

ARTICLE

CROWDSOURCING PLATFORM FOR CREATING INNOVATIONS IN TRANSPORT INDUSTRY

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ABSTRACT

Transport is the connecting link of the economy of any state. For its successful development, the transport industry must use the achievements of science and modern technologies. Nowadays, there are contradictions that do not allow us to use effectively the potential of transport Universities in the interests of the transport industry. The article is devoted to the development of a unified cross-industry information and management platform (digital platform) ensuring effective interaction between research teams of Universities and transport enterprises. The digital platform is a crowd sourcing platform designed to bring together customers and performers of scientific and innovative projects. The purpose of the study is to develop a digital platform that allows railway equipment manufacturers, operating and repair organizations to interact with industry universities in order to attract their scientific personnel to implement innovative developments to improve the reliability, resources and cost reduction at each stage of the creation, operation and maintenance of rolling stock. The article considers the existing contradictions of scientific and innovative work implemented by industry transport Universities of Russia, defines the tasks of the digital platform, defines the list of possible Roles of participants, forms a list of services and regulations for working in the digital platform, develops a structural diagram of the digital platform.

KEY WORDS

Information platform, intersubjective reliability, interaction between business and science, creation of innovations, scientific personnel

INTRODUCTION

Currently, the transport complex of the Russian Federation is a collection of companies providing Currently, the transport complex of the Russian Federation is a combination of enterprises that provide transportation services, logistics companies that operate transport services, transportation departments, transport agencies that regulate processes in the field of transport, manufacturers of transport equipment and transport infrastructure, and industry transport Universities that provide training and scientific research for transport. To date, the lack of a unified information system does not allow us to fully use the potential of industry transport Universities to solve industry problems, introduce innovative developments in the creation of new models of equipment, carrying out repair works, and use the potential of regional enterprises. Samara State Transport University is developing a single inter-industry information and management platform (hereinafter referred to as the "digital platform") with the participation of the Federal Agency for Railway Transport, State Transport Universities, enterprises of JSC "Russian Railways", large regional industrial enterprises with the possibility of accessing the system of third-party contractors and enterprises.

At its core, a digital platform is a crowdsourcing platform designed to bring together customers and performers of scientific and innovative projects. There is a wide variety of foreign crowdsourcing platforms [1-4]. Existing systems do not allow for the organization of interaction between railway equipment manufacturers, operating and repair organizations with industry universities in order to attract their scientific personnel to implement innovative developments to improve reliability, resource and reduce cost at each stage of creation, operation, and repair of rolling stock.

A small amount of research in our country has been devoted to creating crowdsourcing platforms. The works [5-11] are of interest for research. The purpose of the research is to develop a digital platform that allows railway equipment manufacturers, operating and repair organizations to interact with industry universities in order to attract their scientific personnel to implement innovative developments to improve reliability, resource and reduce cost at each stage of creation, operation, and repair of rolling stock. To achieve this goal, the following tasks were set and solved:

- Consider the contradictions of scientific and innovative work implemented by industry transport universities in Russia.
- Define the tasks of the digital platform.
- Define a list of possible Roles for participants.
- Create a list of services and regulations for working in the digital platform.
- Develop a block diagram of the digital platform.

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The study used the methods of expert estimations, method of analysis and synthesis, numerical simulation. The object of research is an information system. The subject of the study is the interaction of participants of the process.

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GENERAL REQUIREMENTS FOR A UNIFIED CROSS-INDUSTRY INFORMATION AND MANAGEMENT PLATFORM: SCIENCE-PRODUCTION-OPERATION

Let's consider the contradictions of scientific and innovative work carried out by industry transport Universities in Russia. During the long period of the late Soviet period 1970 – 1990 and the early Russian period 1990 – 2000, Universities received relatively easy funding for research activities. At the same time, the results of scientific work were not always translated into innovations in the sectors of the national economy. A significant part of the scientific work ended with reports that had no further implementation. The main performance indicators were: the scientific level of work, economic and technical effects, as well as the facts of obtaining documents on registration of intellectual property objects in the country and scientific publications. Funding was allocated mainly on a non-competitive basis. An important role was played by the authority of the heads of scientific schools and its relationship with employers who allocate funds for scientific work. There was practically no competition in scientific work.

