

MANAGING NATIONAL AND EUROPEAN R&D PROJECTS IN THE RAIL SECTOR: A CASE STUDY OF RESEARCH PROJECT MANAGEMENT AND SCIENCE-INDUSTRY COLLABORATION

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ABSTRACT

Research and development (R&D) projects constitute a key mechanism for the development of research institutions, enabling knowledge creation, strengthening organizational capacity, and fostering collaboration with industry. The aim of this article is to identify and compare selected elements of management in national and European R&D projects in the rail sector, with particular emphasis on their role in supporting technology transfer and science–industry collaboration.

The study addresses the following research question: what are the main differences and similarities in the management of R&D projects at the national and European levels, and how do these differences influence the development of research institutions?

The article contributes to the existing literature by proposing a comparative framework of R&D project management models and by identifying their complementary role in enhancing both strategic capabilities and implementation effectiveness within research institutions. The research is based on a literature review, comparative analysis of project documentation, and a case study of projects implemented by the Railway Research Institute.

The results indicate that European projects strengthen internationalization, strategic competencies, and long-term innovation potential, whereas national projects support rapid implementation, technology transfer, and stronger relationships with domestic stakeholders. Despite the growing interest in R&D project management, relatively little attention has been paid in the literature to comparative analyses of projects implemented at national and European levels, particularly in the rail transport sector. There is also a limited number of studies examining these projects from the perspective of research institutions and their capacity for technology transfer and collaboration with industry.

The study also highlights the role of R&D projects as instruments of institutional marketing and relationship building with external stakeholders. The findings indicate that effective project management contributes not only to innovation performance but also to strengthening the visibility, credibility, and collaboration potential of research institutions in both national and international environments.

Key words: research and development projects; project management; rail transport; technology transfer; innovation management; science–industry collaboration.

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1. Introduction

Research institutes in Poland are increasingly seeking effective tools that enable the development and maintenance of a sustainable competitive advantage. The changing model of research funding, growing pressure for the practical application of research results, and rising expectations from the economy mean that traditionally understood scientific activity is no longer sufficient as a driver of research institution development. In this context, R&D projects are becoming particularly important as a mechanism integrating scientific, implementation, and market-oriented activities.

Currently, R&D projects play a dual role. On the one hand, they serve as an instrument for acquiring financial resources for the development of research competencies and infrastructure; on the other hand, they enable the creation of unique knowledge capital and strengthen relationships with the economic environment. The literature increasingly emphasizes that the competitive advantage of research institutions is based not only on the quality of scientific output, but also on the ability to effectively initiate, implement, and commercialize R&D projects carried out in cooperation with industrial partners (Etzkowitz & Leydesdorff, 2000; Kerzner, 2022).

An example of an institute operating in such a model is the Railway Research Institute (Instytut Kolejnictwa, IK), a research and development unit of strategic importance for the development of the rail transport sector in Poland. The activities of IK are strongly oriented toward R&D projects, which include both industrial research and experimental development carried out for railway companies as well as international research consortia. These projects constitute an important instrument for building the institute's position as a specialized competence center in the areas of railway infrastructure, rolling stock, traffic control systems, railway energy systems, and rail transport safety. The projects implemented by the institute form part of its development strategy, focused on strengthening innovation capacity, transferring knowledge to the economy, and cooperating with key stakeholders from the railway market, the broader economy, and the scientific community.

Rail transport plays a key role in achieving sustainable development goals, advancing the energy transition, and strengthening socio-economic cohesion at both national and European levels (European Commission, 2020; OECD, 2021). Responses to growing technological, environmental, and organizational challenges are provided by R&D projects implemented both at the national level and within European Union programmes. Within EU and national policy frameworks, numerous initiatives in the rail sector are supported and financed, inter alia, through the Horizon Europe (HE) programme, the Connecting Europe Facility (CEF), and activities of the National Centre for Research and Development

(NCBR). In this context, not only access to financial resources is of critical importance, but also effective project management covering all stages—from the conceptual phase, through the execution of research activities, to the implementation and practical application of results.

