DIGITAL PLATFORM FOR THE REGION'S ECOSYSTEM OF SCIENCE AND EDUCATION: FUNCTIONS, SERVICES AND CONTENT WHICH USERS NEED (BASED ON SURVEY OF EXPERTS)

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Abstract

The global trend in the development of regional systems of science and education is the emergence of "ecosystems", which are characterized by active interactions between universities, research institutes, business companies, infrastructure organizations, and government bodies. Currently, "intellectual ecosystems" are being formed on the basis of multi-level communication, including reflection and coordination of interests, goals and activities of agents and key stakeholders. Based on digital technologies, platform solutions will be created to support the development of such intellectual ecosystems.

A digital platform is currently being created for the intellectual ecosystem of the Krasnoyarsk Territory, which is one of the largest industrial regions of Russia. A structural model is developed; user groups and the main functions of the platform are defined.

The objective of this study is to detect the interests of users and their requests for functions, services and content of the digital platform.

The research method is a survey of experts (participants in the emerging ecosystem of science and education which are potential users of the digital platform). The experts are the representatives of business, government, academia, students (a total of 295 respondents).

According to respondents, the key items of the digital platform should be representations of 1) universities and other educational institutions; 2) research institutions; 3) institutions and funds supporting science, education, innovation; 4) leading scientific schools of the region; 5) business organizations and engineering companies. Representations of leading research projects, online educational programs and courses will also be in demand.

The most popular information is announcements of events (conferences, seminars, discussions, master classes, etc.); information on competitive selections of scientific and educational projects; online discussions on topical scientific, social and cultural issues in a comprehensible language; information on ongoing scientific, educational projects and innovations in the region.

The needed platform functions are information proceeding (search, filters, ratings, subscriptions), communication with experts and other participants in the ecosystem, filing applications for competitions of the regional fund for the support of scientific activities, user self-organization (event reminders, personal organizer, etc.). Users are interested in services such as "active library" (the bot that searches and offers new publications in the field of user's interest); publication services; tools for organizing teamwork on the project (invitation of participants to the project, roadmaps and schedules of works, a shared library, etc.).

The results of the study can be used in the design of digital resources and communication platforms for scientific and educational ecosystems.

Keywords: intellectual ecosystem, ecosystem of science and education, digital platform, university.

1 INTRODUCTION

Digital platforms, the infrastructure for interactions between various entities based on the use of digital technologies and telecommunications, are becoming an increasingly significant phenomenon in modern economics and society. The purpose of the platforms is to unite users and facilitate the exchange of products or social values between them, contributing to the creation of values that are significant for all participants [1]. In terms of institutional economics, digital platforms can be considered as a new generation intermediary institution. The concept of a digital platform covers: its technological design, a

business model and the ecosystem formed on the basis of the platform, including various economic agents [2].

Digital platform has the following properties [3]:

1 algorithmization of the interaction of participants and streamlined procedures;

2 the mutually beneficial relationship of the participants (the "win-win principle");

3 a significant number of participants using the platform for interaction (the scale);

4 the integrated information environment in which the interactions occur, and the corresponding information technology infrastructure;

5 low transaction costs.

The use of digital platforms initially started in business (retail, finance, services, transport, etc.) and is now spreading in all areas of activity [4], including science [5, 6] and education [7]. In research, after the digitalization of its individual functions, the next step is the creation of holistic multifunctional "Virtual Research Environments" [8]. In education, after digital educational resources and online courses, the next step is virtual environment in which students can play games, set up virtual experiments, be included in project-based education or in cross-training in communities [9]. In the future, digital platforms can become the basis for the formation of "intelligent ecosystems", "knowledge ecosystems" [10] (large-scale distributed systems that generate knowledge and innovations). Projects of "platform universities" are appearing; as an example, we can point to the Russian "University 20.35" launched in the frame of the National Technological Initiative [11]. The emergence of next-generation university (University 4.0) as an integral part of the future "cognitive society" is discussed [12].

The research presented in the article was carried out as a part of the creating a digital platform for the region's intellectual ecosystem in the Krasnoyarsk Territory (Russian Federation). The structural model of the platform is shown in Fig. 1.

