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Difficulties in collaborations between academia and industry: An analysis of the Austrian context

Arbresha Meha[1], Afrim Loku[2*]
[1,2]University of Applied Sciences in Ferizaj, St.„University" 70000, Ferizaj, Kosovo; arbresha.meha@ushaf.net (A.M.) afrim.loku@ushaf.net (A.L.).

Abstract: Collaborations between academia and industry represent an evolving trend aimed at fostering innovation and promoting economic progress. However, establishing and managing such partnerships often present various challenges. This study offers insights into the most common difficulties encountered in collaborations between academia and industry, based on data collected from 52 semi-structured interviews with management and researchers working across 10 public universities, 10 universities of applied sciences, and 15 companies in Austria. The findings reveal that numerous obstacles can hinder effective collaboration. These challenges include issues related to building partnership expectations, such as defining and aligning objectives, goals, priorities, processes, and the focus of collaboration. Additionally, partners often face difficulties related to resource allocation, roles, and responsibilities. Time constraints also pose significant challenges, as industry tends to have a short-term perspective focused on research and implementation, whereas researchers emphasize careful planning, analysis, and validation of findings. Insufficient communication between partners further complicates collaboration efforts, creating barriers to success. Our analysis suggests that understanding the needs, strengths, and limitations of each partner is crucial for establishing and managing successful academic-industry partnerships.

Keywords: *Academia, Collaboration, Difficulties, Higher education, Industry.*

1. Introduction

Scientific research and industrial innovation are the two main pillars that drive social and economic development forward. HEIs contribute by producing new knowledge, preparing skilled staff and building theoretical foundations on which scientific discoveries are based [1, 2]. On the other hand, industry has the role of transforming these ideas into concrete products and services that bring economic benefits and respond to the needs of society [3-5]. International experience shows that countries that have strong public research systems and have developed knowledge transfer mechanisms manage to benefit significantly from investments in "knowledge-based capital" [6].

Collaboration between HEIs and industry is considered as a way to improve innovation and the flow of knowledge and technology across different fields [4, 7]. For HEIs it enables to leverage their expertise and resources to address practical problems and develop new technologies, while giving companies the possibility to have access to the most advanced research and development capabilities [8].

However, despite the great potential, partnerships between HEIs and industry often face difficulties. Understanding the difficulties of collaborative partnerships is vital for the successful knowledge transfer [9, 10] lower research and development costs, and generation of higher levels of innovative output [11].

This research aims to contribute to the identification of the most common difficulties the partners encounter in their collaboration practices. The paper is focused in Austria context, and is built on the

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* Correspondence: afrim.loku@ushaf.net

report published by Meha and Einwiller [12] which explored the collaboration between Austrian HEIs and industry. The focus is on two types of higher education institutions in Austria: public universities (in the following "universities") and universities of applied sciences (UAS).

In Austrian there are 22 public universities that focus on teaching, research, and third mission, and 21 UAS that emphasize strong partnerships with industry. For universities the successful activities of the past few years, attributed to the third mission, have been focused on knowledge and technology transfer, economic development, and the interaction with industry. UAS as relatively new universities in Austria introduced a new professionally oriented sector of tertiary education, with the aim to facilitate the diversification of higher education degree programs and to bridge the gap between academic institutions and the job market. On the other hand, companies seek partnerships with HEIs in different fields to support their innovative processes. The Austrian government through national agencies such as the FFG, provides funding for HEIs for applied research in cooperation with industry. This funding supports scientists to advance their research and fulfill their responsibility to society and the economy. It also helps industry in their development of innovative ideas, products and services. However, establishing and managing partnerships and fostering collaborations are also associated with difficulties [12].

Our research adds to a better understanding of difficulties the partners encounter in collaborative partnerships. The contribution is twofold: first it identifies the most common difficulties that HEIs and companies in Austria come across when establishing and managing partnerships, second, the results suggest that understanding the needs, strengths, and limitations of each partner is essential for successful collaboration.

To this end, this paper addresses the following research question: *What are the most common difficulties the Austrian HEIs and companies encounter in their collaboration practices*?

The rest of this paper is structured as follows: we first describe the ongoing discussion on academia and industry interaction and argue that understanding the difficulties of collaborative partnerships is of importance. This is followed by a presentation of the findings of 52 semi-structured in-depth interviews with management and researchers from 10 universities, 10 university of applied sciences and 15 companies in Austria. We than discuss the results, and the last section follows the discussion with a conclusion.