R&D project management in the rail sector is characterized by a high level of complexity, resulting from, among other factors, long technology life cycles, regulatory requirements, the need to ensure system interoperability, and close cooperation between research institutions, enterprises, and public entities (Givoni & Banister, 2013; Milewski, 2017). In the case of European projects, an additional challenge is operating in an international environment, which involves diverse organizational cultures, different funding systems, and extensive reporting and control mechanisms.

Consequently, the management of such projects requires the use of specific tools, competencies, and organizational structures that go beyond traditional approaches to project management.

The aim of this article is to identify and analyze selected elements of the management of national and European R&D projects implemented in the rail sector, with particular emphasis on aspects relevant from the perspective of research and scientific institutions. The study focuses on issues such as the formal and organizational conditions of project implementation, the structure of project partnerships, mechanisms for coordinating research activities, and the role of managerial competencies in achieving intended outcomes.

The considerations presented in the article are embedded in the research stream concerning the professionalization of R&D management and the strengthening of research institutions' capacity to effectively participate in projects of strategic importance for economic development.

The research hypothesis formulated in this paper is as follows: effective management of R&D projects in the rail sector requires advanced technical knowledge and its integration, strong collaboration between partners, and the efficient use of project management tools, while differences between national and European approaches influence final implementation success.

To verify this hypothesis, the study addresses the following research questions: What are the main differences in R&D project management at the national and European levels? What factors influence the effectiveness of rail sector project implementation (e.g., partner cooperation, risk management, financing)?

The topic was selected due to the relatively limited number of scientific publications in this area, as well as the author's practical experience in coordinating R&D projects. The recommendations and conclusions presented in the article may be used by public

administration institutions responsible for the distribution of funding, as well as by beneficiaries, enterprises, and research organizations, in order to improve the efficiency and effectiveness of R&D project management in the rail transport sector.

The scientific contribution of this article lies in:

- developing a comparative framework of R&D project management models in the rail sector,
- identifying key differences and similarities between national and European projects in terms of management,
- highlighting their complementary role in the development of research institutions, with particular emphasis on technology transfer and science–industry collaboration.

The article is situated within the research stream on the professionalization of R&D management and the role of research projects as a tool for building innovation capacity in scientific institutions.

2. Methods

2.1. Research Assumptions and Methodological Framework

The study employed a qualitative comparative case study approach involving two research and development (R&D) projects carried out in the railway sector at the Railway Research Institute. The analyzed projects were intentionally selected due to their different organizational models and funding sources: one project was implemented within the national R&D funding system, while the other was conducted under a European international cooperation programme.

The objective of the study is not to formulate universal and fully generalizable conclusions applicable to all R&D projects implemented in the railway sector, but rather to identify and compare selected managerial, organizational, and cooperative mechanisms characteristic of two representative project environments.

The comparative analysis was conducted with regard to the following dimensions:

- project management structure,
- stakeholder management,
- reporting and administrative requirements,
- risk and schedule management,
- science–industry cooperation mechanisms,
- technology transfer processes,
- organizational learning effects for the research institution.

The empirical material included project documentation, internal management procedures, reporting practices, and organizational observations conducted during the implementation of the analyzed projects.

Due to the limited number of analyzed cases and the focus on a single research institution, the findings should be interpreted as exploratory and illustrative in nature. Nevertheless, the conducted analysis provides valuable insight into the practical differences between national and European models of R&D project management in the railway transport sector.

The study also referred to classical project management concepts, which emphasize the importance of managing scope, time, cost, and quality, as well as stakeholder coordination and risk management in complex projects (PMI, 2021; Kerzner, 2017). Despite the dynamic nature of research and development projects, the fundamental principles of project management remain relevant. However, the specific characteristics of the R&D environment require greater organizational flexibility, interdisciplinary collaboration, and the use of adaptive management mechanisms that enable effective responses to high levels of uncertainty and changing project conditions.

