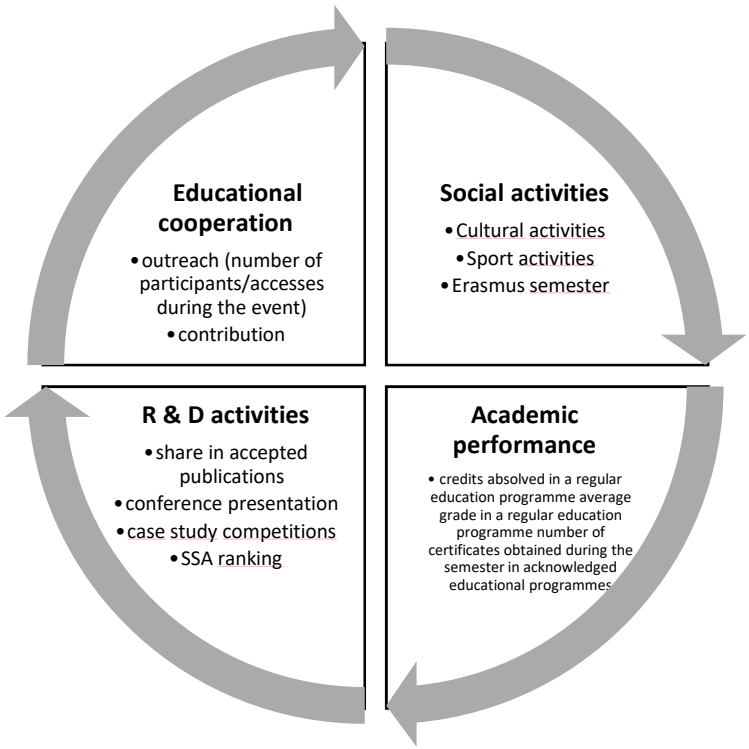

Figure 2: Model of general reward system
Source: Own edition

CONCLUSION

To summarize, the reward system of CfAS members should serve as motivation and quality feedback and help them find the suitable career path. In order to achieve these goals, the system should be quantitative and objective. This study proposes a model which is similar to the way higher education measures performance, using credits and half-year periods. The indices of the system are divided into four categories: knowledge dissemination activities, social activities, R & D activities, and educational performance. These categories are aligned with the requirements of the college. As a result of using these indices, the members can be compared to each other, the best students can access extra opportunities and various benefits, while the least accomplished students can get support to improve their performance, and if they fail to improve, their memberships can be suspended. This summary was a good basis for the principles along which a system should be designed, and the performance of a professional college should be evaluated. One of our goals is to introduce it in the practice of the CfAS operating at the University of Miskolc and correct it to get a real picture of the current performance.

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