2. Literature Review

2.1. Rationale and Forms of HEIs and Industry Collaboration

Collaboration between HEIs and industry has emerged as a possible alternative to enhance innovation, advancement of technology and expand the flow of knowledge in all sectors [13, 14]. Collaboration as an inter-organizational relationship can be categorized as tangible exchange of funds, material and equipment, and intangible as exchange of technology and data resources [8]. In cross-sector collaboration, partners have both individual and common objectives to providing solutions for society's problems [15, 16]. Thus, collaboration occurs when both HEIs and industry engage with specific goals to acquire knowledge, resources, and capacities, and is viewed as a rational process based on strategic evaluation and need of resources [17, 18].

Governments are supporting HEIs and industry partnerships to increase the impact of public money for research on public growth, and have established competitive funding programs to promote collaboration [19]. Public funding of research is seen as a way to incentivize HEIs to not focus only on teaching and basic research, but to consider as well the third mission, a contribution to society and the economy [20]. Existing research has shown a positive impact of such programs on industry increasing R&D efforts [21] and achievements [22, 23]. Thus, for HEIs, revenue from industry collaboration is used to supplement research and development income [24, 25] whilst industry benefits from lowering the risk of investment in research [13, 26].

A systematic review of the literature highlights a wide range of partnership forms, ranging from joint research projects and student internships, to technology transfer, licensing agreements, consulting

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and training services, as well as entrepreneurship support programs. Nsanzumuhire and Groot [27] in their study discerned three major forms of partnership implementation: educational collaboration, academic entrepreneurship, and the research related collaboration. Business cooperation in education can take a number of forms, ranging from student mobility to curriculum design, curriculum delivery or lifelong learning [28]. Academic entrepreneurship literature turns around patenting, licensing, joint ventures, spin-offs and so forth [29, 30]. Other forms of application of academic knowledge into practice is through knowledge exchange [31, 32]. The research related collaboration includes collaborative research, research contracts, or scientific consultancy. These result are put into practice through technology transfer for commercialization purposes [8, 33, 34].

2.2. Difficulties in Collaboration

Although collaborations between HEIs and industry have great transformative potential, they often face structural, cultural, and conflicting goals that hinder their full functioning [35, 36]. HEIs typically emphasize openness, long-term research, and knowledge sharing, while companies are oriented toward confidentiality, speed, and commercial exploitation of results. Differences in goals comes from the differences in market orientation [37] and different knowledge sharing approaches [38]. For Corsaro and Snehota [39] understanding goals, concepts, assumptions, and cause-effect relations are significant in partnership. Further, they presented three types of alignment: the agreement on the goals between partners, process and competences, and the view and perceptions among partners called "cognitive alignment". Cognitive alignment is important to enable communication and knowledge transfer and build trust between partners. As Öberg and Shih [40] show, for collaboration to succeed, partners need to have similarity of priorities, interests and interaction goals. Ingstrup, et al. [41] explained the differences in institutional logics of academia, industry, and government in collaborative partnership. Companies aim to maximize their profit, academic actors focus to increase the amount of public knowledge, while government through funding and other support structures, aims to improve the well-being of citizens.

Inconsistency of timelines often created difficulty in collaborative partnerships. While companies typically seek quick and market-ready results, academic research is more exploratory, with a long-term view on research and implementation [42]. The time lag between completion of the academic research and commercial introduction of innovations in the market is longer for large companies than for small ones [43]. Due to the risk and unknown factors that collaboration partnerships encounter, Garcia, et al. [44] state that it is important in collaborative partnerships to maintain a balance between basic research with a focus on long-term perspective, and applied industrial research, with a short-term perspective.

Effective communications between partners is crucial to create a shared understanding. This includes regular meetings, continuous feedback, exchange of information and updating about challenges and progress [24, 45]. The regular, adequate, and accurate communication created positive expectations between partners, especially when the partnership is new [46].

Researchers often fear that partnership may limit freedom to publication, and they autonomy toward the research direction and research execution [47]. For researchers, deciding on research scientific aspect [47] and ensuring that collaborative projects with industry is contributing to research activity is crucial D'este and Perkmann [48]. Zalewska-Kurek and Harms [47] in their study made distinguishes between operational and academic autonomy. Accordingly, the researchers might be willing to give up certain aspects of operation autonomy which includes formalization and operational management of projects, but not with regard to the academic autonomy – the scientific integrity and methods.