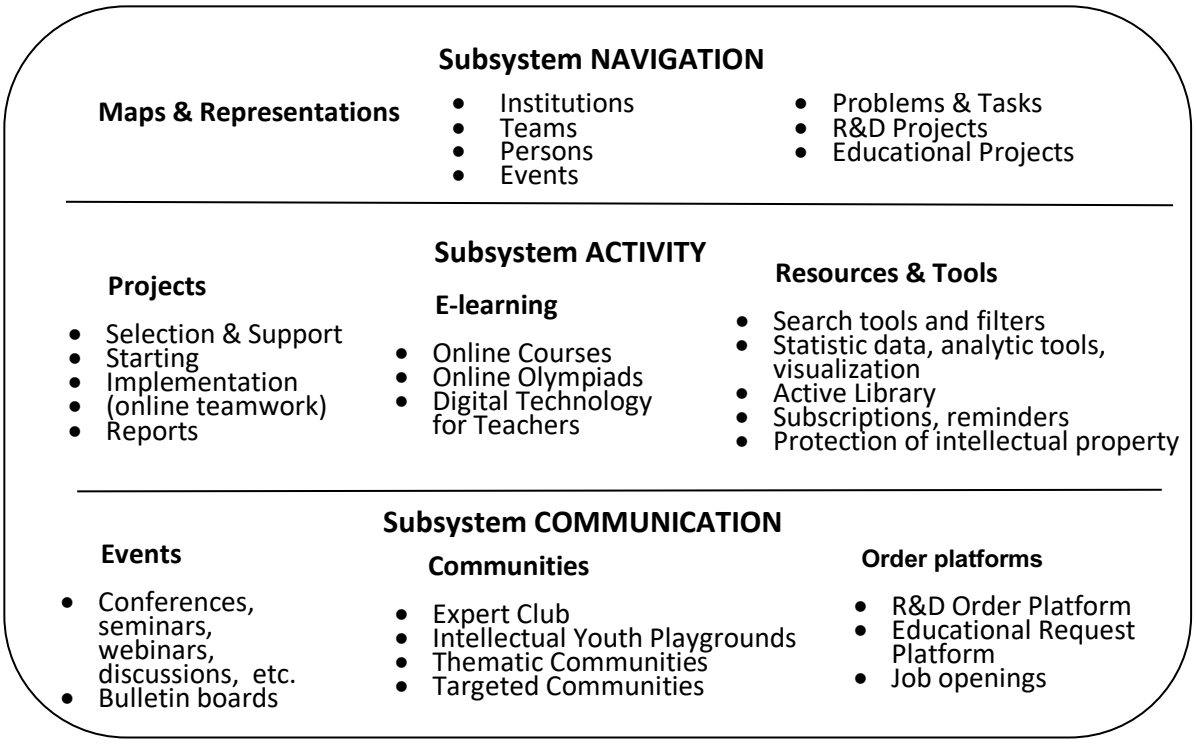

Figure 1. The structural model of the digital platform for region's intellectual ecosystem (educational and research institutions and communities, governmental bodies, business companies)

An important requirement for the design process of digital systems is the use of information about the needs and behavior of potential users. Knowledge of what are the interests and needs of users and how they handle digital resources is the basis for designing the main functionality and content of the digital

platform and its additional services. This study of user requests was carried out as a part of a project to create a digital platform for scientific and educational ecosystem in the region.

2 METHODOLOGY

In this study, user requests were identified based on expert knowledge; experts were participants in the scientific and educational ecosystem including teachers, scientists, students, representatives of business and regional authorities. To accumulate expert knowledge, in-depth expert interviews and a questionnaire survey were used.

At the first stage of the study (interviews) the situation in the scientific and educational sphere of the region and the needed changes were discussed. Experts were representatives of business, government, academia, research institutes, etc. (a total of 32 experts). Based on the information received, the necessary components of the digital platform and its significant functions were identified and a questionnaire was drawn up. Experts studied the questionnaire and expressed their opinion on the completeness, correctness, clarity of the proposed questions; accordingly, adjustments were made to questions and answer options.

At the second stage, a questionnaire survey was conducted, in which representatives of target groups (potential users of the platform) participated: students, undergraduates, graduate students; teachers, consultants, researchers; business representatives; representatives of authorities; representatives of administrations of educational institutions. In total, 343 respondents took part in the survey; after preliminary processing 295 questionnaires were left.

