

BARRIERS TO THE IMPLEMENTATION OF PROJECTS WITHIN SCIENTIFIC AND INDUSTRIAL CONSORTIA – ANALYSIS FROM THE POINT OF VIEW OF ENTERPRISES

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Purpose: to identify and assess barriers to enterprises within scientific and industrial consortia implementing projects.

Design/methodology/approach: this paper presents the results of mixed studies involving preliminary qualitative research in the form of unstructured interviews with project managers implemented within scientific and industrial consortia, followed by quantitative research using a questionnaire among representatives of enterprises from a group of such consortia.

Findings: the effect of the research is the identification of key barriers from the point of view of enterprises in the implementation of projects by scientific and industrial consortia.

Research limitations/implications: the results of the research will improve our understanding of the barriers encountered by enterprises participating in the implementation of projects within scientific and industrial consortia. The next stage of research should include an assessment of barriers from the point of view of public HEIs participating in the joint implementation of projects by scientific and industrial consortia.

Practical implications: the results of the research will contribute to an increase in the absorption capacity of consortia consisting of private enterprises and public universities and may affect the intensification of work aimed at obtaining funds and joint implementation of projects within scientific and industrial consortia.

Social implications: the results of the research may help to increase interest in implementing research and development projects by scientific and industrial consortia, which will result in the transfer of modern solutions from the world of science to industry, bringing specific economic and social benefits.

Originality/value: to identify key barriers to scientific and industrial consortia implementing projects and the scope for enterprises to eliminate these barriers.

Keywords: barriers, projects, scientific and industrial consortia.

Category of the paper: research paper.

1. Introduction

Public universities and private enterprises may cooperate by creating scientific and industrial consortia applying jointly in competitions for co-financing projects from external funds. In Poland, the main source of financing for such projects are funds from European funds. The previous financial perspective for 2014-2020, for which the period of eligibility of costs will end on 31 December 2023, made it possible to obtain significant funds for the implementation of innovative projects implemented in cooperation between universities and enterprises. One key condition for obtaining funds was to ensure the possibility of commercial use of the project, possibly by implementing its effects within the consortium's own activities.

Implementing research and development projects is burdened with a high risk of failure resulting from many barriers that appear during cooperation between public universities and enterprises. They may affect both the stage of establishing cooperation and joint preparation of the application for co-financing, as well as the implementation and settlement of the project itself. Therefore, not all projects that have received funding will ultimately achieve their goals to the full.

On the basis of literature studies and qualitative research, an attempt was made to identify, and then quantify, as part of quantitative research, key barriers to enterprises within scientific and industrial consortia implementing projects. The results of the research will improve our understanding of the barriers encountered by enterprises participating in the implementation of projects within scientific and industrial consortia. They will also contribute to the increase in the absorption capacity of these entities and may affect the intensification of work aimed at obtaining funds and joint implementation of projects by enterprises and public universities.

2. Cooperation between universities and enterprises

The growing importance of university-led research for innovation systems has been highlighted by numerous authors, including Brekke (2020); Etzkowitz and Leydesdorff (2000); Lam (2011); Shi et al. (2020) and Caviggioli (2023). Nevertheless, innovative activity requires significant financial resources, funds that are available primarily to large corporations, public institutions financing research and development as well as the largest universities. Roncancio-Marin et al. (2022) points out that the literature on university-business collaboration is based heavily on research from Western Europe and North America, where universities have a well-developed R&D infrastructure and significant budgets.

In recent years, the turbulent state of the global economy and the intensifying process of globalisation have seriously affected the activities of international and multinational corporations (Alon, 2020; Peretz, Morley, 2021). It should be noted that the current economic situation is not conducive to large investments in research and development or the introduction of expensive and innovative products to the market (Yurevich et al., 2023). Therefore, financing innovative research involves seeking additional external funds, which may be possible to obtain as part of calls announced for scientific and industrial consortia by public institutions financing research.

As Bernal, Carree and Lokshin (2022) point out, the primary motive for which innovative companies seek to collaborate is to gain access to knowledge resources. They emphasise that cooperation in the field of R+D plays an important role in creating innovations; it can facilitate access to resources that companies do not have internally and enable consortium partners to share costs and risks in R&D projects.

Aksoy, Pulizzotto, and Beaudry (2022) point out that universities can become accelerators of innovation and regional economic growth provided that the cognitive gap between universities and industry is reduced by increasing technological proximity or by funding organisations that act as intermediaries in the process of incubating research results.

