PMUni

INTERNATIONAL NETWORK
FOR PROFESSIONAL EDUCATION
AND RESEARCH IN PROCESS
AND PROJECT MANAGEMENT

Bálint Blaskovics, Csaba Deák and Attila K. Varga (eds.)

CHAPTERS FROM THE ACADEMIC ASPECT OF PROJECT MANAGEMENT - RESEARCH AND TEACHING METHODOLOGIES
VOLUME III

Chapters from the Academic Aspect of Project Management - Research and Teaching Methodologies Volume III

Editors: Bálint Blaskovics, Csaba Deák and Attila K. Varga

PMUni

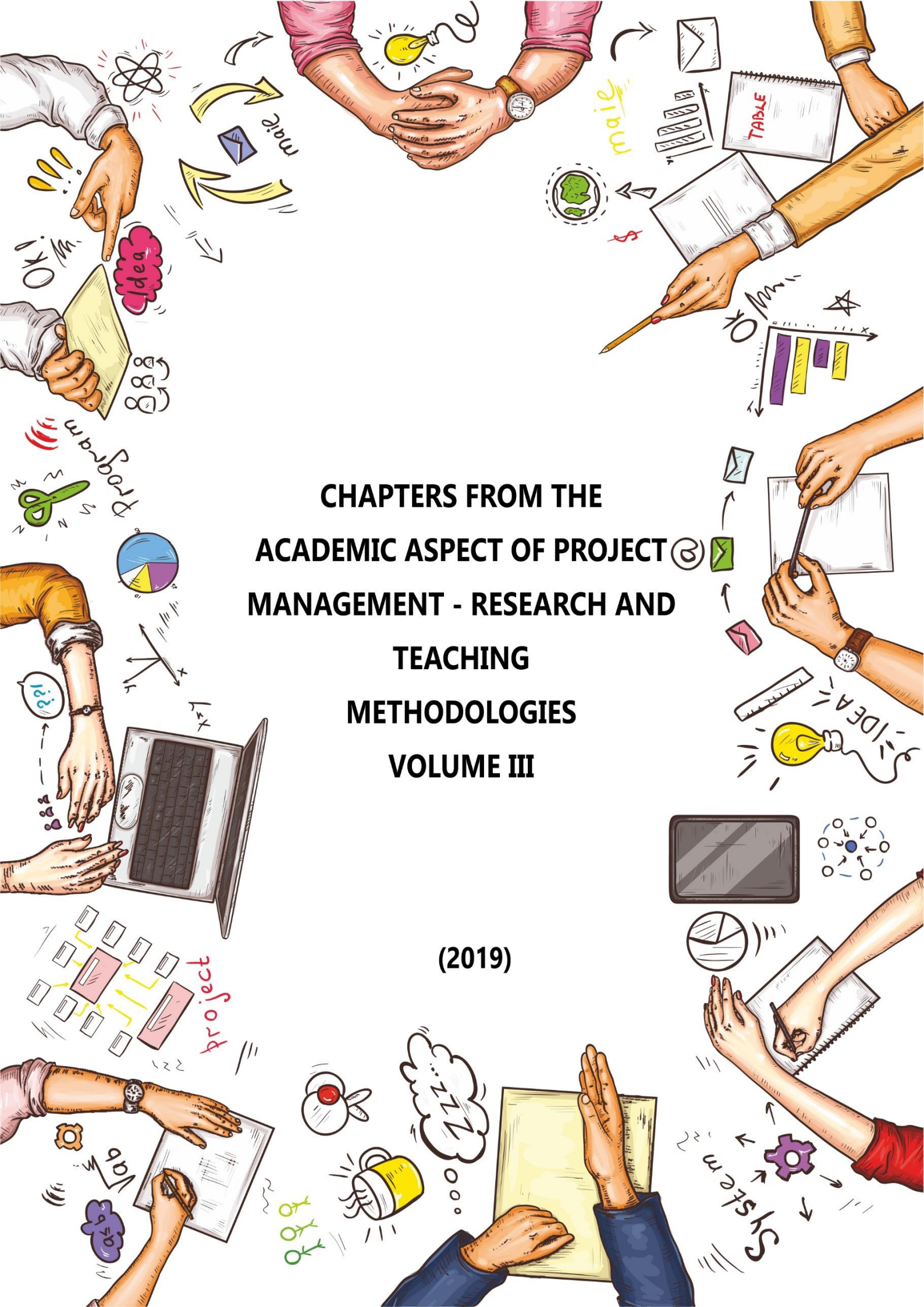
International Network for
Professional Education and Research
in Process and Project Management
www.pmuni.org