At the beginning of the 21-st century, University science found itself in an unusual situation. The market economy gradually led to competition in scientific work. Almost all types of scientific work were distributed on a competitive basis. The main criteria for the effectiveness of scientific work included in the tender documentation are: achievement of targets and economic efficiency of scientific work. The target indicators were the effectiveness of the resulting innovations, such as: reducing customer costs, increasing labor productivity, increasing profits, etc. Such indicators as the level of scientific study of the topic, the number of scientific publications, etc., have ceased to be of value to the customer, since they are not the final result, but only an intermediate one. Personal connections no longer matter. In fact, the customer became less interested in scientific work. There is an increased interest in the end result – innovation.

Let's consider the current situation and the place of University science in the development and implementation of innovations. It can be schematically depicted in the diagram of [Fig. 1], where the abscissa scale shows the conditional level of scientific novelty of the work performed, and the scale of the results of the work is shown on the ordinate scale.

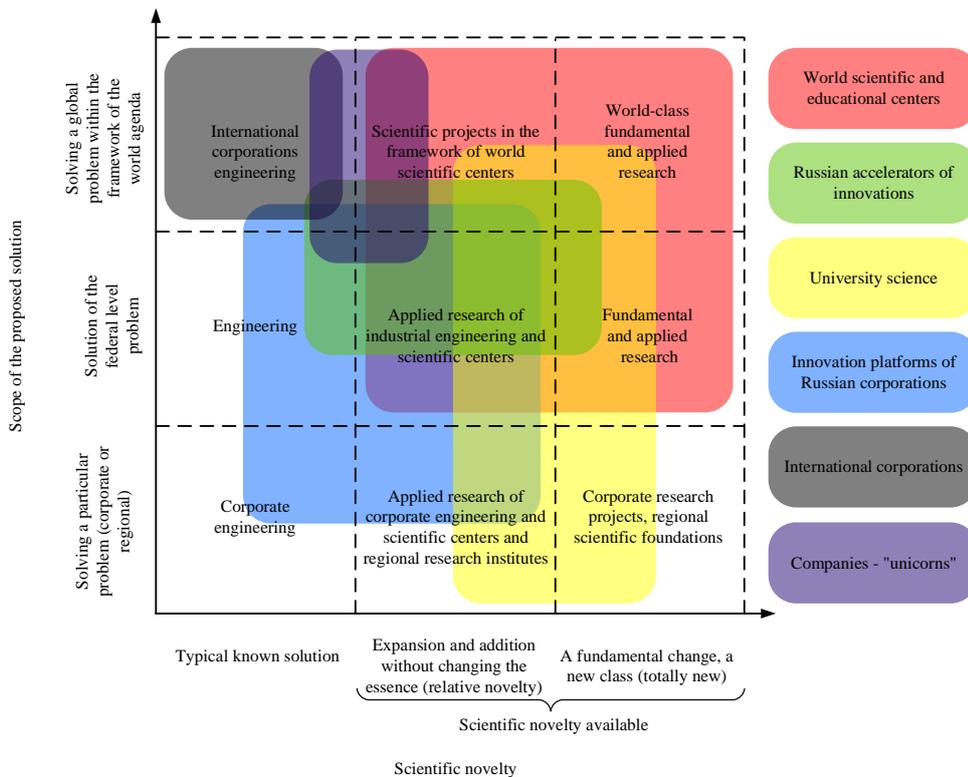


Fig. 1: Contradictions of scientific and innovative work implemented by universities (author's drawing).

[Fig. 1] shows the place occupied by participants in scientific and innovative work, among them: world-class scientific and education centers, Russian innovation accelerators, Universities (University science), innovation platforms of Russian corporations, international corporations and unicorn companies. Unicorn is a private company, a startup valued at \$1 billion or more. The term was first used in 2013 by well-known venture entrepreneur and founder of Cowboy Ventures, Eileen Lee, who chose this mythical animal as a vivid image to represent the statistical rarity of such successful companies.