Numerous studies on cooperation between academic institutions and industry look at how such partnerships develop and what benefits they bring (Attour, Lazaric, 2020; Compagnucci, Spigarelli, 2020; De Silva et al., 2020; Rajalo, Vadi, 2017). Interesting results on the processes underlying the evolution of university-industry collaboration were presented by Patnaik, Pereira and Temouri. The case they investigated involved a collaboration between a university and a large company that then evolved into a tripartite partnership with the entry of a health organisation (Patnaik et al., 2022). This case well reflects the opportunities offered by cooperation between universities and enterprises in the context of implementing joint research and development projects with co-financing from the European Union funds provided by the Intermediate Body. Examples of this in Poland include the National Centre for Research and Development or the European Commission (in the case of Horizon projects).

Research on collaboration between industry, academia, and government based on an analysis of eight Brazilian universities was presented by Andrade et al. (2022). They point to four reasons for cooperation: funding, the existence of innovation environments and specific innovation legislation as well as the regional context. On the basis of an empirical study on the impact of government-enterprise-university cooperation on startups incubated by new research and development institutions in China, Zhou and Wang (2023) indicate that cooperation between the government and the academic community in creating new R+D institutions has a positive effect on business incubation. The results of research presented by Belderbos et al. (2018) indicate that sustained R&D cooperation with institutional partners is a prerequisite for establishing new R&D cooperation with industrial partners and that the interruption of a certain type of R&D cooperation is likely to lead to the resumption of such cooperation. They point

out that past innovation-related achievements increase the likelihood of companies cooperate in research and development with further partners (except competitors as there is a high risk of these acquiring key knowledge and strengthening their competitive position).

Partnerships in the field of research and development of universities with entities from industry can be implemented in various forms, such as partnership programmes, commissioned research or the establishment of spin-off companies (Rybnicek, Königsgruber, 2019; Skute et al., 2019; Thune, Gulbrandsen, 2014; Sjöo, Hellström, 2019). A new type of university-business collaboration involves creating joint university-industrial laboratories to carry out research and development projects (Gomes et al., 2023). These laboratories are an example of long-term joint ventures between universities and companies aimed at achieving benefits for all those involved. Bearing in mind the diverse objectives of universities and enterprises, they constitute a significant management challenge that involves overcoming many barriers to the joint implementation of projects (Meissner et al., 2022).

Cooperation between science and business can develop within consortia established for the purpose of joint application in competitions for co-financing projects from public funds. As research shows, not only can it turn not only into a long-term relationship; it can also develop into new entities. This will help to intensify the transfer of new knowledge to enterprises and, as a result, increase the entire economy's level of innovation.

3. Barriers to the implementation of projects by public universities and private enterprises

In recent years, public universities and private enterprises have actively participated in the joint implementation of projects within the framework of scientific and industrial consortia. Many of these projects have achieved the intended effects, but not all. The fact is that implementing research and development projects is burdened with a high risk of failure (Szczepaniak, 2022) resulting from many barriers that appear during cooperation between public universities and enterprises. Contemporary foreign literature points to various factors that may hinder the joint implementation of projects by public universities and private enterprises. The difficulties in developing and maintaining successful cooperation between universities and industry are highlighted by Steinmo and Rasmussen (2018). Ambos et al. (2008) point to the tension between academic and commercial activities. In their research devoted to the microbasics of management of cooperation between universities and industry, Borah and Ellwood (2022) draw attention to the sources of conflicts between entities conducting R+D activities within joint laboratories being one of the barriers to cooperation.

On the other hand, Bruneel et al. (2010) draw attention to organisational barriers in cooperation between universities and industry. They analyse two types of barriers: the first related to differences in the orientation of industry and universities, and the second related to conflicts over intellectual property and contacts with university administrations. Most researchers face barriers to orientation with regard to the limited time spent on research activities of academic staff due to their traditional roles and responsibilities, such as teaching, seminar attendance and administrative tasks (Ramli, Senin, 2015). In addition, resource barriers relate to financial issues and limited infrastructure (Hanel, St-Pierre, 2006; Abeda et al., 2011).

McCabe, Parker and Osegowitsch point to three key barriers to university-business collaboration: structural differences between partners, poor conflict management, and traditional knowledge perspectives. In addition, barriers to cooperation between universities and enterprises in joint ventures include (Lhuillery, Pfister, 2009; Lemos, Cario, 2017):

- universities' emphasis on basic research to expand existing knowledge, while companies are interested in application research,
- different time standards: researchers perceive research in the long term when employees of enterprises are interested in obtaining results as soon as possible,
- high level of bureaucracy and formalisation of the rules for cooperation on the part of universities and public institutions financing research.