Cover images: freepik.com

Publisher:
PMUni - International Network for Professional Education and Research in Process and Project Management
H-1093 Budapest, Fővám tér 8

Year of publishing: 2019

Printed at:
Miskolc University Press
H-3535 Miskolc – Egyetemváros
ISBN: 978-615-00-6839-8



CHAPTERS FROM THE ACADEMIC ASPECT OF PROJECT MANAGEMENT - RESEARCH AND TEACHING METHODOLOGIES VOLUME III

(2019)

Chapters from the Academic Aspect of Project Management - Research and Teaching Methodologies Volume III

Editors:

Blaskovics, Bálint
Deák, Csaba
Varga, Attila K.

Lectors:

Kása, Richárd

Deutsch, Nikolett

Technical editing and illustrations:

Varga, Attila K.

Authors of the chapters:

Aranyossy, Márta
Berényi, László
Blaskovics, Bálint
Deutsch, Nikolett
Fekete, István
Hoffer, Ilona
Jelen, Tibor
Katona, Viktória,
Klimkó, Gábor
Nachbagauer, Andreas
Tamás, Péter
Tóth, János
Varga, Attila K.

TABLE OF CONTENTS

A STUDENT-BASED EVALUATION OF PROJECT MANAGEMENT TEACHING METHODS

László Berényi
University of Miskolc, Hungary
szvblaci@uni-miskolc.hu

Gabriella Bognár
University of Miskolc, Hungary
v.bognar.gabriella@uni-miskolc.hu

Abstract: Collaboration between the industry and universities is a driving force of innovation. The different competencies of the partners can complement each other well. Solutions for industrial challenges usually need a thorough confirmation that is feasible in specified laboratories of the universities. In other cases, actually limited industrial development capacities or knowledge can be complemented by the universities. Smart HEI-Business collaboration for skills and competitiveness (HEIBus) is an Erasmus + Knowledge Alliances 2 project that aims to support this collaboration. HEIBus is a great evidence of the complexity of knowledge production. The project established an umbrella with the purpose of identifying and solving real-life problems with the cooperation of higher education institutions and companies, moreover in an international environment. Three models of collaboration are developed. Multidisciplinary Real Life Problem Solving (RLPS), Flexible Student Mentoring by Companies (Flex Mentoring) and Expert Level Real Life Problem Solving (EXPERT) jointly offer a comprehensive solution for long-term cooperation. The paper presents the project management method of the EXPERT level. The experience of the last two years with the project is that defining the technical content of the cooperation is quite easy but continuous coordination and professional project management supports can ensure success.

Keywords: Triple-Helix model, innovation, portfolio management, international collaboration

1. Introduction

Satisfying customer needs is available continuous improvement including innovative products and services, more effective manufacturing procedures, development of communication, etc. Quality management systems and procedures can help to avoid failures, but it is difficult to find a proper solution that can follow the continuously changing environment. Alignments of operations can be justified by identified failures as well as discovering new opportunities. Changes can be managed by projects.