[Fig. 1] shows the contradictions between scientific and innovative work implemented by universities. They can be formulated as follows:

- Lack of tools for creating innovations of the level of technological readiness required by business. Universities are able to bring most of the developments to the level of technological readiness that is not in demand for business.
- Low business interest in scientific work aimed at obtaining new knowledge used to create innovations. Funding for scientific work can be assumed by the state. And the financing of innovative activities can be assumed by business.
- World-class scientific and educational centers created in Russia are capable of occupying the niche of University science in the next 10-15 years. It is obvious that the most successful research and teaching staff can become the human resources of such centers.
- Innovation platforms of Russian corporations and Russian innovation accelerators on the one hand and Universities on the other have a rather narrow area of mutual interest. The reason is the low interest of Russian corporations in scientific work and, on the contrary, the high interest in innovations of a high level of technological readiness.

The digital platform being created is an automated information system with a set of digital services. The digital platform is a tool for improving the efficiency of scientific and innovative activities of transport Universities in Russia. The digital platform is based on the following main strategic documents: "Transport strategy of the Russian Federation for the period up to 2030"; "Strategy for scientific and technological development of the Russian Federation"; "Strategy for the development of railway transport of the Russian Federation until 2030" , etc.

The digital platform is considered as a complex of services available to all its main participants. Services are defined as the ability of certain participants and partners, described below as Roles, to solve specific tasks using the digital platform.

In addition to services, the interaction of the Competence Centers of the digital platform participants is supposed to be based on internal (existing for the participants of the digital platform) and external (regulatory framework of the digital platform) regulations that will create the most convenient conditions for working with the customer.

The first and key purpose of the digital platform is to provide expert and technical support for the effective work of railway equipment manufacturers, operating organizations, and scientific organizations. To do this, the platform must enable the digital platform management company to quickly configure the Competence Centers to ensure that the contract can be executed.

The second task of the platform is a B2B solution for active market participants who do not have a clear idea of what set of technological operations will be required to complete their task and/or what the cost of these works is. To do this, the platform should provide such customers with the possibility of online ordering, the formation of the best execution option for a number of parameters and a preliminary estimate of the final cost - a filter for selecting options.

The work of all elements of the system should be subject to a single Quality Management System. The Competence Centers of the digital platform are required to harmonize their business processes in accordance with the requirements of the Quality Management System.

The digital platform provides jobs for the following possible Roles of participants [Fig. 2]:

- Customer
- Competence Center
- Digital Platform Administrator

Participants of the digital platform interact, which is shown in the right part of the [Fig. 2]. Industry transport Universities form the configuration of their Competence Centers for the customer. The customer gets the most effective result due to the flexible configuration system of the contractor based on the existing Competence Centers and their competition among themselves.

The main effect of the digital platform is that the differentiation of the performer of scientific and innovative work is carried out not at the level of the organization (enterprise), but at a lower level of Competence Centers. This is possible thanks to agreements concluded between Universities. The agreements provide for a similar format of work. The principles described by the authors Garanin M. A. and Sandler D. O. are embedded in the digital platform [10, 11].

