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Managing innovation in corporations: The experience of JSC Russian Railways*

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ABSTRACT This paper examines the innovation management system at Russian Railways (RZD), one of the largest railway companies in the world, and analyses the evolution of the RZD innovation policy from 2007 — the year that a strategic course for technological development was taken — up to the present day.

In the paper the authors describe the key institutional element of the system: the Center for Innovative Development (established in 2009), which coordinates strategic planning, methodological supporting, the management of the external projects portfolio, interacting with the external environment, and intellectual capital. We also show how the company moved from isolated experiments to a centralized management system that oversees its central and regional levels, as well as subsidiaries.

The paper introduces the main forecasting and planning tools used: foresights (including a long-term, foresight study up to 2050 completed in 2021) and technological comparisons (benchmarking against 60 foreign companies according to 70 individual metrics and 34 technological areas). The authors give examples of innovative projects that are being implemented: driverless trains on the Moscow Central Circle; a digital railway station in Chelyabinsk; and the construction of the high-speed railway between Moscow and St. Petersburg.

Further, we describe the "open innovations" ecosystem: regional centres for innovative development; the "One Stop Shop for Innovations" digital platform; and partnerships with technology parks and innovation clusters (Skolkovo, Innopolis, etc.). The mechanisms for supporting projects at all stages are explained — from idea (quantoriums, business incubators, and the "New Link" and JSC RZD "Idea" competitions) to replication (the Russian Railways Innovation Support Programme).

Particular attention is paid to intellectual property management: the portfolio of JSC Russian Railways includes more than 4700 assets (software, inventions, utility models, trademarks). Measures to protect intellectual property, litigation work, and commercialization strategy are discussed.

The authors conclude that a systemic innovation policy, coupled with the synergy of internal and external resources, a focus on technological sovereignty and intellectual capital management, will ensure that Russian Railways maintains its position as a transport industry leader.

KEYWORDS: innovation; JSC RZD; innovation management; innovative ecosystem; foresight; benchmarking; open innovation; intellectual property; technological development; regional centres for innovative development; digital platform; technological sovereignty

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Обзорная статья

Управление инновациями в корпорациях: опыт компании «Российские железные дороги»*

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АННОТАЦИЯ Рассмотрена система управления инновациями в ОАО «РЖД» — одной из крупнейших железнодорожных компаний мира. Проанализирована эволюция инновационной политики компании с 2007 г., когда был взят стратегический курс на технологическое развитие, и до настоящего времени.

Описан ключевой институциональный элемент системы — Центр инновационного развития (создан в 2009 г.), координирующий стратегическое планирование, методологическую поддержку, управление портфелем внешних проектов, взаимодействие с внешней средой и интеллектуальным капиталом. Показано, как компания перешла от точечных экспериментов к централизованной системе управления инновациями, охватывающей центральный и региональный уровни, а также дочерние общества.

Раскрыты основные инструменты прогнозирования и планирования: форсайты (в том числе долгосрочный форсайт до 2050 г., проведенный в 2021 г.) и технологические сопоставления (бенчмаркинг с 60 зарубежными компаниями по 70 показателям и 34 технологическим направлениям). Приведены примеры реализованных инновационных проектов: беспилотное движение на Московском центральном кольце, цифровая железнодорожная станция в Челябинске, строительство высокоскоростной магистрали Москва – Санкт-Петербург.

Охарактеризована экосистема «открытых инноваций»: региональные центры инновационного развития, цифровая платформа «Единое окно инноваций», партнерство с технопарками и инновационными кластерами (Сколково, Иннополис и др.). Описаны механизмы поддержки проектов на всех этапах — от идеи (кванториумы, бизнес-инкубаторы, конкурсы «Новое звено» и «Идея» ОАО «РЖД») до тиражирования (Программа поддержки инноваций ОАО «РЖД»).

Особое внимание уделено управлению интеллектуальной собственностью: портфель ОАО «РЖД» насчитывает свыше 4700 объектов (программное обеспечение, изобретения, полезные модели, товарные знаки). Рассмотрены меры по защите интеллектуальной собственности, судебно-претензионная работа и стратегия коммерциализации.

Авторы приходят к выводу, что системная инновационная политика, интеграция внутренних и внешних ресурсов, фокус на технологическом суверенитете и управлении интеллектуальным капиталом обеспечивают ОАО «РЖД» лидерство в транспортной отрасли.