2.2. Railway Research and Development Projects: Review and Document Analysis

In the European Union, stable and long-term funding for scientific research, development activities, and innovation is provided through Framework Programmes (FPs). These multiannual financial frameworks are oriented towards the development of key areas from the perspective of European policy, economy, and society.

The analysis of data on research and development expenditure indicates a clear and significant increase in R&D funding within the European Union over recent decades (Figure 1). Strategic policy documents, such as the Sustainable and Smart Mobility Strategy (European Commission, 2020) and the European Green Deal, play an important role in shaping the allocation of resources, defining the strategic objectives for transport development, including the rail sector.

Within the Horizon 2020 programme, a dedicated public–private partnership for the rail transport sector was established in 2014 under the name “Shift2Rail Joint Undertaking”. During the 2014–2020 period, the European Union allocated EUR 450 million to research and innovation activities in the rail sector. An additional EUR 470 million was contributed by private entities, which together with the EU acted as founding members of the partnership.

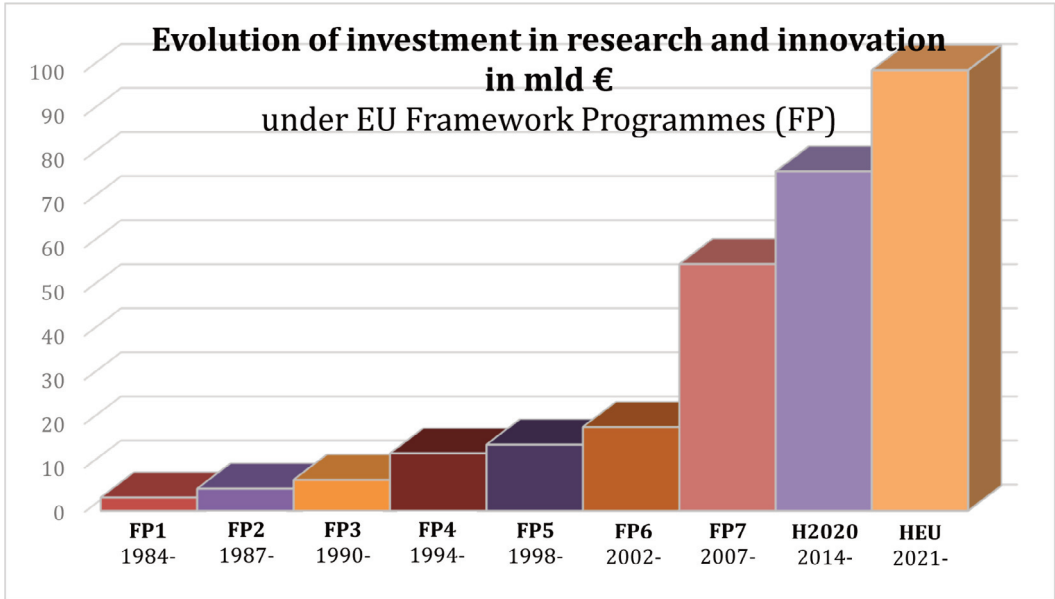


Figure 1. R&D expenditure in the EU. Source: own study based on data published on the website of the National Contact Point: www.kpk.pl [accessed on 4 March 2026].

Shift2Rail activities focused on large-scale and well-coordinated research, development, and innovation efforts aimed at adapting rail transport to the challenges of the twenty-first century. The thematic scope of Shift2Rail was divided into six “Innovation Programmes” (IPs), which addressed:

- passenger rolling stock (IP1),
- traffic management (IP2),
- railway infrastructure (IP3),
- IT solutions for rail services (IP4),
- freight transport (IP5),
- and breakthrough technologies (IPX).

These Innovation Programmes were complemented by additional cross-cutting areas and topics that addressed issues relevant to all projects and captured interactions between the individual IPs. The thematic structure of Shift2Rail is illustrated in Figure 2.