Collaboration between industry and higher education is a consequence of the need for improving performance. However, corporations have the competencies for establishing capacities of effective production, monitoring the market opportunities covered by "large" projects with a financial return. But their development projects usually require special knowledge, measuring equipment or even an innovative idea. Implementing these capacities are beyond the limits of economic considerations. Universities can properly fill this gap. Universities are ready to manage "small" targeted projects effectively. Collaborations mean win-win situations with a wider social impact.

A critical problem is meeting the needs and possibilities between corporations and universities. The limited knowledge about the opportunities, the slow administration processes, redundancy in communications or time-limits can be mentioned as hindering factors. We believe that managing the cooperation must have an emphasis that supports the implementation of the development projects. Coordinating the tasks (small projects), maintaining effective communication and continuous collaboration is the key to success.

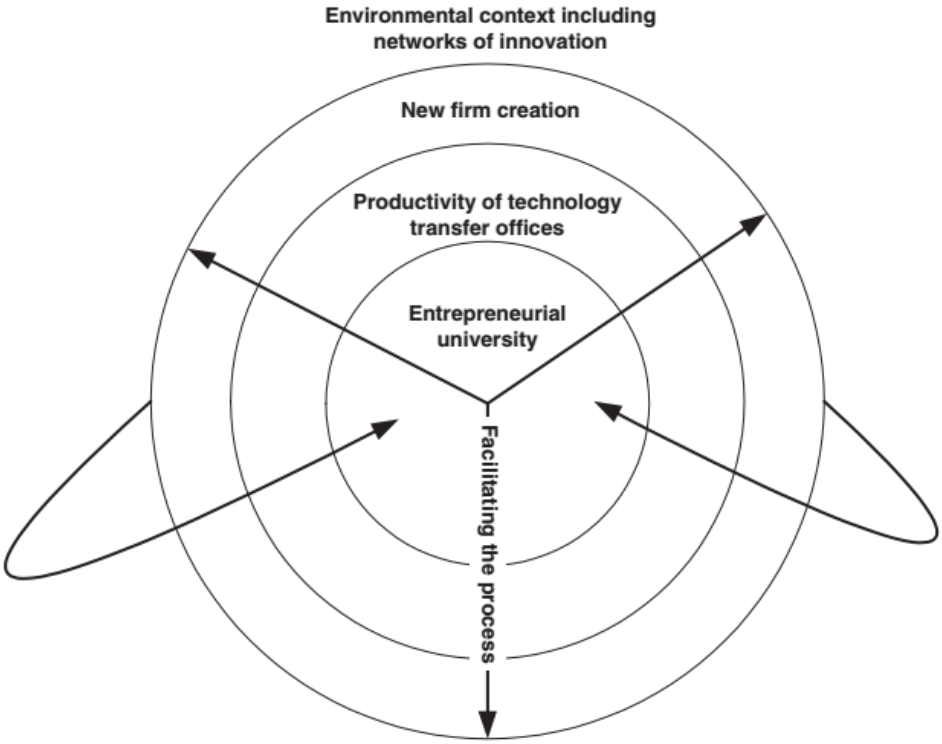
2. Collaboration between higher education and business

2.1. Triple helix: more or less?

The higher education institutions have a key role in achieving a higher level of knowledge society (Tamás, 2006). They are consistently knowledge centers (Ollé, 2012) but the proper way of managing this knowledge must be adjusted to the actual challenges. A social utilization of the knowledge produced is available through the products and services of various companies. The necessity for cooperation between higher education institutions and companies is obvious, however, the implementation may be difficult. A conflict of interest may be in business goals or time frames. Managing the cooperation is a key issue of knowledge production and knowledge transfer.

University entrepreneurship (Figure 1) is a great opportunity (Rothaermel et al., 2007) but asking higher education institutions to share their efforts to business issues may hinder success since it is out of the core competencies. These institutions must focus on research and development.