КЛЮЧЕВЫЕ СЛОВА: инновации; ОАО «РЖД»; управление инновациями; инновационная экосистема; форсайт; бенчмаркинг; открытые инновации; интеллектуальная собственность; технологическое развитие; региональные центры инновационного развития; цифровая платформа; технологическая суверенитет

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INTRODUCTION

Rail transport plays a vital role in the development of national transportation systems and economies. Railways create new transport corridors, improve regional connectivity, develop domestic tourism and help shape a comfortable and safe environment for millions of people — both passengers and shippers. The appearance of new technologies opens up new horizons and opportunities for innovative development in rail transport. The implementation of innovations allows railway companies to respond quickly to changes in consumer preferences and the market environment, helping increase the competitiveness of rail transport compared to road and air transport.

The innovative development of Russian Railways (JSC RZD) is inextricably linked with the prospects, goals, and objectives of the country in general, which are defined in the Concept of Technological Development of the Russian Federation for the period up to 2030, the national goals for the Russian Federation up to 2030 and up to 2035, and Federal Law No. 523-FZ "On the Technological Policy of the Russian Federation" dated 28 December 2024.

THE STRATEGIC VECTOR OF INNOVATIVE DEVELOPMENT

Russian Railways is one of the largest and most innovative railway companies in the world today. The company embarked on a strategic course towards innovative development in 2007 following a rebranding and a review of the company's business development strategy. The Center for Innovative Development (hereinafter referred to as the Center) was established in 2009 to organize the innovative activities of this vertically integrated and systemically important company in Russia [1][1]. The Center became an integrator of new competencies and the basis for the development of an

[1] List of Systemically Important Organizations of the Russian Economy: Approved by Minutes No. 3 of the Meeting of the Government Commission to Increase the Sustainability of the Development of the Russian Economy dated 20 March 2020. Available at: https://www.consultant.ru/document/cons_doc_LAW_349267/40833be0fb65511bddc7cff58090c734a22b7ab3/.

innovative ecosystem and the dissemination of an innovation culture throughout the country's network.

This came after the appearance of various internal and external factors that led to an increased need for the following processes:

- the development of interaction with manufacturing companies and small tech entrepreneurs at the regional level;
- the development of systematic work with the executive authorities, research organizations, state corporations, and other structures on issues related to innovative activities;
- a transition from targeted work with promising projects and initiatives at the local level to the creation of a centralized system uniting JSC Russian Railways, its branches and other structural divisions and regulating work with innovations at all stages of their implementation.

The Government of the Russian Federation set the task of implementing innovative development programmes in 2010[2, 3]. Just one year later, the JSC Russian Railways Board of Directors approved its Innovative Development Programme for the period up to 2015 (IDP 2015), marking the launch of systematic work in priority areas of the company's innovative development. The basic principles of technological development were established, defining the timeline for the implementation of resource-saving technologies, the creation of modern transport and logistics systems, and the complete overhaul of rolling stock and infrastructure in line with the best international practices.

The Center has come a long way since its establishment 16 years ago, as have the innovative activities at JSC Russian Railways:

- Planning horizons have been expanded; organizational changes have been introduced to support innovations and new strategic areas for development have been established: import substitution, the involvement of external organizations (universities, tech companies, development institutions) in solving the company's problems, protecting and developing its own intellectual capital.
- A comprehensive system of support for innovative projects and a functional vertical structure have been created that oversees the central and regional levels of innovation management and extends to subsidiaries of JSC Russian Railways.

However, the company has faced new challenges since 2020: the COVID-19 pandemic; sanctions; the withdrawal of Western companies from the Russian market; problems with staff retention and much more. The response to these challenges was a rethinking of the innovative development priorities, with a focus on ensuring technological sovereignty and improving the safety of rail transport. The company focused on ensuring transport accessibility across the country, improving services, enhancing comfort and speed for passengers and freight, improving the quality of transportation, and developing new types of services based on the latest technologies. Russian Railways is focused more than ever on improving energy efficiency and environmental friendliness, automation, robotics, and AI implementation.

Today, Russian Railways is working with the business community to develop hi-tech areas relevant to the government and is also implementing national projects that create new opportunities for accelerating the technological development of rail transport in Russia.

THE ARCHITECTURE OF THE INNOVATION ECOSYSTEM

The Russian Railways Holding's innovation ecosystem combines sources of "in-house" innovations (for example, the scientific-industrial complex) and tools for attracting and adapting external innovative solutions and technologies.