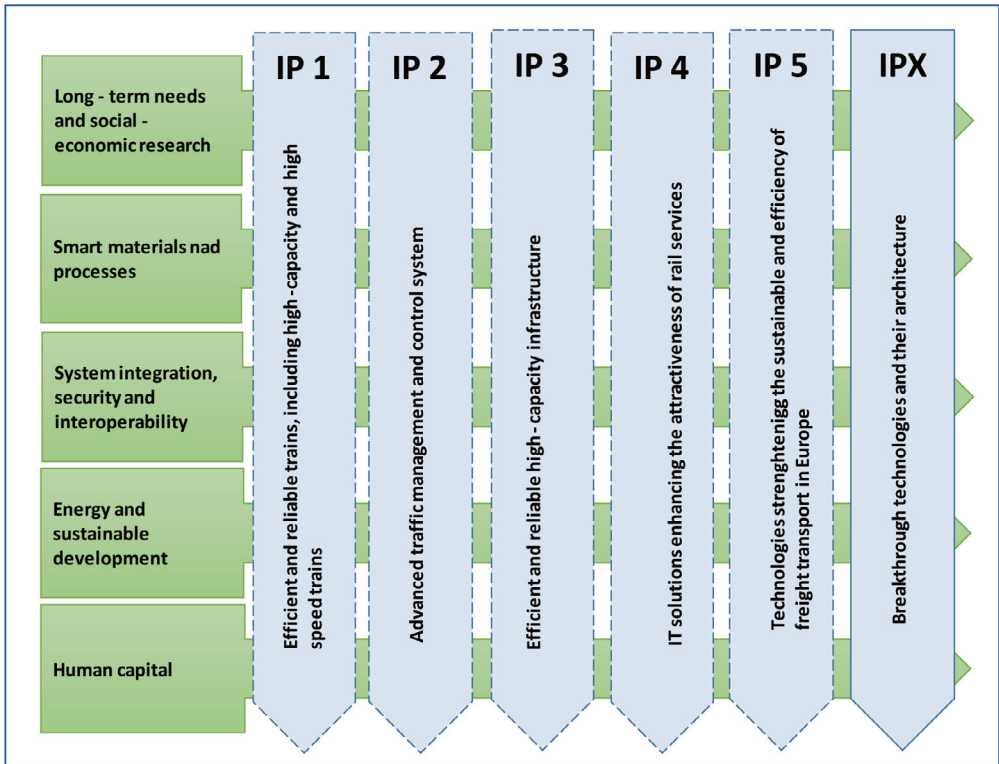


Figure 2. Thematic areas of the Shift2Rail Programme. *Source:* own study based on Shift2Rail Multi-Annual Work Programme available at http://shift2rail.org/wp-content/uploads/2013/07/MAAP-5nal_5nal.pdf [accessed on 6 March 2026].

In the current financial perspective under the Horizon Europe programme, the Europe's Rail Joint Undertaking (ERJU) is in place. The establishment of this dedicated R&I programme, similarly to its predecessor Shift2Rail, was driven by the need to accelerate the implementation of the rail policy packages and enhance interoperability within the European rail system.

The ERJU structure is based on two pillars: the Innovation Pillar and the System Pillar. The Innovation Pillar provides the environment for the implementation of research and innovation projects, while the System Pillar acts as an integrator and architect of the future European rail system. Its objective is to ensure governance, resources, and results that support a coherent and coordinated approach to the development and transformation of the rail sector.

ERJU is a European public-private partnership operating under Horizon Europe, aimed at coordinating and financing research and innovation for sustainable and modern

rail transport. R&D projects are implemented in the form of consortia comprising various stakeholders, including railway undertakings (operators, rolling stock manufacturers, technology suppliers), infrastructure managers, research institutes, universities, and standardisation bodies.

Project management within ERJU includes several key stages. The first is the planning phase and consortium formation, during which partners define common research objectives aligned with the Strategic Research and Innovation Agenda (SRIA). This is followed by the preparation of project documentation in response to a call for proposals, including task allocation, selection of the project leader, budget definition, schedule, and technical objectives. The next stage involves submission of the project proposal via the EU Funding & Tenders Portal. Final evaluation is conducted by independent experts in accordance with criteria defined by the European Commission.