Intellectual property management is another obstacle. Universities value instant publication and scientific recognition, while companies seek exclusive rights and financial benefits from research results. This often creates lengthy negotiations over copyright, publication deadlines, and licensing terms, slowing or jeopardizing partnerships [49-51]. Likewise, the organizational structures of universities,

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and larger companies, which are often rigid and hierarchical, do not facilitate the flexibility and quick cooperation required for successful projects [52]. These structures, based on traditional procedures, often lack the flexibility and speed of decision-making during collaborative partnerships.

Economic crises and cuts in research funding have forced HEIs and researchers, especially those funded by governments, to identify potential partners in order to finance their research and innovation projects, education programs, equipment and facilities [9, 53]. Dependence on competitive external funds often orients research agendas according to donor priorities, imposing certain restrictions on the publication of research results, thus weakening the strategic adaptation of academia and industry partnerships [54]. Additionally, for universities and researchers increasing third-party funding can be challenging. The institutional sustainability is evaluated based on the amount of funding generated from third parties [55], which creates pressure for researchers and institution to engage in third stream activities through a variety of national funding programs [55].

3. Methodology

To answer the research question, an exploratory study was designed using semi-standardized interviews with academic, industry and government representatives. The questionnaire was organized into two versions to capture the views of management and researchers. Following a grounded theory approach [56] a theoretical sampling procedure was adopted to produce a sample as diverse as possible by including 10 universities, 10 UAS, and 15 companies. We conducted 52 problem-centered interviews [57] with 34 representatives from management from universities, UAS and companies, 13 interviews with researchers, and 5 with representatives of PR departments. Additionally, 4 interviews were conducted with representatives of the Federal Ministry of Education, Science and Research of Austria (BMBWF) responsible for higher education, UAS, and research and development, and 1 interview with the Austrian Research Promotion Agency (FFG). Sampling began with purposive sampling, targeting participants from management (vice rectors for research and innovation, deans, vice-deans, managers of global funding, managers of innovation, principal patent attorney) and as data collection and analysis progressed, a snowball sampling was conducted to reach the researchers and companies that were more involved in joint collaboration projects.

Semi-structured interviews were selected as they allow participants to center the topic, while still being flexible enough to let participants bring in their own experiences and perspectives. All interviews were conducted, recorded, and transcribed in English. The coding procedure and analysis was performed using MAXQDA 2022.

4. Results

The main difficulties in collaboration partnerships that emerged during the interviews are generally in line with the aspects in conceptual definitions mentioned above. The finding indicate a numerous difficulties that partners encounter in collaborative partnerships. However, the most common frequently mentioned difficulties during the interviews as presented in figure 1, are building partnership expectation, time constraint pressure and insufficient communication between parties. Other difficulties included dependence on third-party funding, balancing benefits and goals, research/researchers autonomy, regulatory barriers, contract negotiation, and multi-level hierarchies.

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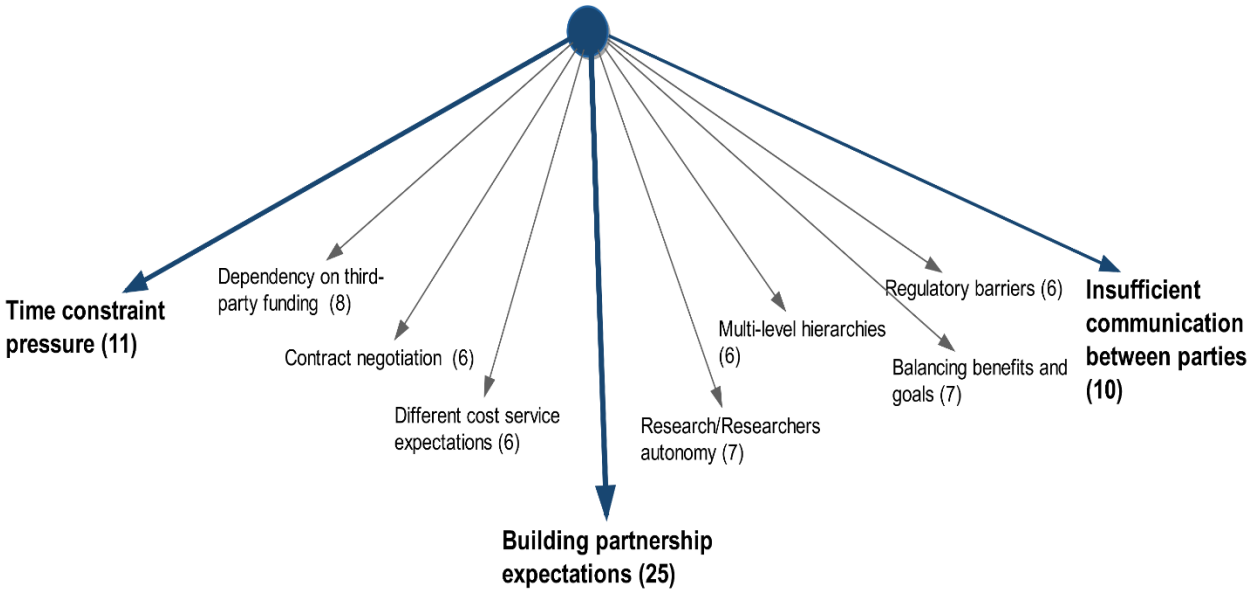