Figure 1: Conceptual framework of university entrepreneurship



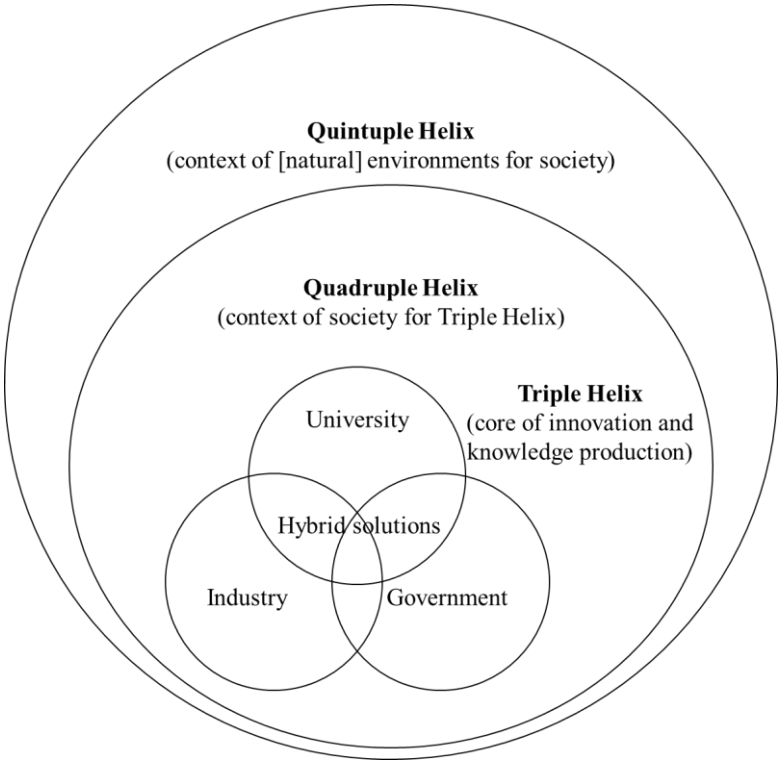
Source: Rothaermel et al. (2007:707)

Other forms of collaboration are (Perkmann & Walsh, 2007):

- Research partnerships: Inter-organizational arrangements for pursuing collaborative R&D
- Research services: Activities commissioned by industrial clients including contract research and consulting
- Academic entrepreneurship: Development and commercial exploitation of technologies pursued by academic inventors through a company they (partly) own
- Human resource transfer: Multi-context learning mechanisms such as training of industry employees, postgraduate training in the industry, graduate trainees and secondments to industry, adjunct faculty
- Informal interaction Formation of social relationships and networks at conferences, etc.
- Commercialization of property rights Transfer of university-generated IP (such as patents) to firms, e.g. via licensing
- Scientific publications: Use of codified scientific knowledge within the industry.

The Triple Helix model of collaboration (Leydesdorff, 2000; Etzkowitz & Leydesdorff, 2000; Etzkowitz, 2003) joins a third partner: the government. The quadruple helix approach widens the possibilities (Carayannis & Campbell, 2012). These models go beyond the linear approach to innovation, consequently, a wider scope of utilization is available in a turbulent environment or the consideration of regional/local characteristics (Szakály, 2013). Teperics and Dorogi (2014) summarize the position of various models (Figure 2).

Figure 2: Relations of knowledge production models



Source: Teperics & Dorogi (2014:454)

The HEIbus actually uses the logic of the triple helix model, but governmental support is limited to the elaboration of the collaboration model. The project forces direct cooperation between higher education institutions and companies for increasing the efficiency of the development actions. Accordingly, the third pillar is just an umbrella until partners discover the real benefits and opportunities. We believe that coordination must be done as simple as possible. Considering the differences in financial management, decision-making processes, time management, etc. of higher education institutions, governmental units and companies, more administrative issues are involved may lead to lower efficiency and effectiveness.

2.2. The HEIBus project

Smart HEI-Business collaboration for skills and competitiveness (HEIBus) is an Erasmus + Knowledge Alliances 2 project of 36 months duration between 2017 and 2019 (see the www.heibus.eu website for more details). The project aims to develop smart and innovative new methods for cooperation between higher education institutions (HEI) and companies. This project was preceded by the RePCI project (Reshaped Partnership for Competitiveness and Innovation Potential in Mechanical Engineering) (Bognár, 2015).