Table 1. Selected European and national research programmes and instruments dedicated to the railway sector in 2020–2027.

Years	Programme	Level	Type of R&D projects	Thematic scope	Beneficiaries
2020–2023	Horizon 2020 – Transport	EU	Industrial research, experimental development	Railway systems, interoperability, safety	International consortia
2020–2023	Shift2Rail Joint Undertaking	EU	Research, demonstration	ERTMS, automation, railway technologies	International consortia
2021–2027	Europe’s Rail Joint Undertaking	EU	Research, demonstration	Digitalisation, automation, traffic management	International consortia
2020–2025	BRIK II	PL	Industrial research, experimental development	Diagnostics, infrastructure, safety	Science–industry consortia
2020–2025	NCBR – Fast Track	PL	Industrial research, experimental development	Transport, including railway	Enterprises, consortia
2020–2025	NCBR sectoral programmes	PL	R&D, demonstration	Transport innovations	Industry, science

Source: own elaboration based on documents of the European Commission, programme materials of Horizon 2020 and Horizon Europe, documentation of Shift2Rail Joint Undertaking and Europe’s Rail Joint Undertaking, as well as data from the National Centre for Research and Development

Abbreviations: ERTMS – European Rail Traffic Management System.

The above table presents selected research and development instruments and programmes addressed to entities operating in the rail transport sector within the European Union and Poland.

In parallel to European initiatives, the National Centre for Research and Development (NCBR) implements so-called joint R&D undertakings. These constitute a financing mechanism for research and development projects carried out in cooperation with an external partner, who is required to provide financial contribution amounting to at least 50% of the funds allocated to the project.

The objective of joint undertakings is to orient the activities of research organisations towards R&D work addressing specific technological needs defined by enterprises or public institutions. Partners in such initiatives may include both public entities and private companies, and projects may be implemented in bilateral or multilateral consortia. Although the partner co-finances selected projects awarded in a competitive procedure, it cannot act as a direct project executor.

This formula is intended for entities possessing a strategic research agenda, the capacity to implement R&D results, and readiness to carry out innovation-oriented projects with a significant share of own financial resources. A proposal for establishing a joint undertaking should include, among others, a description of the partner, the proposed implementation period, the budget (including the partner's contribution), as well as a detailed presentation of problem areas, objectives, justification, and expected R&D outcomes.

An example of such an initiative is the joint undertaking implemented by PKP Polskie Linie Kolejowe S.A. and the National Centre for Research and Development (NCBR) under the name BRIK (Research and Development in Railway Infrastructure). The main objective of the programme is to enhance innovation and competitiveness in rail transport. Its implementation is expected to increase R&D activity in the railway infrastructure sector, foster the development of innovative solutions, improve the efficiency of infrastructure operation and management, and reduce the environmental impact of rail transport. The programme is addressed to both research institutions and enterprises operating in the rail sector.

A total budget of PLN 100 million was allocated to the programme, with PLN 50 million contributed by each partner. The first edition of the competition (BRIK I) was financed under the Smart Growth Operational Programme, whereas the second edition (BRIK II) was fully financed from national funds.

The formal requirements for both editions of the competition were similar. Funding could be applied for exclusively by consortia composed of at least one research organisation and at least one enterprise, or at least two research organisations. A consortium could

consist of a maximum of five entities, and its leader had to be a research organisation. Entities affiliated or partnered with PKP Polskie Linie Kolejowe S.A. were excluded from participation in the competition.

The level of funding depended on the status of the participant and the type of research activities. For research organisations, funding could cover up to 100% of eligible costs, provided that the project was carried out within non-economic activity. Funds granted by the National Centre for Research and Development, as well as remuneration provided by PKP Polskie Linie Kolejowe S.A., were allocated to industrial research and experimental development activities, although the implementation of industrial research was not mandatory in every project.