The age structure of respondents is as follows. More than half (50.8 %) are young people under the age of 30, the most active and competent users of digital technologies (the “digital generation”). Respondents aged 31–50 years old were 38 %, over the age of 50 years old – 11.2 %. Target groups are represented among respondents in the following proportions: students 28.5 %, undergraduates and graduate students 18 %, teachers 22 %, experts and consultants 2 %, researchers 16.6 %, business representatives 5.4 %, government representatives 2.7 %, administrators of educational institutions 4.7 %.

The survey participants were asked to evaluate: 1) the need for certain components of the digital platform of the scientific and educational ecosystem; 2) the need for these components for them personally (whether they will use the appropriate components and functions). The following items were proposed for evaluation:

- components of the regional scientific and educational ecosystem presented on the platform;
- types of information (content) that can be placed on the platform;
- digital platform capabilities addressed to individual users and organizations;
- target groups with which it is possible to interact within the digital platform;
- functions in the personal account of the digital platform, allowing to reduce the costs of interaction and cooperation.

For each of the items, a list of options was offered, and respondents noted significant (in their opinion) options in these lists.

3 RESULTS

3.1 Expert Interview Results

Interviewees believe that the digital platform for the region’s scientific and educational ecosystem (Krasnoyarsk Territory) should change the situation as follows.

1 Achievement of information transparency of the institutions of science and education. Each university or scientific institution must have its own "representation" on the platform, which contains information that is important for potential partners. The most significant business companies in the region should also have “representations” reflecting their interests and requests in the field of applied research and development.

The existing university sites include a huge amount of information, and the most significant for partners (for example, information on ongoing developments that are of interest to industry) is difficult to access – it is located "deep in the bowels" of sites, inside academic articles, etc. Unlike the site, the “representation” should directly contact potential partners, in a brief and clear form to convey the essence of the proposals or opportunities for cooperation providing a clearly defined channel for interactions.

Experts note that universities remain largely “encapsulated”, i.e. professors and students participate, as a rule, in scientific, educational, public projects of only their university. Educational and scientific networking remains rare. Intercollegiate activity mainly refers to sports, cultural and leisure activities.

The informational openness of business partners is also low. The interests of business companies in research and development are reflected, at best, in procurement plans that are published on the Internet. At the same time, the long-term interests of companies that scientific groups at universities could focus on remain undetected.

2 Emergence of active groups and leaders that come forward with initiatives and projects in the field of education, science, innovation, cultural and social activity. It is important that these groups and initiatives be open, create links and communications between institutions, thereby contributing to the formation of the regional ecosystem.

Currently, it is easier for active individuals and groups to find interested audiences or partners in other regions and even countries – through global social networks – than in their own or in a neighboring university. The digital platform should give them the opportunity to create their own “representations”, initiate events and projects, find partners and entry points.

3 Initiation of events, i.e. significant actions involving various participants in the emerging ecosystem. These can be competitive selections of projects, scientific forums, educational events, etc. A fairly dense “stream” of events is needed that will allow ecosystem participants to learn about each other and form their prospects taking into account the interests, goals and prospects of other participants.

3.2 Survey Results

The distribution of answers to the question “What components of the regional scientific and educational ecosystem should be presented on the digital platform? What components will I use?” is shown in Fig. 2.