1. Science institutes — RZD subsidiaries (Railway Research Institute, RIIZT; Scientific Research Institute of Railway Transport; All-Russian Research and Design Technological Institute of Rolling Stock, VNIKTI; Institute of Transport Economics and Development, IERT; etc.), design bureaus and research laboratories attached to the largest research and technological centres in Russia (for example, the Innovation Center for Railway Transport, a resident of the Skolkovo Innovation Center), specialized JSC RZD research laboratories in the Lomonosov cluster (*Fig. 1*), and others ensure the continuity and development of engineering knowledge and expertise in fundamental areas of railway transport, and are directly involved in applied R&D for JSC RZD and the rail industry.

2. Understanding that breakthrough technologies often emerge outside the industry, Russian Railways has built an extensive system of interaction with the external innovation environment. The partner network includes hundreds of technology parks, industrial clusters, and industrial competence centres (such as the Moscow Innovation Cluster Fund, MIC Fund;

[2] Instruction No. Pr-22 of the President of the Russian Federation on the Results of the Work of the Presidential Commission on the Modernization and Technological Development of the Russian Economy dated 4 January 2010.
[3] Minutes No. 4 of the Meeting of the Government Commission on High Technologies and Innovations dated 3 August 2010 (Para. 4).

Fig. 1. Quantum Communications Center in the Lomonosov Cluster. Photo provided by the press service of Russian Railways

the Skolkovo Foundation; Joint Stock Company Technopark of Novosibirsk Academgorodok, Academpark Innopolis Special Economic Zone in Tatarstan, Open Joint-Stock Company Lenpoligrafmash in St. Petersburg, and many others). The main goal of this partnership is to identify, adapt, or jointly develop promising domestic technologies to meet the requirements of rail transport in such areas as unmanned vehicles, new materials, intelligent surveillance systems, digital platforms, and others.

Regional Innovation Development Centers (RIDCs) have been established on all the country's railways, ensuring productive interaction between JSC RZD divisions and innovative solutions developers (small tech companies, industrial enterprises, scientific and production organizations).

The Center for Innovative Development coordinates the activities of all elements of the Russian Railways Holding's innovation management system:

- *strategic planning:* the Center defines the priority areas of technological development, which in turn form the basis of "road maps" for all participants in the innovation ecosystem;
- *methodological support:* within its scope of responsibility, the Center provides the methodological base for the company's structural divisions (directorates, branches), which makes it possible to create standardized and effective project development processes "on the ground," bringing innovations as close as possible to the end customer — the company's divisions;
- *External project portfolio management:* end-to-end management of open innovation projects — from collecting information on the needs of the company's units, searching for and evaluating relevant innovative solutions, to selecting tools for adapting and refining them and organizing pilot testing, implementation, and subsequent replication across the network;
- *Systemic work with the external environment:* the Center serves as a "one-stop shop" for thousands of external tech suppliers, structuring their requests and proposals and directing them to the appropriate units;
- *Intellectual property management:* legal protection and commercialization of JSC RZD's intellectual activities results.

FORECASTING, PLANNING, AND DISTRIBUTION OF TASKS

In the context of the rapidly changing macroeconomic situation, the company has established a process for developing strategic priorities for the short- (three to five years) and long-term (20–30 years) planning horizons to promptly identify new areas for the development of rail transport and introduce innovations into the activities of JSC RZD.

The main tools used in this process are foresight and technological comparisons, integrated into the innovation management system of the Russian Railways Holding. These tools allow us to analyse promising trends in the development of the transport industry, as well as in the Russian and global socio-economic systems, and identify best practices and solutions based on the experience of the most tech-savvy companies.

Foresight and technological comparison (benchmarking) are quantitative, qualitative, and expert forecasting and analysis methods that are used to assess the current company's innovative development level and formulate a development strategy that identifies promising vectors for achieving set goals. The process involves analysing the strategic documents of countries and companies, reports of international organizations, and patent databases.

Foresight is the main tool of technological forecasting, based on the analysis of extensive flows from various sources. Focus groups are a big part of the foresight process, which involves brainstorming sessions and the tracking of futurological forecasts. The expert community's involvement in this activity is in the form of hundreds of multidisciplinary experts in the most important areas of scientific, technological, and engineering development. Dialogue with them allows Russian Railways to assess the speed of breakthrough innovations, determine the impact of technological changes on rail transport, and, through joint efforts, model the most effective development scenarios.