The presentation of the project in this paper is based on the official reports and public information published.

The HEIBus project focuses on strengthening the collaboration between higher education institutions and companies by creating cooperation models. These cooperation models increase the involvement of students and university staff in international Research & Development & Innovation (R&D&I) project implementations proposed by companies. This facilitates direct contact of the students and staff with companies in an international environment that stimulates innovative and entrepreneurial thinking.

The new cooperation models between higher education institutions and companies will facilitate easy knowledge share between the involved partners and create the premises of developing innovative products and services. The knowledge and expertise in different fields of the participants allow approaching complex multidisciplinary projects with a great impact on the small and medium-sized companies that help to improve their competitiveness.

All activities facilitate an increase in the involvement of the companies in the educational process. The HEIBus project creates educational models that allow companies to be directly involved in education and at the same time creates the framework for students to solve real-life problems based on a problem-solving approach.

The consortium with 12 partners from five different EU member countries (Figure 3) is led by JAMK University of Applied Sciences (Jyväskylä, Finland) as project coordinator, the project manager is Anelli Kakko. The other university partners are Technical University of Cluj-Napoca (Romania), University of Miskolc (Hungary), Esslingen University of Applied Sciences (Germany) and University of Jaén (Spain).

Figure 3: HEIBUS countries

Source: www.heibus.eu

There are three models of collaboration developed:

- Multidisciplinary Real Life Problem Solving (RLPS)
- Flexible Student Mentoring by Companies (Flex Mentoring)
- Expert Level Real Life Problem Solving (EXPERT)

The Multidisciplinary Real Life Problem Solving cooperation model focuses on bringing students, HEI staff and companies to work together. The concept is that students from different study programs and nationalities are brought together to form mixed groups in order to solve a real-life problem given by a company.

The Flexible Student Mentoring by Companies cooperation model aims to find and test flexible ways to involve companies in the education process of students. During implementation, one or more companies walk hand-in-hand with one study group from the beginning until the end of the studies. The involvement level and best-suited methods are chosen, in a flexible way, by each HEI and company.

The Expert Level Real Life Problem Solving cooperation model aims to develop a well-defined framework that allows companies to access high-level expertise that partners from European universities and companies have. In EXPERT projects companies introduce a real-life problem to be solved by a team of experts from HEIs (researchers,

teachers) and companies. One project team includes a total of 6 experts from 3 different HEIs (3 different countries) and 2 experts from the company that proposes the real-life problem. During HEIBus implementation 6 EXPERT pilot projects were developed. The schedule of each pilot project depends on the needs of the company and the problem needed to be solved. Based on the experience in the pilot projects a plan for widening the international expert cooperation model outside the partner team will be made.

2.3. HEIBus EXPERT Projects

HEIBus project is an umbrella program. At the initiation phase, the technical and business content of the development were not identified, this is the main result of the collaborative learning of the partners. The pilot projects of the EXPERT level cover real-life, comprehensive challenges of the companies. Moreover, actual problems are related to scientific and social problems as environmental protection, and Industry 4.0.

The content and the goal of each project is defined individually, however, some project management frames had to be followed according to project design and project administration. The experience of the pilot project shows that the consolidated but simplified administrative and management requirements significantly supported the success of both the planning and the implementation phases.