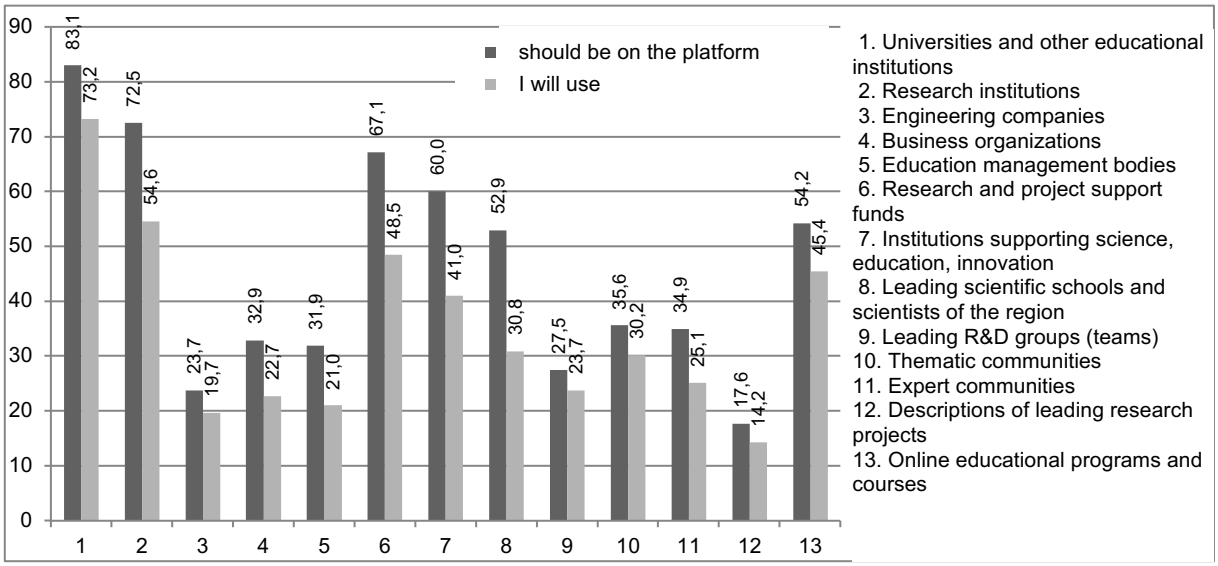

Figure 2. The respondents' choice of the components of the regional scientific and educational ecosystem that should be presented on the digital platform (% of respondents who noted answer option)

The respondents believe that the following should be presented on the digital platform of the scientific and educational ecosystem: universities and other educational institutions – 83.1 % of the respondents

noted this option; research institutions – 72.5 %; research and project support funds – 67.1 %; institutions supporting science, education, innovation – 60.0 %; online educational programs and courses – 54.2 %; leading scientific schools and scientists of the region – 52.8 %.

Least of all, respondents chose the answers “descriptions of leading research projects” (17.6 % of respondents indicated the need for their placement on the platform, 14.2 % indicated their intention to use this information), “engineering companies” (23.7 % and 19.7 %, respectively), “education management bodies” (31.9 % and 21 %, respectively).

In Fig. 3 we see the distribution of answers to the question “What information should be presented on the digital platform, and what information will be of interest to you?”

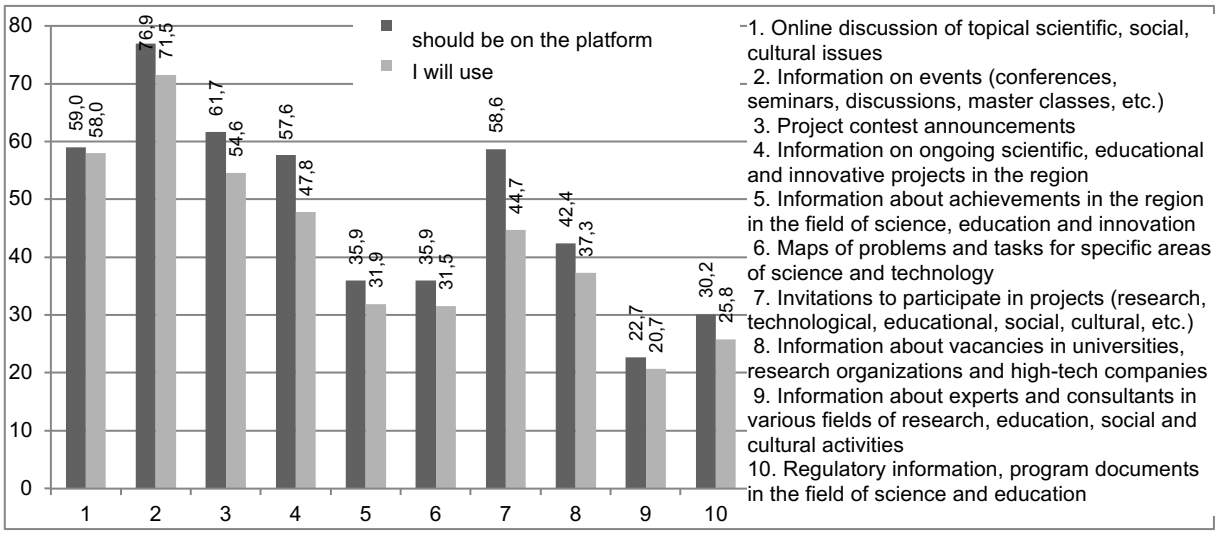

Figure 3. Distribution of answers to the question “What information should be presented on the digital platform, and what information will be of interest to you?” (% of respondents who noted answer option)