The first Russian Railways foresight study was completed in 2021. It focused on technological development and had a forecast horizon that extends to 2050. The global trends identified and the factors that characterize them allowed the Center to forecast potential scenarios for long-term technological development and

Fig. 2. Lastochka Driverless Electric Train on the Moscow Central Circle

Fig. 3. Operator monitoring the movement of the Lastochka Driverless Train on the Moscow Central Circle

Fig 4. Chelyabinsk-Glavny Station, where construction of a multifunctional digital railway station (Smart Station) is being completed

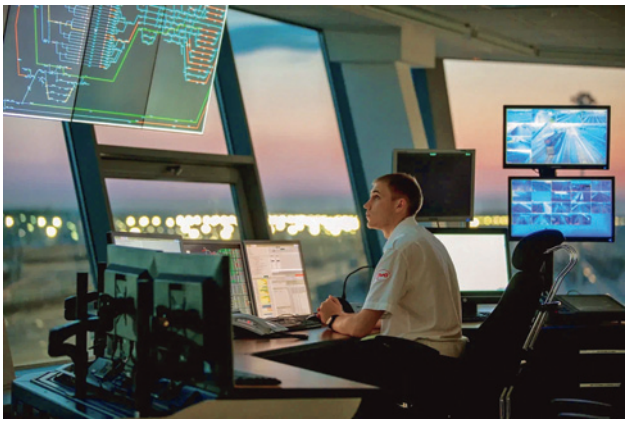

Fig. 5. Duty Officer at Chelyabinsk-Glavny Station

Photos provided by the press service of Russian Railways

establish new requirements for the future transport infrastructure, rolling stock, and transport process[4] [4].

In addition, every year, JSC Russian Railways engages independent experts to help assess its technological development measures compare to other railway companies around the world. For example, in 2024, the company carried out a comprehensive comparison of the business models of 60 companies across 70 performance indicators and 34 technology areas. Key areas that were analysed include transport logistics, transportation management, digitalization, hi-tech solutions implementation, the development of innovative rolling stock and infrastructure, energy efficiency improvement, environmental friendliness, and the transportation process safety.

Foresight and benchmarking allow companies to move from technological forecasts to planning activities and setting specific objectives based on reserves for growth and the achievement long-term goals. In the period from 2018 to 2025 alone, JSC Russian Railways, JSC RZD updated the Holding's key strategic documents and launched several cross-functional innovative products, including:

- The launch of an experimental electric train service on the Moscow Central Circle (MCC), where the driver simply monitors the equipment, while an intelligent system steers the train autonomously (*Fig. 2*, *Fig. 3*).
- The construction of a multifunctional digital railway station (smart station) at Chelyabinsk-Glavny Station, which is almost complete. Advanced robotics and digital solutions and systems are being implemented to ensure a full cycle of automation and robotization of its technological processes (*Fig. 4*, *Fig. 5*).
- The launch of construction of a high-speed railway line on the Moscow – St. Petersburg section. Innovative track and catenary system designs are cur-

[4] RZD 2050: Looking Beyond the Horizon. Ed. by V. Saraev. Moscow: Innopraktika. Available at: https://company.rzd.ru/ru/9990/page/103290?id=19093#main-header.

rently being created for this. and a train that will operate at speeds of up to 360 km/h on the line is being developed domestically.

"OPEN THE DOORS": IMPLEMENTING THE "OPEN INNOVATION" FORMAT

Over the past two decades, the speed at which technology is progressing has become a critical factor in the development of major companies. Many corporations (Russian Railways included) have leveraged their own sources of innovation, with the entire cycle — from research and development to implementation — being contained within the company itself. In the context of the digital revolution, those who deliberately started to incorporate "external" ideas and technologies in a line with their own in-house developments gained a competitive advantage.

Working with innovations created by third parties has enabled Russian Railways to transition from isolated experiments to the creation of a sustainable system of continuous research, testing, adaptation, implementation, and replication of new technical and technological solutions. This has led not only to the implementation and large-scale rollout of specific technological solutions across the company's infrastructure, but also to the development of a culture of innovation, which is reflected in the openness of its employees to anything new and a willingness to seek new solutions to current challenges, including challenges outside of the company.

The regional innovation development centres established from Kaliningrad to Khabarovsk have played a crucial role in this.

Regional centres articulate the Holding's needs and harness the scientific and industrial potential of the constituent entities of the Russian Federation to address the most pressing challenges facing the company.