Expert level real-life problem solving (EXPERT) projects offer companies the opportunity to closely collaborate with European universities in solving their real-life problems by accessing high-level expertise and infrastructure that HEI's possess. The projects are as follows:

1. Electrolux Lehel Ltd., Hungary: The topic is "Developing a pipe airflow resistance measuring device for vacuum cleaner pipes" and the company wanted expertise in the following areas: mechanical engineering, electronics, aerodynamics (fluid dynamics) and data collection. For this pilot project, the HEI experts come from the University of Miskolc (ME) in Hungary, Technical University of Cluj-Napoca (TUCLUJ) in Romania and JAMK University of Applied Sciences (JAMK) in Finland.
2. ITAB Shop Concept, Finland: Their topic is "Inventory management by Smart Fittings" and the company wanted expertise in the following areas: machine vision, mechanical engineering, electronics, data collection, user interface and

usability as well as logistics. For this pilot project, the HEI experts come from ME, University of Jaen (UJA) in Spain and JAMK.

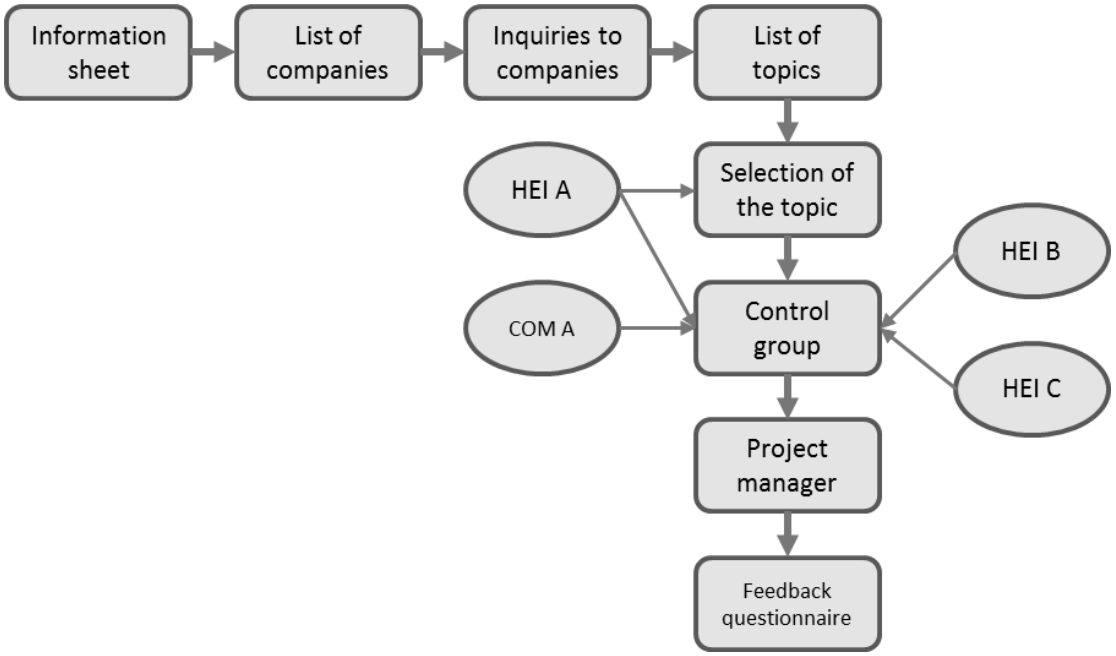
3. ProTehnic SRL, Romania: The project topic is focused on "Development of new systems that implement IoT and life cycle management in photovoltaic area". For this project, the company wanted expertise in the following areas: electronics, sensors, data acquisition, microcontrollers, actuators, control systems and embedded systems. The HEI experts come from TUCLUJ, ME and JAMK.
4. Valtra Oy, Finland: The topic is "Benefits of audio feedback enhancing user experience in an agricultural tractorhigh-level" and the company wanted expertise in the following areas: mechatronics, ergonomics and usability, automation and product development. For this project, the HEI experts come from JAMK University of Applied Sciences (JAMK) in Finland, Technical University of Cluj-Napoca (TUCLUJ) in Romania and the University of Jaen (UJA) in Spain.
5. Bosch Jucu Plant, Romania: Their topic is focused on "Elimination of the air bubbles during the conformal coating process of PCB's" and the company wanted expertise in following areas: fluid mechanics, mechatronics, robotics, sensor fusion and process control and mechanics. For this pilot project, the HEI experts come from TUCLUJ, UJA and JAMK.
6. Bosch Power Tool, Hungary: The project topic is "Perceivable noise reduction of power tools". For this project, the company wanted expertise in the following areas: mechanical engineering, vibration, numerical modeling, electrical engineering, mechatronics, machine design and computational fluid mechanics. The HEI experts come from the University of Miskolc (ME), TUCLUJ and UJA.