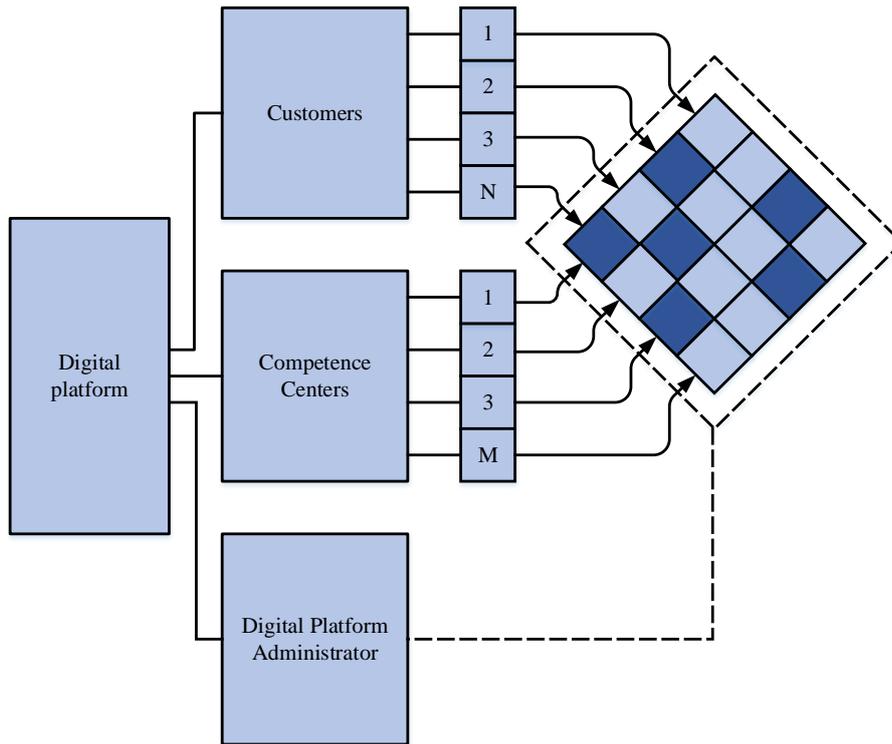


Fig. 2: Roles of digital platform participants (author's drawing)

LIST OF SERVICES AND REGULATIONS FOR WORK IN THE DIGITAL PLATFORM

The digital platform provides specialized services to the various Participant Roles. The work of participants when working in the system is based on process regulations. A consolidated list of services and work regulations in the digital platform is presented in the [Table 1].

Table 1: Consolidated list of digital platform services and regulations

Roles	Service	Regulations
Customer	Initial registration and maintaining your profile	Customer Relationship Management (CRM) Policy
Customer	View the full database of available competencies, portfolio of completed projects	Customer Relationship Management (CRM) Policy
Customer	Description of the order in a structured way	Order management regulations
Customer	Viewing possible combinatorics of order execution, clarification of parameters and optimization criteria, order submission	Order management regulations
Customer	Monitoring the logistics of the order execution process - the stages of execution, the staff of the performers, their obligations in terms of time and quality, intermediate results	Order management regulations
Customer	Working communication with the Management company of the digital platform	Customer Relationship Management (CRM) Policy
Customer	Conclusion and support of contracts	Contract management regulations
Competence Center	Initial registration, maintaining your profile and describing your competencies in a structured form	Customer Relationship Management (CRM) Policy
Competence Center	Description of its capacity and schedule of availability over time	Production capacity management regulations
Competence Center	Ability to refuse subcontracting (with a drop in the reliability rating)	Contract management regulations
Competence Center	Opportunity to obtain subcontracting on a competitive basis (if there are several Competence Centers with the same competence)	Contract management regulations
Competence	Monitoring the logistics of the order	Engineering and design work

Center	execution process - the stages of execution, the staff of the performers, their obligations in terms of time and quality, intermediate results	management regulations
Competence Center	Receiving and transferring the results of work to other participants in the technological chain in electronic form	Customer Relationship Management (CRM) Policy
Competence Center	Working communication with the Single Window and with permission from the Management Company - with other CCs and the Customer	Customer Relationship Management (CRM) Policy
Competence Center	Conclusion and support of contracts	Contract management regulations
Administrator	Data directories management (types of competencies, technologies, equipment, value groups, etc.) and business rules (logical conditions according to which the regulations are automatically executed)	Regulations for working with data directories and business rules
Administrator	Entering the parameters of the technical specifications for electronic trading in the system, further manual adjustment of the order if necessary	Regulations for interaction with electronic trading platforms
Administrator	Automated assessment of execution opportunities (forming a logistics chain) of order fulfillment	Order management regulations
Administrator	Formation of the primary set of documentation for participation in electronic trading	Order management regulations
Administrator	Confirmation of the correctness of the order placed by the Customer independently	Order management regulations
Administrator	Conclusion and maintenance of contracts with customers	Contract management regulations
Administrator	Conclusion and support of subcontracts with Competence Centers	Contract management regulations
Administrator	Monitoring the progress of orders	Contract management regulations
Administrator	Maintaining a structured portfolio of completed projects	Customer Relationship Management (CRM) Policy
Administrator	Obtaining "big data" of the digital platform for subsequent data analytics	All regulations
Administrator	Management of access and rights of participants of the digital platform	Information security management regulations
Administrator	Providing information security of services	Information security management regulations