Figure 1.
Difficulties in collaborations; the numbers in brackets indicate the frequency of mentions.

Building partnership expectation was mentioned by 25 representatives from HEIs (universities/UAS) and companies. It referred to the difficulties in achieving a common understanding of objectives, roles, responsibilities and timelines in collaborative partnerships. Researchers and companies find it difficult to manage their expectations with regard to research finding and the output of the research. For researchers, the outcomes of the research does not always yield a finished product, whereas companies find it difficulty when their expectations on product solutions are not met.

Time constrain pressure was another difficulty mentioned by 11 interviewees. Companies, guided by market competition and product development cycles, typically require fast and result-oriented engagement. Meanwhile, researchers focus on careful planning, rigorous analysis, and long-term knowledge generation. This basic distinction between short-term implementation objectives and long-term scientific research often creates tensions and difficulties in coordination. These results reaffirm the importance of setting the frameworks right at the beginning of the partnership which can help to reduce tensions and provide lasting benefits for both sides.

Insufficient communication between partners was another difficulty mentioned by 10 interviewees. Poor communication between partners causes misunderstandings and misalignment of expectations. Participants underlined the importance of establishing a common communication language, and maintaining a regular contact to strengthen partnership. Furthermore, managing a structural discussions between partners helps to build mutual trust and understanding, while minimizing failures during project implementation,

Securing funding for research and relying on external funding whether through university support, government grants or industrial investment is challenging and time consuming for researchers. It requires setting research agenda and selection of projects that align with their academic work, institutional strategic approach and company goals. Furthermore, increasing third party funding through collaboration with industry it lead toward dependency on those funds and it might have an impact on research priorities and directions.

The legal aspect of the cooperation—including the negotiation of intellectual property rights, the terms of publication, objectives, duration, funding, was identified as a long and complex process and very important when negotiating the contract. Some participants during the interview described contractual negotiations as bureaucratic associated with some legal uncertainty. This was identified as

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regulatory barriers. Having a numerous regulations with different rules creates uncertainty when entering the partnership.

Researchers highlighted the autonomy and strategic orientation of their institution as very important when deciding the goals and objectives of collaboration research project. Maintaining their academic freedom and the university/UAS independence is very important when deciding on the research direction and research execution.

Collaboration with large HEIs and companies can slow down the process as it goes through multi-level hierarchies. Negotiation have to go through a long hierarchy for approval, which potentially can hinder the success of the collaboration.

Further, to understand exactly where the focus of difficulties lies more, we divided per institution as shown in table 1. The numbers indicate the frequency of mentions. Building partnership expectations was mentioned more frequently by HEI representatives (16), and less by companies (9). However, for both partners it was very important to reach partnership agreements that are in line with institutional objectives and goals. Time contain pressure was mentioned 8 times by HEI representatives and 4 times by company representatives. For researchers it is vital to take a long-term view on research, whereas companies with the pressure to stay ahead in the marked need to deliver innovative produces quickly. Communication is also valued a lot by HEI representatives (8), as a very important tool to overcome the cultural differences between partners, and development of personal relationships and trust. As the numbers indicate other difficulties as well are mentioned, like dependency on third-party funding (8), mostly by researches as they find it challenges to seek out for funding especially for UAS, as they need to secure funding for applied research. Autonomy is also highly valued by researchers, as they prefer the focus of research that is important for society.