According to the respondents, the following should be presented in the first place: information on events (conferences, seminars, discussions, master classes, etc.) – 76.9 %; announcements of project contests – 61.7 %; online discussions of topical scientific, social, cultural problems in a generally accessible and professional language – 59.0 %; information on ongoing scientific, educational and innovative projects in the region – 57.6 %; invitations to participate in projects (research, technological, educational, social, cultural, etc.) – 58.6 %.

The most interesting information for respondents (“I will use, I will participate”): on events (conferences, seminars, discussions, master classes, etc.) – 71.5 %; announcements of project contests – 54.6 %; information on ongoing scientific, educational and innovative projects in the region – 47.8 %; invitations to participate in projects – 44.7 %. Online discussions of topical scientific, social, and cultural issues is also in demand – 58.0 %.

Least of all, the survey participants noted that information is needed (for placement on the platform and for them personally) about experts and consultants in various fields of research, education, social and cultural activities (22.7 % and 20.7 %, respectively). Relatively low demand is “regulatory information, program documents in the field of science and education” (30.2 % and 25.8 %).

The distribution of answers to the question “What opportunities should the digital platform provide for you and your organization?” is shown in Fig. 4.

The experts believe that the digital platform should primarily provide the opportunities: to mobilize resources (organizational, financial, intellectual, infrastructural, etc.) for projects and events – 66.8 % of the survey participants chose this answer option; search for partners for joint projects and events – 62.4 %; submitting applications for grants (templates of documents, etc.) – 55.3 %; communication support for scientists, teachers, students – online discussions, network communities, chats, etc. – 49.5 %.

Answering the question “what will I use”, the respondents most often chose: search for partners for joint projects and events – 56.3 %; resource mobilization for projects and events – 53.9 %; filing applications for grants – 46.1 %; communication support for scientists, teachers, students – 38.6 %.

Least of all, the respondents noted as significant the opportunity of “accumulating the intellectual and reputation capital of people, teams and organizations – publishing, promoting and protecting the results of intellectual activity”. The need for such an opportunity was indicated by 17.3 % of the respondents; 12.5 % would use it.