Santalova et al. (2019), in turn, draw attention to the importance of communication in project management and the barriers that interfere with this communication. In particular, they point to the distortion of messages, information overload and unsatisfactory structure of the organisation. As a result, distortions and loss of information are a significant barrier to the effective implementation of projects. This is particularly important when the implementation of the project involves the participation of several independent entities. In this case, communication may be disrupted both internally within each consortium member and externally between the members of the consortium.

In the national literature, one can also find many studies devoted to barriers to joint implementation of projects between public and private entities (Michalski et al., 2013; Różański, 2013; Zontek, 2015; Skwarek, Dzirba, 2017; Zasadzki, 2019; Tomaszewski, 2019). According to Cyran (2015), the barriers hindering cooperation between universities and enterprises include: the excessively high costs of entering and maintaining cooperation, high risk of failure, bureaucracy and formal barriers as well as the excessively long waiting time for results.

Bryła, Jurczyk, Domański (2013) present in detail the barriers in cooperation between universities and enterprises within the framework of joint ventures. These include lack of interest in cooperation, complicated procedures accompanying the establishment of cooperation and bureaucracy, deficiencies in infrastructure and insufficient financial resources, risk of failure, weakness of intermediary institutions and an unfavourable organisational culture.

According to Zajko K. (2013), the main barriers to cooperation between universities and enterprises include: insufficient legal regulations, insufficient information on the potential scope for cooperation, lack of interest among companies in financing research projects with insufficient application features and unsatisfactory effects of previous cooperation for enterprises.

To sum up, in the relevant literature, one may notice a diverse approach to identifying barriers in the implementation of projects in cooperation between universities and enterprises. Nevertheless, there are some common barriers to all these studies, although these are not always defined in the same way: insufficient resources (financial, human and infrastructural), errors in project management (communication problems, poor planning, lack of training), bureaucracy and lack of support from senior management.

4. Research methodology

The study uses an explanatory sequential model, involving preliminary qualitative research, followed by quantitative research on a larger sample. In order to identify barriers that may hinder the implementation of the project within a consortium consisting of universities and private enterprises, unstructured interviews were conducted with five managers of projects implemented as part of this type of cooperation. These interviews were aimed at gathering empirical material based on the use of open-ended questions, which enable the interlocutor to speak directly and freely. During the unstructured interviews, barriers to the implementation of joint projects of public universities and enterprises were identified. The results obtained were used to develop a questionnaire and conduct a survey among persons managing projects implemented by consortia consisting of at least one public university and at least one private enterprise. The study was carried out using the mixed mode method combining CATI and CAWI techniques. The study concerned one project.

The research used a random selection of respondents: first of all, a database was created, containing a list of projects implemented since 2014 by consortia composed of at least one public university and at least one private enterprise. Next, an invitation to complete the survey was sent to 192 people, 120 fully completed surveys were obtained, giving a manoeuvrability rate of 62.5%.

One of the objectives of the study was to identify barriers to the implementation of projects within the consortium of public universities and enterprises. The barriers identified during the qualitative study and assessed during the quantitative study included:

1. Making ones own contribution.
2. No adequate infrastructure.
3. No specific procedures in the entity.
4. No properly prepared staff.

5. No such need.
6. Reluctance of the authorities of the entity.

The question posed to the respondents regarding the indication of barriers in the implementation of the project within the framework of the scientific and industrial consortium was semi-open, next to the indicated barrier proposals, the last answer "Other, which..." allowed respondents to indicate their own barriers that were not mentioned in the survey.

Characteristics of the study population

The survey was addressed to persons managing projects implemented by consortia consisting of at least one public university and at least one private enterprise. Among the respondents, the largest group were people representing medium-sized enterprises 30.83%. A detailed distribution of respondents by company size is shown in Figure 1.

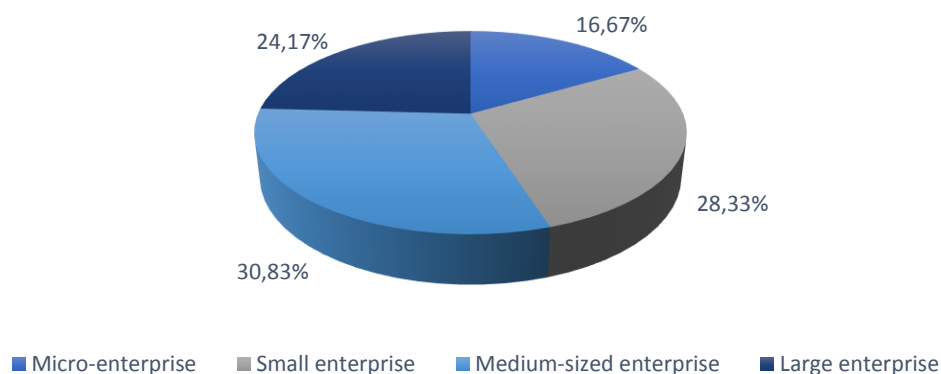


Figure 1. Size of surveyed enterprises.