STUDY OF THE STRUCTURAL DIAGRAM OF THE DIGITAL PLATFORM

The digital platform is aimed at solving the problem when scientific and innovative projects do not reach the decision point due to insufficient funding. The reasons for this are complex: the unwillingness of businesses to finance early-stage projects, insufficiently high-quality marketing study of the issue, not fully assessed risks when making a decision to launch a project, and many others.

To create innovative solutions, the resources of several Centers of Competence (laboratories, scientific research centers) are required. At the same time, the levels of proficiency in the competencies of higher education institutions are different (this is the scientific and laboratory base, the level of training of specialists). The current situation can be presented in the form of a diagram [Fig. 3], where the heterogeneity of the Centers of Competence of higher education institutions is clearly visible. State Transport Universities (STU) are used as higher education institutions.

At the same time, the customer needs a transparent innovation creation management system that is understandable to the partner and helps to evaluate the progress of developing an innovative solution. [Fig. 4] shows a model for creating an innovation with the participation of several competence centers. For example, according to the legend, the request for innovation is received by the University under the conditional number 5, while the competence number 3 is the key for this work. At the stage of project implementation, which in our case includes 3 stages, and the competence centers of other universities are connected. Thus, the project involves 4 universities, three types of competence centers (for example, it can be power engineering, IT-block, and others). This increases the efficiency of project implementation and the quality of product development.

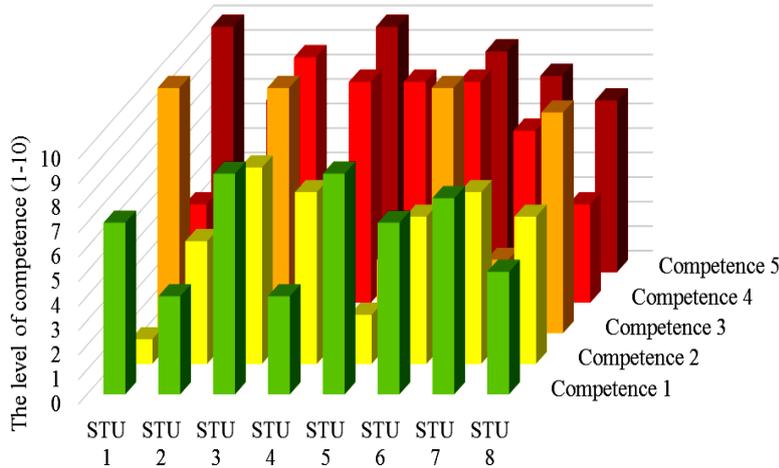


Fig. 3: Heterogeneity of University competence centers. Universities and their centers of competence are represented on the X and Y scale. On the Z scale, the diagram conventionally refers to the level of competence in a particular University.