2.3 Selected Research and Development Projects Implemented by the Railway Research Institute – Comparative Analysis

The aim of this section is a comparative analysis of R&D project management based on two projects implemented with the participation of the Railway Research Institute (Instytut Kolejnictwa, IK): the international FP4 Rail4Earth project funded under the Horizon Europe programme, and the national BRIK project entitled *“Innovative solution enabling rail flaw detection at speeds from 60 km/h to 120 km/h”*, concerning the application of ultrasonic technologies in railway infrastructure diagnostics and financed by the National Centre for Research and Development (NCBR). The analysis focuses on project management level aspects, including organisational structure, decision-making processes, reporting, risk management, and communication.

The FP4 Rail4Earth project is implemented within the framework of the Europe’s Rail Joint Undertaking (ERJU) under Horizon Europe and represents a large-scale, long-term international research and innovation project. Its main objective is to develop solutions supporting the transformation of rail transport towards climate neutrality, including the application of systems thinking, digital twins, integrated energy management, and new infrastructure planning models.

The project is carried out by a broad international consortium comprising research institutes, universities, and industrial stakeholders from multiple European countries. The Railway Research Institute participates in the project as an affiliated entity within the R&D ecosystem coordinated by PKP S.A., and acts as an executor of selected work packages. For instance, within Work Package 9 (WP9) *“Safety issues of hydrogen refuelling stations”*, the Institute contributes to activities aimed at improving hydrogen refuelling systems for the rail sector through the standardisation of their components.

Project activities within this task focus on safety analyses related to hydrogen-powered rolling stock refuelling infrastructure, including issues concerning hydrogen storage and the refuelling process at hydrogen stations.

The BRIK "*Ultrasound*" project represents a national R&D initiative focused on addressing a narrowly defined technical problem, namely the improvement of ultrasonic rail inspection methods for railway tracks. The project is application-oriented and directly responds to the operational needs of the infrastructure manager, which significantly influences its management approach.

At the level of general characteristics, a fundamental difference between the two projects is already evident: Rail4Earth represents a systemic and long-term approach, whereas the BRIK project follows a problem-oriented and task-driven logic.

The management of the FP4 Rail4Earth project is implemented in accordance with the formal requirements of the Horizon Europe programme. The project features a multi-level governance structure, including a Steering Committee, a Project Coordinator, Work Package Leaders, and task-oriented teams. Each work package is defined by clearly specified objectives, timelines, budgets, and measurable outputs (deliverables and milestones). Strategic decisions are taken collectively, which enhances transparency but may prolong decision-making processes.

In the BRIK project, the management structure is significantly simplified. The key role is played by the Project Manager, responsible for the delivery of project scope, budget control, and communication with the funding institution. In the case of a consortium, partner roles are clearly defined in the grant agreement; however, the number of decision-making levels is limited. This structure enables faster responses to technical and organisational challenges.

A comparison of both structures indicates that international projects are dominated by formalised governance models, whereas national projects rely more on hierarchical and operational management models.

Planning in the FP4 Rail4Earth project is based on detailed work plans for individual work packages, which form part of the project documentation approved by the European Commission. Progress monitoring is ensured through periodic reporting, technical reviews, and international meetings. A formal change management procedure is also a key element, requiring approval from relevant project governance bodies.

In the BRIK project, planning and control have a more pragmatic character. The project schedule is defined in the funding agreement, and reporting is carried out at predefined intervals to the National Centre for Research and Development (NCBR). Project modifications, although possible, are assessed primarily in terms of their impact on the achievement of intended implementation outcomes.

These differences demonstrate that EU-funded projects emphasise procedural and documentary compliance, whereas national projects prioritise the effective achievement of technical and implementation objectives.

Risk management in the FP4 Rail4Earth project is systematic and formalised. Risks are identified at both the overall project level and within individual work packages, and mitigation measures are documented and continuously monitored. Communication takes place in an international environment using dedicated IT tools, supported by regular online and in-person meetings.

In the BRIK project, risk management is more operational in nature and relies heavily on the experience of the project team. Communication is direct and often informal, which facilitates rapid problem-solving but at the same time limits the formalisation of project knowledge.