The centres serve as attraction points for innovative activity in the regions, localizing the company's objectives. For example, on 21 April every year, the regional centres celebrate Russian Railways Innovation Day, timed to coincide with World Creativity and Innovation Day. Every year, up to 10,000 Russian Railways employees, tech entrepreneurs, government representatives, development institutions, research organizations and universities, and innovative manufacturing enterprises take part in Russian Railways Innovation Day events across the country.

The Oktyabrsky Center for Innovative Development opened by JSC RZD CEO and Chairman of the Board Oleg Belozerov and Governor of St. Petersburg Alexander Beglov in June 2019 was the first of its kind.

Another key element of the open innovation process was the creation of a unified digital platform — the "JSC RZD Single Window of Innovation" — to accept technology requests from the Holding's customer divisions and innovation initiatives from external parties.

This way, not all technologies are developed exclusively within the company, allowing it to borrow best practices from other industries and integrate them into its production processes, including through long-term partnerships with the scientific and technological community. Developers from outside the company propose solutions, while experts in the relevant areas at the company evaluate their potential application, adaptation, and implementation.

The fact that all participants in the project selection process have access to a single digital platform, coupled with the fact that the regional centres are distributed more or less evenly across the country's railway network, means that submissions can be reviewed at the centre for innovative development that is closest to the applicant and then tested on the railway whose needs and specific features they address (climate conditions, logistics infrastructure, etc.). This type of information exchange makes it possible to quickly replicate promising solutions that have undergone successful testing in one region on other railways.

More than 10,000 external innovative proposals have been submitted and reviewed in the seven years since the platform's launch.

COMPREHENSIVE SOLUTIONS FROM IDEA TO ROLLOUT

JSC RZD Russian Railways is developing a corporate ecosystem for innovation activities, integrating various tools to support promising projects to scale up the implementation of innovative solutions, accelerate their adaptation, and attract external funding to refine projects in the company's interests (*Fig. 6*).

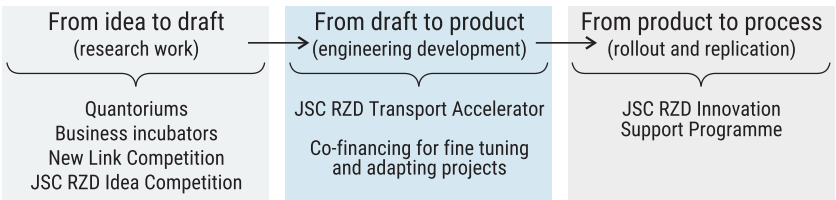

Fig. 6. Support Mechanisms for Innovative Projects

JSC RZD has a comprehensive system of support for innovative projects at all stages of their life cycle — from a promising idea to the project's rollout at railway sites.

One of the company's strategic priorities is the development of human capital. The development of innovative thinking in future specialists starts at school — at the Quantorium children's tech parks and the business incubators at the country's leading transport universities. Here, schoolchildren and students master the basics of technical creativity and project work and learn the fundamentals of business.

One example is the joint student business incubator set up by the Oktyabrskaya Railway and Emperor Alexander I St. Petersburg State Transport University, where heads of production departments provide support for projects developed by future specialists and encourage student entrepreneurship through consulting and project assessment.

In addition, large corporate competitions are held every year within the company, serving as a "social lift" and way of "monitoring" promising ideas put forward by employees. The "New Link" youth project competition and the JSC RZD "Idea" Innovation Proposal Competition attract an impressive number of participants every year — more than 5000 people submitting approximately 2000 projects and initiatives for expert review. The most promising of these go through acceleration programmes before in-depth development and implementation.

Key in the development of the innovation ecosystem is the practice of attracting external financing. JSC RZD actively works with the constituent entities of the Russian Federation and foundations that support scientific activities. To systematize this work, the company has compiled and constantly updates a list of more than 70 federal and regional support programmes.

The Russian Railways Innovation Support Programme serves as the corporate financial support instrument, and it has been running since 2022. Approximately 200 projects run by 28 company divisions have been financed since its launch through direct financing, which demonstrates the demand for this mechanism and its role in bringing promising developments to the implementation stage.

PROTECTING AND MANAGING RZD'S INTELLECTUAL CAPITAL

In today's economy, the value of a company is measured not only by its tangible assets, but also by its intellectual capital.