Source: Own elaboration based on the results of the survey, N = 120.

The number of entities forming the consortium has a significant impact on the implementation of projects within the consortium. Figure 2 shows the distribution of respondents according to the number of entities included in the consortium.

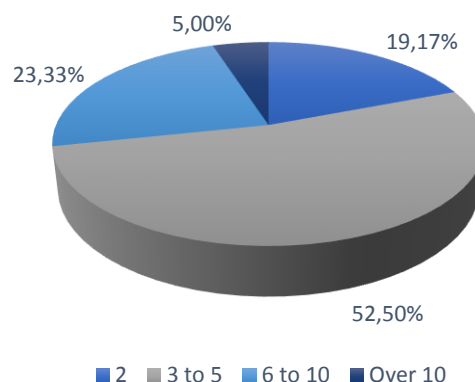


Figure 2. Number of entities in the consortium.

Source: Own elaboration based on the results of the survey, N = 120.

The largest part of the examined projects were those implemented within consortia consisting of at least three, but not more than five entities, so it can be assumed that these were medium-sized consortia formed for the joint implementation of the project. In addition to public universities and private enterprises, the participants in the consortium also included private universities and other types of entities.

5. Research results

As part of the survey, representatives of enterprises were asked to identify barriers to the implementation of projects within the consortium of public universities and enterprises. The question was semi-open-ended; respondents could indicate one or more of the proposed barriers or present another, not included in the list. The results are presented in Table 1.

Table 1.

Barriers to the implementation of projects within scientific and industrial consortia from the point of view of enterprises

Barriers	Number of Indications	Percentage
Making ones own contribution	59	49,17%
No adequate infrastructure	45	37,50%
No specific procedures in the entity	38	31,67%
No properly prepared staff	33	27,50%
No such need	19	15,83%
Reluctance of the authorities of the entity	13	10,83%
Other	6	5,00%

Source: Own elaboration based on the results of the survey, N = 120.

The largest group of respondents (almost 50%) indicated that the implementation of projects within scientific and industrial consortia is hindered by the need to make own contribution. Unlike research units, enterprises cannot receive funding in the amount of 100% of eligible costs, this is due to restrictions related to state aid. Therefore, every time they plan the implementation of the project, they must secure adequate funds to cover their own contribution.

The second most frequently indicated barrier was the lack of adequate infrastructure, which was indicated by 37.5% of respondents. Receipt of public funding for the joint implementation of the project by a scientific and industrial consortium takes place on the basis of an open competition, under which one of the evaluation criteria is the potential of the applicants. Therefore, the lack of appropriate infrastructure may be one of the elements hindering the process of obtaining funding and the subsequent implementation of the project. This barrier is also connected with the option of making own contribution: existing infrastructure may be used as part of the entity's own contribution and reduce the need to engage additional funds.

The lack of specific procedures in the company, a barrier that is not directly related to the financial resources, is indicated by almost 32% of respondents. The process of applying for public funds and the subsequent implementation of co-financed projects are very formalised and require many conditions to be met. First of all, the requirements related to the eligibility of costs and procurement procedures are crucial.

The lack of specific procedures may to some extent result from another barrier, which was indicated by 27.5% of respondents: the lack of properly prepared staff. Members of the project team with the manager at the helm have a lot of duties, both formal and substantive.

Among other barriers, respondents pointed to (original spelling):

- Extensive bureaucracy involved in documenting project costs, selecting suppliers of materials for research work.
- VAT refund tax procedures.
- A changing environment.
- No preparation of public Higher Education Institutes for such cooperation.
- Communication issues.
- Inability to obtain a project due to the fact that a large number of projects have not been implemented in the past (no additional points in the project scoring) (a closed circle is created).

In order to better understand existing dependencies, the analysis was deepened by the presentation of the main barriers in the implementation of projects, within a consortium of public universities and enterprises, in individual groups of enterprises. These data are presented in Table 2.

Table 2.