The comparative analysis indicates that different funding sources and objectives of R&D projects determine distinct management models. The FP4 Rail4Earth project represents a governance model based on high formalisation, a complex organisational structure, and a long-term strategic perspective. In contrast, the BRIK project is characterised by agility, a strong focus on technical outcomes, and close alignment with market needs.

From the perspective of a research institute, both models are complementary. European projects foster the development of strategic and international competencies, while national projects enable rapid implementation of innovations and strengthen relationships with key domestic stakeholders.

R&D project management in the rail sector therefore requires flexible adaptation of methods and tools to the specific requirements of the funding programme.

The comparative analysis of FP4 Rail4Earth and BRIK “*Ultrasound*” demonstrates that management effectiveness does not stem from the universality of a single model, but rather from the ability to adapt it to the scale, objectives, and environment of the project. For research institutions, it is therefore crucial to develop competencies in parallel in both international and national project management domains.

Table 2. Comparison of ERJU and BRIK programme instruments in the context of R&D project management.

Criterion	ERJU	BRIK	Managerial implications
Partnership model	international	national	multi-level vs national coordination
Management level	international consortia	national consortia	complexity of relationships

Criterion	ERJU	BRIK	Managerial implications
Project scale	large, systemic	medium, problem-oriented	strategic vs operational
Formalisation	high (EU)	high (national)	higher administrative burden in EU
Evaluation	Excellence, Impact, Implementation	NCBR + partner	EU focus on impact
Funding model	reimbursement-based	grant-based + partner contribution	greater stability in BRIK
Funding intensity	depends on entity type	up to 100% (science)	lower risk in BRIK
Strategy	EU transformation	national infrastructure	long-term vs implementation-oriented
Risk level	high	moderate	project management approach
Implementation	indirect	direct	stronger implementation in BRIK
Institutional position	internationalisation	national	prestige vs relationships

Source: own elaboration based on EU and NCBR data.

3. Results

The conducted analysis of the literature, programme documentation, and case studies of projects implemented by the Railway Research Institute enabled the identification of key similarities and differences in the management of national and European research and development projects in the rail sector. The obtained results confirm that the source of funding, project scale, and strategic objectives significantly determine the management model, the level of formalisation, and the competencies required from project teams.

The first significant finding of the study is that European projects are characterised by a high level of formalisation of management processes, including planning, reporting, progress monitoring, and risk management. In projects implemented under the Horizon Europe programme, such as FP4 Rail4Earth, multi-level governance structures, extensive decision-making procedures, and precisely defined roles and responsibilities of partners are in place. This model enhances transparency and ensures alignment with the strategic objectives of the European Union; however, it simultaneously reduces operational flexibility and extends decision-making processes.

The second key finding is the identification of a more operational and technically result-oriented model of national project management, represented by projects implemented under NCBR programmes, including BRIK. These projects are characterised by a simplified organisational structure, shorter decision-making chains, and a strong focus on the needs of a specific stakeholder, most often an enterprise or a public institution. As a result, they enable faster implementation of R&D outcomes and more effective technology transfer into economic practice.

The comparative analysis also showed that the role of managerial competencies differs between the two types of projects, although it remains equally important. In European projects, key competencies include international coordination, intercultural management, communication skills, and familiarity with EU programme procedures. In contrast, national projects place greater emphasis on the ability to solve technical problems on an ongoing basis, manage project teams, and effectively cooperate with domestic stakeholders.

An important result of the study is also the confirmation that national and European projects play complementary roles for research institutions. European projects contribute to the development of long-term scientific potential, the enhancement of strategic competencies, and the internationalisation of research activities. National projects, in turn, strengthen the implementation capabilities of institutions, enabling the rapid application of research results in practice and the development of durable relationships with the national rail sector.

4. Discussion and Conclusions

The aim of this article was to identify and analyse selected aspects of the management of national and European research and development (R&D) projects in the rail sector, as well as to assess their significance for the development of research institutions. The study supports the assumption that effective management of R&D projects in the rail sector may require the integration of advanced technical expertise, efficient partnership cooperation, and the adaptation of management tools to the specific characteristics of the funding programme. Due to the exploratory nature of the analysis, these observations should be interpreted primarily in relation to the analysed institutional context.