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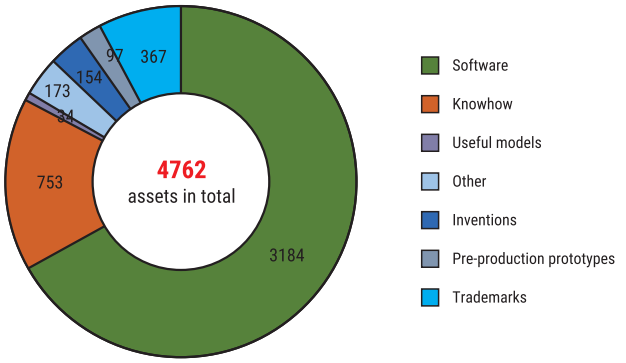

Fig. 7. JSC RZD Intellectual Property Portfolio as of 1H 2025

For such a technically complex and massive corporation as Russian Railways, intellectual property (IP) is a significant strategic resource. Having one of the largest IP portfolios among companies with state participation (more than 4700 assets, per 1H 2025 results *Fig. 7*), JSC RZD has built a comprehensive and proactive system for its protection and management.

The Russian Railways IP portfolio is a dynamically developing structure that includes all types of results of intellectual activity (RIA) that are granted legal protection in accordance with the law. Since the beginning of 2025 alone, Russian Railways has been granted intellectual property rights (patents and certificates) to over 300 assets. The portfolio structure (see *Fig. 2*) clearly demonstrates the company's digital transformation: nearly 70% of the IP portfolio is made up of computer programs. This is the core of the digital infrastructure that powers the entire enterprise — from transportation management systems to customer services.

Approximately 20% of the JSC RZD IP portfolio consists of registered inventions and useful models that protect breakthrough technical solutions in the field of traction, infrastructure, and logistics. A regulatory framework is the basis for managing these assets. Several internal documents were revised and updated in 2024–2025 that regulate the company's activities at various stages of the IP lifecycle — from identifying promising developments to their commercialization. Among these is the company's key document in this area — the IP Management Strategy for the Period up to 2030 (hereinafter referred to as the Strategy) — is undergoing approval. Among the priorities outlined in the strategy are ensuring the company's technological sovereignty and leadership. Thus, working with IP not only protects significant investments in R&D from potential plagiarism, but it also allows the company to benefit from the use of new, superior developments.

Another area of the Russian Railways' work is the protection of its trademarks. The company has established a practice of registering all names used. However, legal protection alone is not always sufficient to

combat IP theft. Since 2024, the Center for Innovative Development has been working alongside the company's legal department to conduct systematic litigation and claims work. Practice shows that the claims stage is frequently ignored by the guilty parties. The response to this is to initiate legal proceedings. In 2024–2025 alone, approximately 300 violations were suppressed, a significant portion of which concerned the sale of counterfeit products online (goods bearing the Russian Railways logo, for example).

Not only does this work bring benefits in terms of monetary compensation, but it also serves a preventative purpose. The information that is made public about Russian Railways actively initiating claims for IP violation and the amounts the company has received in compensation for such violations is creating a new reality in which offenders are forced to take the risks into account. In addition to protecting the company's rights, measures are also being taken to commercialize its intellectual property.

Every year, JSC RZD enters into licensing agreements for the right to use its IP, demonstrating that it is in demand not only within the company, but also in related markets. The Strategy assumes that income from the use of the IP portfolio will continue to grow.

Thus, JSC RZD's IP activities are developing from solving tactical problems of registering and protecting IP to building a strategic system that is able to anticipate potential challenges. The company's large and diversified portfolio, supported by the digitalization of patent documentation and an active legal position, has become a key asset ensuring the Holding's technological leadership and sustainability. Intellectual property is no longer simply a legal formality; it is a fully fledged tool for managing innovation and strengthening national technological sovereignty in a critically important area — rail transport.

CONCLUSION

The railway is a complex system of transport, energy, services, environment, and people that transforms rails, stations, and rolling stock into a single, living organism. It is a sustainable ecosystem that ensures the seamless fusion of customer needs, innovative technologies, and engineering expertise.

JSC RZD's continuous innovation system is a key factor in the company's accelerated growth: cutting-edge developments allow Russian Railways to continually improve service quality, safety, mobility, and comfort. Its flexible and systematic approach to planning innovation activities and implementing innovative projects, the innovation management ecosystem it has established, and its partnerships with organizations in the external innovation environment ensure that Russian Railways is one of the most innovative and hi-tech transport companies in the world.

Bionotes

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