3. Common elements of project management and administration

Each pilot project has been finished with the satisfaction of the participants. However, the contents of the projects were diverse, project management used a unified approach in planning, implementation and control. Topic selection (Figure 4) was performed in teamwork and thorough risk analysis was also conducted. Topic ideas were collected continuously. A risk analysis used the scoring and the visual model of the probability-impact matrix, in harmony with the general risk analysis method of the HEIBus project. A predefined item list of the risk was available for each project that allowed a general evaluation, but special issues could be added to the analysis. Pilot projects must have been confirmed by the project management for checking the conformance to the project goals and limitations.

Nevertheless, thorough project selection was a key factor in successful implementations. Since there was a time frame given, the scope of the projects must have been refined in each case. However, it seems to be an unnecessary limitation of the professional and scientific work, we found it is useful for avoiding over or under-planning. This helps to learn companies not to define impossible missions or project elements that go beyond the actual collaboration.

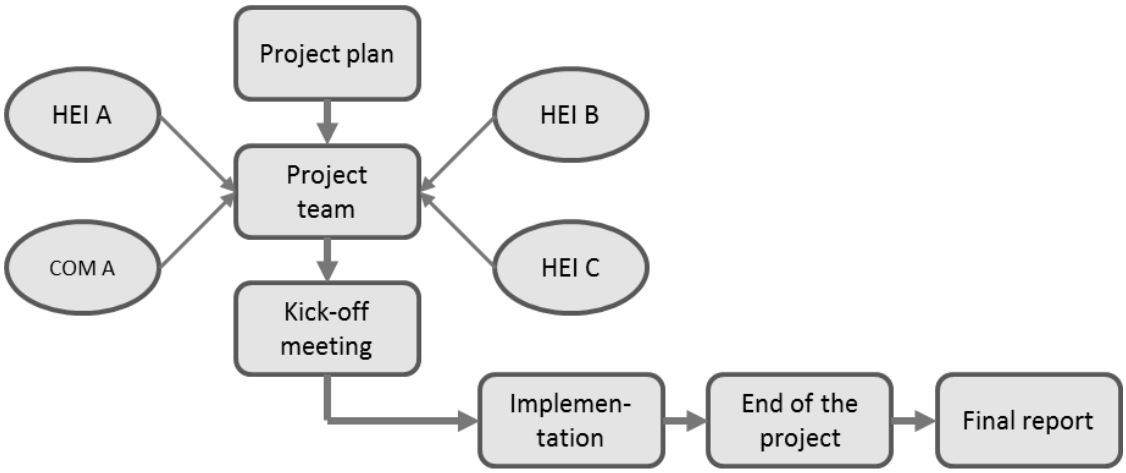
Figure 4: Preparation tasks



Source: HEIBus report

Project team members had to use a unified process (Figure 5) and a documentation template system for controlling the implementation. A Gantt-chart, mid-term reports, final reports and the highlight of scientific content, as well as kick-off meetings, were formalized.

Figure 5: implementation task



Source: HEIBus report

The structure of implementation and documentation covered the following issues including inputs, contents and outputs:

- Minutes of the kick-off meeting
- Analysis of the problem
- Finding possible solutions
- Feasibility study of the new solution
- Reporting

Another management solution was the parallel running of the projects. Three pilot projects were implemented in 2018 and three in 2019. Lessons of the first round could be used in preparing the second one, while the experience of the parallel running project supported the prompt problem solving related to teamwork or technical issues.