The analysis suggests that the differences between national and European projects are not limited to the level of funding but may also involve distinct approaches to planning, control, reporting, and the implementation of results. European Union-funded projects, implemented within framework programmes, primarily fulfil a strategic function by fostering systemic innovation, the standardisation of solutions, and the integration of the

European rail market. National projects, in turn, address the current needs of the sector by supporting innovations of an applied and implementation-oriented nature.

A particularly important aspect of the analysed projects is their impact on technology transfer and science–business cooperation. National projects, such as BRIK, constitute a direct mechanism for transferring research results into economic practice due to their strong alignment with the needs of enterprises and infrastructure managers.

European projects, by contrast, support technological development at a systemic level, creating the foundations for future implementations and the international standardisation of solutions. The literature emphasises that effective technology transfer is closely associated with the level of cooperation between science and industry, as well as with the ability of institutions to operate within an open innovation model (Chesbrough, 2003; Perkmann et al., 2013).

Consequently, the findings indicate that the integration of both strategic and applied approaches may support the development of sustainable science–business relationships within research institutions.

From the perspective of a research institution such as IK, the ability to operate simultaneously in both domains is of crucial importance. Experience gained through the implementation of international projects can be used to professionalise the management of national projects, while national projects provide a natural environment for testing and implementing solutions developed within European initiatives.

Embedding railway projects within strategic public policy frameworks, including the objectives of the European Green Deal, further strengthens their importance as instruments supporting the transition towards sustainable mobility. Rail transport, regarded as one of the pillars of transport system decarbonisation, has become a priority area for research funding, thereby increasing the importance of effective project management.

At the institutional level, participation in European projects may contribute to the internationalisation of scientific activity, enhance organisational absorptive capacity, and improve competitiveness in subsequent grant competitions. As a result, R&D project management ceases to be merely an operational function and becomes an integral element of a research institution's development strategy, influencing its sustainability and position within both national and European innovation systems.

The conclusions of this article are intended primarily as a contribution to the discussion on R&D project management in the rail sector and as a potential source of practical insights for institutions responsible for innovation policy and the distribution of public funds. Owing to the exploratory character of the study and its focus on a specific institutional context, the findings should not be interpreted as the basis for a universal model of R&D project management. In particular, the findings highlight the need to

strengthen managerial competences within research institutions and to create mechanisms facilitating knowledge transfer between national and European projects.

Another important conclusion concerns the need for the further professionalisation of administrative and project-support structures within research institutions. The growing number of international projects generates substantial procedural and reporting burdens that require specialised organisational support.

In this context, R&D project management may also be viewed as one of the elements influencing a research institution's image, collaboration networks, and ability to commercialise research results.

From a marketing perspective, participation in R&D projects—particularly those implemented at the European level—significantly enhances the visibility and reputation of research institutions. International projects contribute to building brand recognition, credibility, and trust among stakeholders, while national projects strengthen direct relationships with industry partners and facilitate the commercialisation of research results. Consequently, within the analysed context, R&D project activity may be interpreted not only as a research function but also as a factor supporting the positioning of research institutions within the innovation ecosystem.

The conducted analysis was not intended to develop a universal model for managing R&D projects in the railway sector. Instead, the study constitutes an exploratory comparison of selected project management practices applied in national and European projects observed at the Railway Research Institute. The presented findings therefore relate primarily to the analysed institutional environment and should be interpreted with caution when referring to other organisational or national contexts.

Despite its limited empirical scope, the analysis indicates significant differences between national and European frameworks for implementing R&D projects, particularly in terms of administrative complexity, stakeholder coordination, reporting requirements, and opportunities for international knowledge exchange.

The study also demonstrates that participation in European projects may strengthen organisational learning processes, support the development of international cooperation networks, and enhance institutional competences related to technology transfer.

Future research should include a broader range of projects and institutions in order to verify the identified observations and develop more generalisable conclusions.

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