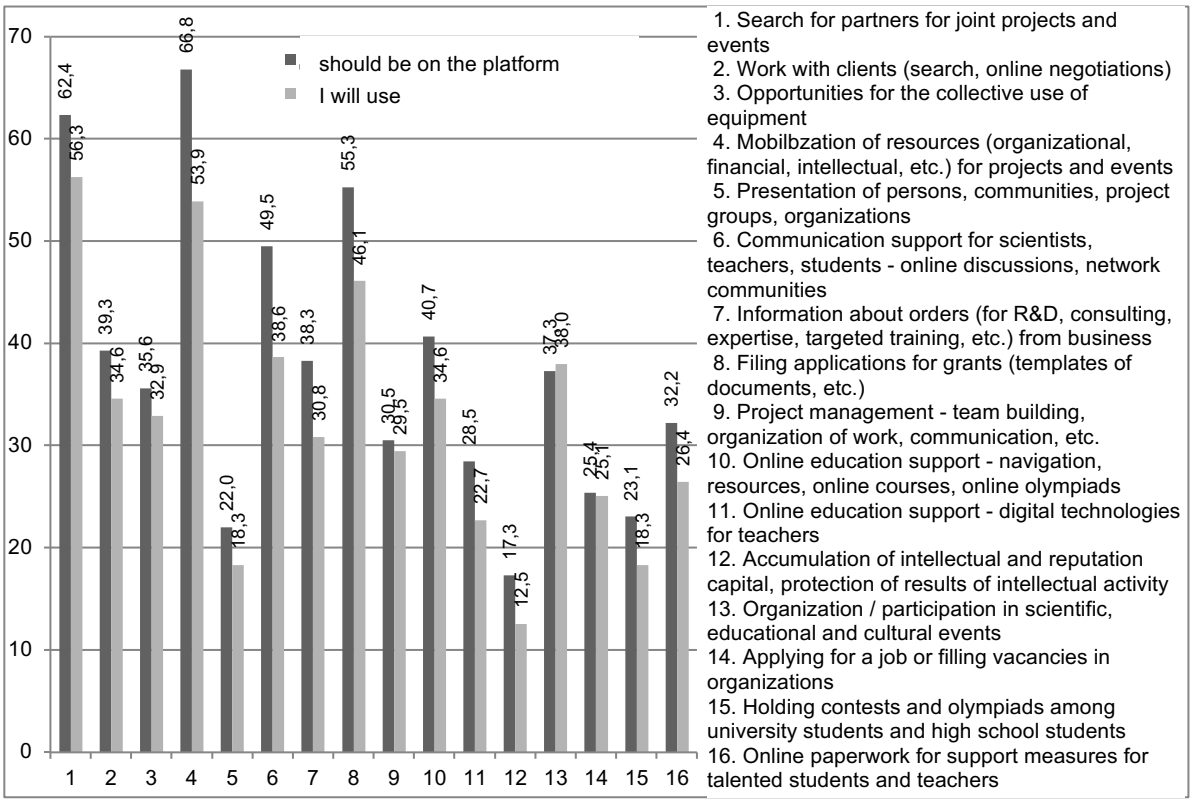

Figure 4. Distribution of answers to the question “What opportunities should the digital platform provide for you and your organization?” (% of respondents who noted answer option)

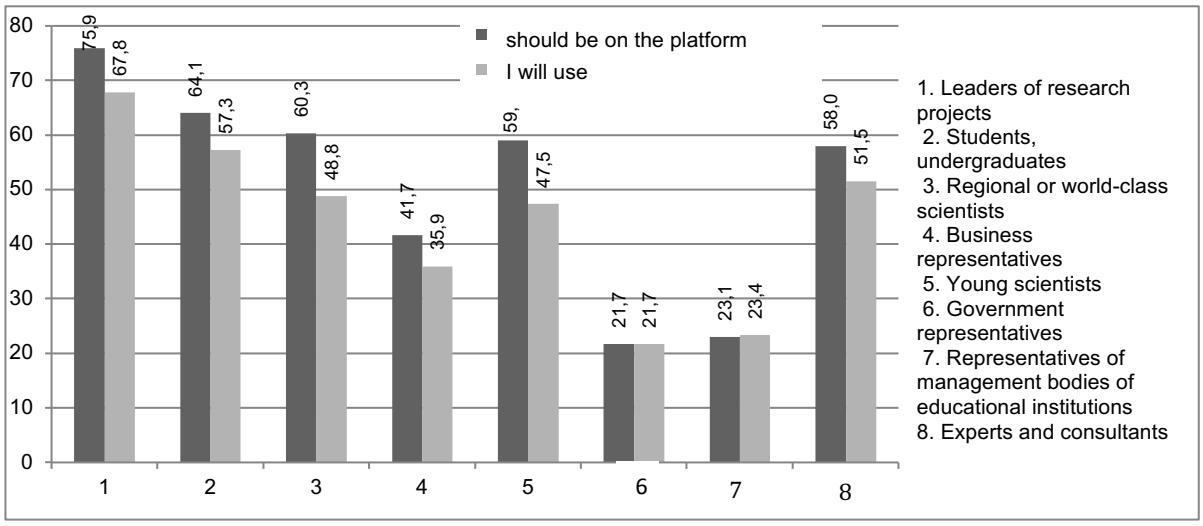

Figure 5. Distribution of the answers to the question “What target groups should be represented on the digital platform? What groups would you like to interact with?” (% of respondents who noted answer option)

Fig. 5 shows the distribution of answers to the question “What target groups should be represented on the digital platform? What groups would you like to interact with?”