Barriers to the implementation of projects within scientific and industrial consortia depending on the size of the company

Barriers	% of answers depending on the size of the company			
	Micro	Small	Medium-Sized	Large
No properly prepared staff	20,00%	26,47%	37,84%	20,69%
No specific procedures in the entity	10,00%	17,65%	29,73%	65,52%
No adequate infrastructure	30,00%	32,35%	40,54%	44,83%
Making ones own contribution	70,00%	47,06%	48,65%	37,93%
No such need	5,00%	20,59%	10,81%	24,14%
Reluctance of the authorities of the entity	20,00%	2,94%	18,92%	3,45%
Other	10,00%	2,94%	2,70%	6,90%

Source: Own elaboration based on the results of the survey, N = 120.

The most frequently indicated barrier in the case of micro-enterprises, which is not surprising, was making ones own contribution; 70% of respondents representing micro-enterprises indicated it as an obstacle in the implementation of projects within scientific and industrial consortia. This barrier was also most often indicated by small and medium-sized enterprises, it was 47.06% of respondents representing small enterprises and 48.65% of

responses among respondents representing medium-sized enterprises. What might seem surprising in the answers given is the very high percentage of responses regarding the lack of specific procedures in the entity in the case of large enterprises. This barrier in the implementation of projects within scientific and industrial consortia was indicated by 65.52% of respondents representing the largest enterprises. However, by conducting an in-depth cause-and-effect analysis, it can be pointed out that micro, small and medium-sized enterprises have a much less complicated and extensive management structure, hence they can more easily and quickly introduce specific procedures for new projects. In the case of large entities, only general procedures are most often introduced, which may not always meet the requirements of the institutions providing co-financing.

6. Summary

The research indicates four main barriers to the implementation of projects within the consortium of public universities and enterprises. The most frequently indicated barrier by respondents (49.17% of responses) was making ones own contribution. This was particularly evident in the responses of respondents representing micro-enterprises (70.00% of indications), small enterprises (47.06%) and medium-sized enterprises (48.65%). In these three groups of companies, this barrier was indicated most frequently. Only in the case of large enterprises was the frequency of its indications lower (37.93%).

In second place, respondents pointed to a lack of adequate infrastructure (37.50% of responses). The implementation of projects within scientific and industrial consortia mainly affects research projects requiring the use of specialised equipment. Therefore, this answer, like the previous one, should not come as a surprise. In all surveyed groups of companies, this barrier was the second most frequently indicated.

The podium is closed by a lack of specific procedures in the entity (31.67% of responses). This barrier was in first place among large enterprises (65.52% of responses) and in fourth place among other groups of enterprises. In the case of large enterprises implementing many projects at the same time, the procedures introduced are of a general nature, because it would be difficult to develop specific procedures for each individual project. In the case of smaller companies that implement several or only one project within a scientific and industrial consortium, the development of specific procedures for individual projects is no longer so troublesome. In the case of micro-enterprises, only every tenth respondent indicated this barrier. However, it can be noted that with the increase in the size of enterprises, the number of indications of this barrier increased significantly.

As a significant barrier, the respondents also indicated a lack of properly prepared staff (27.50% of responses). This barrier was most often indicated by representatives of medium-sized enterprises (37.48% of responses). In the case of both micro-enterprises and large enterprises, this answer was indicated by every fifth respondent.

Presentation of barriers involves identifying agents and actions that will assist in eliminating them or reduce their negative impact on the implementation of projects by enterprises within scientific and industrial consortia. When planning their own contribution, enterprises should first use their own resources. One can make ones own contribution using ones own machinery and equipment and also by delegating employees to perform tasks in the project. Secondment of an employee to perform tasks under the project means that all or part of their remuneration (depending on the type of secondment) will constitute an eligible cost and may complement the unit's own contribution.

Eliminating the second barrier may require the involvement of additional consortium members who will have the necessary infrastructure. Fixed assets can also be acquired as part of a hire, holding or lease. The indicated forms of financing do not require incurring the full cost of acquiring infrastructure, but only their temporary use for the needs of the project.

The barrier related to a lack of specific procedures in the entity can be eliminated by using the appropriate knowledge management within the company. The use of knowledge and experience from previously completed projects can provide a foundation for the developing and applying specific procedures for the implementation of projects within scientific and industrial consortia within the enterprise.

Eliminating the fourth of the key barriers in the implementation of projects within scientific and industrial consortia may involve the need to attract new employees, which is not always possible. An alternative may be to provide appropriate courses and training for your own staff. However, unfortunately this solution also has its limitations as it will take time to give staff the necessary preparation.

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