Of course, pilot projects are covered by HEIBus level quality management. Evaluation of satisfaction is performed for each project. The core element of the evaluation is a feedback survey for the team members and other stakeholders at the company partner. The questionnaire asks the participants about task properties (feasibility, difficulty), teamwork and communication. The responses are processed by the project management. Lessons learned are also included in scientific reports.

4. Conclusions

The HEIBus project is great evidence of the complexity of knowledge production. The project established an umbrella with the purpose of identifying and solving real-life problems with the cooperation of higher education institutions and companies, moreover in an international environment. Both topic selection and implementation were project tasks. The concept is based on the triple helix model, but the long-term goal is to present the opportunities for two-player cooperation.

Achieving the goals even though the details of the tasks were not predefined is available through the application of consequent management tools. HEIBus is considered a project, but in terms of its internal functioning, it is portfolio (PMI, 2017a). Real-life problems defined and solved are the projects to be managed. With regard to the dynamic environment, HEIBus actually applies the concept of agile project management (PMI, 2017b) to traditional project tasks. This approach seems to be successful.

Intensive support of quality management and project management knowledge ensured and ensures the proper implementations.

An experience of the last two years with the tasks (including feedback and evaluation) the content of cooperation is quite easy to define. Problems descriptions and technical plans served every participant concerned, support was required in managing the communication and the documentation. In the interest of establishing the two-player cooperation after closing the HEIBus project, the developed methods must be stabilized.

5. References

1. Bognár, G. (2015): Reshaped partnership and good practice in engineering, in: Proceedings of 2015 International Conference on Interactive Collaborative Learning (ICL), IEEE, 957-963.
2. Carayannis, E. G., & Campbell, D. F. J. (2012): Mode 3 Knowledge Production in Quadruple Helix Innovation Systems. Twenty-first-Century Democracy, Innovation and Entrepreneurship for Development. *SpringerBriefs in Business*, *7*, 1–63.
3. Etzkowitz, H. (2003): Innovation in innovation: the Triple Helix of university-industry-government relations. *Social Science Information*, *42*(3), 293–337.
4. Etzkowitz, H., & Leydesdorff, L. (2000): The dynamics of innovation: from Nation Systems and „Mode 2" to a Triple Helix of university-industry-government relations. *Research Policy*, *29*(2), 109–123.
5. Leydesdorff, L. (2000): The triple helix: an evolutionary model of innovations. *Research Policy*, *29*, 243–255.
6. Ollé, J. (2012): A tudás alapú társadalom iskolája. *Információs Társadalom*, 12(3), 7–14.
7. Perkmann, M., & Walsh, K. (2007): University-industry relationships and open innovation: Towards a research agenda. *International Journal of Management Reviews*, *9*(4), 259–280.
8. PMI (2017a): *The Standard for Portfolio Management – Fourth Edition*. Newtown Square, PA: Project Management Institute.
9. PMI (2017b): *A Guide to the Project Management Body of Knowledge. PMBOK® Guide – Sixth Edition.* Newtown Square, PA: Project Management Institute.
10. Rothaermel, F. T., Agung, S. D., & Jiang L. (2007): University entrepreneurship: a taxonomy of the literature. *Industrial and Corporate Change*, *16*(4), 691–791.
11. Smart HEI-Business collaboration for skills and competitiveness [HEIBus] Official Webpage. Retrieved from: http://www.heibus.eu/ Downloaded: 09.12.2019
12. Szakály, D. (2013): *Innovációmenedzsment*. Miskolc: Miskolci Egyetem.
13. Tamás, P. (ed.) (2006): *A tudásalapú társadalom kialakulása Magyarországon*. Budapest: Új Mandátum Könyvkiadó.
14. Teperics, K., & Dorogi, Z. (2014): Az egyetemek gazdasági és regionális hatásai. *Educatio*, *23*(3), 451–461.