Table 1.
Difficulties in collaborations; the numbers indicate the frequency of mentions.

Difficulties in collaborations	HEIs (Universities and UAS)	Companies
Building partnership expectations	16	9
Time constraint pressure	7	4
Insufficient communication between parties	8	2
Dependency on third-party funding	8	
Contract negotiations	5	1
Regulator barriers	3	3
Research/researchers autonomy	7	
Multi-level hierarchies	4	2

5. Discussion

This study investigates the difficulties of collaboration between Austrian HEIs and companies. The results of the study clearly show that establishing and managing partnerships are associated with difficulties. The difficulties there were more frequently mentioned were coordination of the scope of the collaboration, to ensure the consistency of goals, objectives and roles, time pressure on research implementation, as well as the lack of communication between partners in collaborative partnerships. These results and their implications are discussed in detail below.

Agreement on the goals of collaboration, processes and perceptions among partners are significant in partnerships [39] and define the success of the collaboration [40]. Our results indicate that HEIs and companies struggle to align the objectives, goals, priorities and competences. Moreover, the varied institutional logic of partners, coming from academia and industry, including government that offer support for the establishment of partnerships are manifested, and are in line and confirm that all actors involved in partnerships possess dissimilar institutional logics [24, 41]. Understanding the diversity of actors involved are very important to manage the collaboration in order to achieve positive results [58].

Companies value the return from short-term production activities, rather than long-term innovation strategies [27]. According to our results, these distinctions between short-term activities and long-

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term scientific research, represent a need of setting the time line framework which can help to reduce tensions and provide lasting benefits for both sides.

In line with previous studies (e.g., [24, 45, 46]) we find that effective communication among partners in collaborative partnerships is crucial and requires constant interaction through face to face meeting, networks, workshops, and seminar sessions. Thus, rules of two-way open communication should be clearly established.

The results of our study showed other difficulties as well that partner encounter in collaborative partnerships, including dependence on third-party funding, which often orients research agendas according to donor priorities, and restrictions on the publication of research (e.g., [54]). Negotiation of contact, specifically the terms and conditions, obligations, rights, including the negotiation of IP, was identified as a long and complex process, but also very important. We also found that multi-level hierarchies especially present at large universities and companies can lengthen the cooperation time frame. The excessive bureaucracy coming from universities and companies and the lack of legal certainty creates mistrust in partnerships [52].

The findings also demonstrate the importance of understanding the researcher's autonomy constrains. As Zalewska-Kurek and Harms [47] stated for researchers preserving the academic autonomy with regard to scientific aspect is crucial. The study, further highlighted that most of the researchers enter the collaboration with industry to advance their research in their field of expertise. Our results agree that preserving researcher's autonomy and advancement of researchers in their field of expertise is important, however, solving practical problems and improving the real-world situations through applied research is crucial for researchers as well [12].

6. Conclusion

This study provides an exploratory insight into difficulties that Austrian HEIs and companies encounter during collaborative partnerships. Our study showed that HEIs and companies in Austria confirm the importance of collaboration to drive innovation and economic progress. However, managing and establishing joint collaborative partnerships are associated with difficulties. The most often difficulties mentioned were building partnership expectations, time contain pressure, and insufficient communication. Other difficulties were dependency on third party funding, researches autonomy, contract negotiation and so on.

The study demonstrates that, due to the diversity of actors involved in partnerships and the institutions they represent, building partnership expectations requires increasing shared interests, goals, priorities, and practices among collaborative actors. This means that alignment of partnership expectations increase adjustments, and produce positive effects.

Another dynamic that is difficult to manage is time contain pressure. Academia and industry struggle to find a balance between company priorities toward short-term research and quick solution, and academia long-term rigorous research. When working with SMEs, conducting long term research in not feasible, thus, researchers should aim for quick feedback, and market validation to meet the industry's needs and expectations. While larger companies should prioritize solution that leads to more significant outcomes.

Effective communication gives possibility for partners to engage more and provide input. The study showed that open communication raises understanding, and a collaborative environment supported by communication stimulates the relevant topics on academic and industry. Regular formal and informal meetings contributes to creating social networks and identifying more research joint project.

Overall, by highlighting the difficulties encountered during partnership collaborations, this adds knowledge on how to manage and facilitate collaboration, and the necessity to understand the needs, strengths, and limitations of each partner.

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Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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