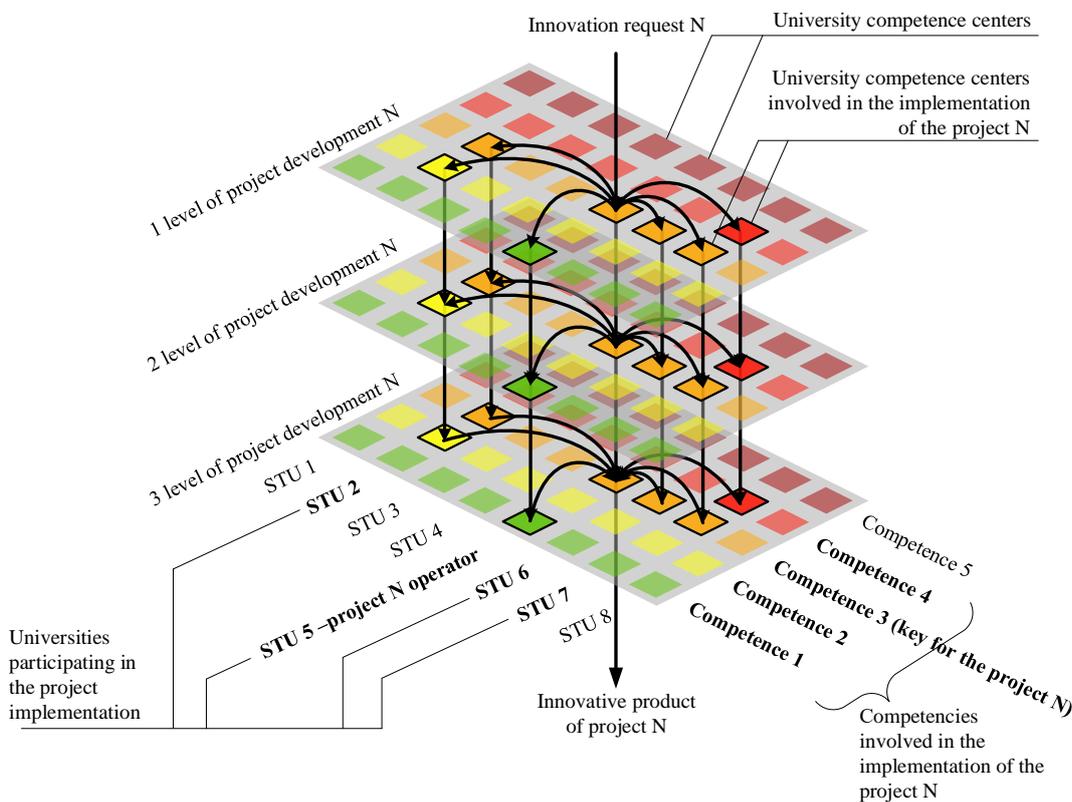


Fig. 4: Block diagram of the digital platform

The digital platform allows participants to combine efforts in the development and implementation of innovations in railway transport within the framework of the program, the main directions of which are:

- development and implementation of comprehensive research programs and integrated scientific and technical programs;
- ensuring legal protection of the management of rights to the results of intellectual activity;
- commercialization of the obtained results of intellectual activity, including marketing research and search for partners to promote products to markets, including foreign ones;
- transfer for free use or provision on special conditions of the infrastructure of universities to its Participants;
- information and consulting support on certification and standardization issues;

- provision of engineering services, including accelerated design and implementation of innovations;
- carrying out an examination of the quality of innovative projects;
- participation in activities aimed at supporting the export of innovations.

CONCLUSION

The proposed digital platform is aimed at increasing the scientific and innovative activities implemented by Russian transport Universities in the interests of the transport industry. The use of the digital platform is considered by the authors as a tool for creating innovations of the level of technological readiness that is in demand among businesses. This will increase business interest in scientific work aimed at obtaining new knowledge used to create innovations. The digital platform enables to provide funding from the state for scientific work. This is a mechanism for stimulating science. In the future, the digital platform can become a platform for interaction between world-class research and education centers, University research schools, and innovation platforms of Russian corporations and Russian innovation accelerators. Currently, these parties have a fairly narrow area of mutual interest. Work on the creation of a digital platform is being carried out by Samara State Transport University as part of the state budget research in 2020. The work is carried out in 2 stages. At the first stage, it is planned to develop the structural and functional schemes of the information and control platform, and develop the interface of the main software modules. At the second stage - programming and creating an information and management platform, debugging and testing the work, filling in and collecting information for the work of the platform.

CONFLICT OF INTEREST

There is no conflict of interest.

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FINANCIAL DISCLOSURE

None.

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