Respondents believe that there should be presented first of all: leaders of scientific projects – 75.9 % noted this answer option; students, undergraduates – 64.1 %; regional or world-class scientists – 60.3 %; young scientists – 59.0 %; experts and consultants – 58.0 %. Groups with which respondents would like to interact: research project leaders – 67.8 %; students, undergraduates – 57.3 %; experts and consultants – 51.5 %; regional or world-class scientists – 48.8 %; young scientists – 47.5 %.

Significantly fewer respondents believe that the target group presented on the digital platform should be representatives of government bodies (21.7 %) and 21.7 % of respondents will interact with them. The same applies to representatives of management bodies of educational institutions (23.1 % and 23.4 %, respectively). This result is quite logical, since the purpose of the digital platform is to increase the "density" of the "horizontal" links between the ecosystem participants.

The distribution of answers to the question “What functions in your personal account should be provided (from the services that already exist on digital platforms in the world)” is shown in Fig. 6.

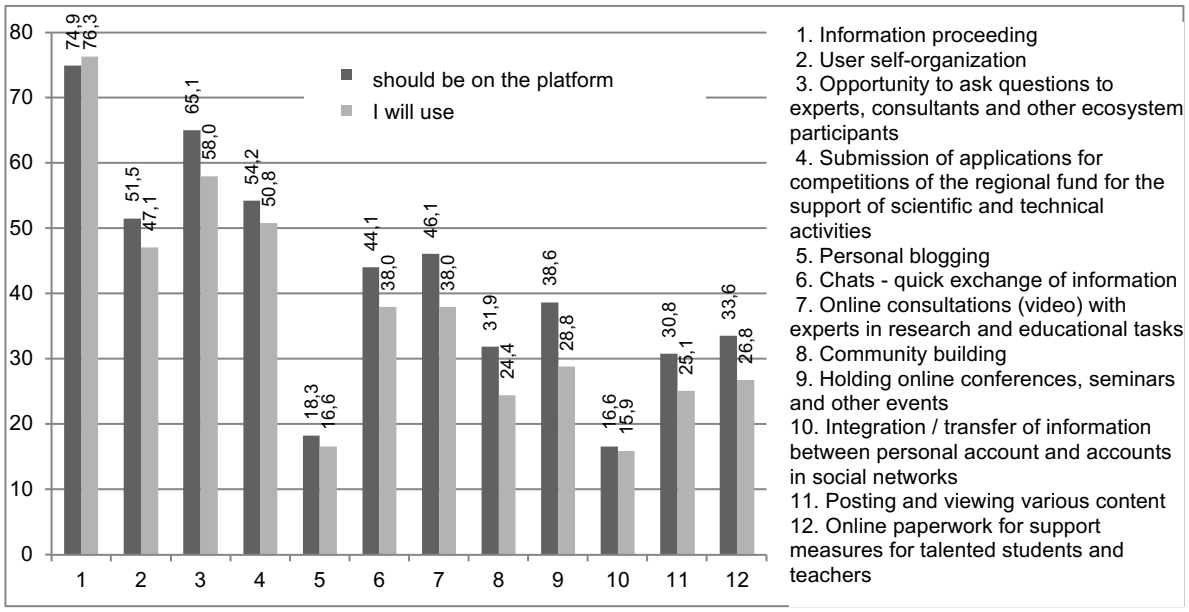

Figure 6. Distribution of respondents' answers to the question “What functions in your personal account should be provided (from services that already exist on digital platforms in the world)”

Respondents believe that the personal account should first have the following functions:

- information proceeding – search, filters, ratings, newsletter subscriptions, etc.: 74.9 % – “should be”, 76.3 % – “I will use”;
- the opportunity to ask personal or general questions to experts, consultants and other participants in the ecosystem (65.1 % – “should be”; 58.0 % – “I will use”);
- submission of applications for competitive selections of projects of the regional fund for the support of scientific and technical activities (54.2 % – “should be”; 50.8 % – “I will use”);
- user self-organization – reminders of events, personal organizer (51.5 % – “should be”; 47.1 % – “I will use”).

The respondents consider the least significant functions of the personal account are: maintaining a personal blog – 18.3 % and integrating / transferring information between personal account and accounts on social networks – 16.6 %; will use these functions 16.6 % and 15.9 % respectively.

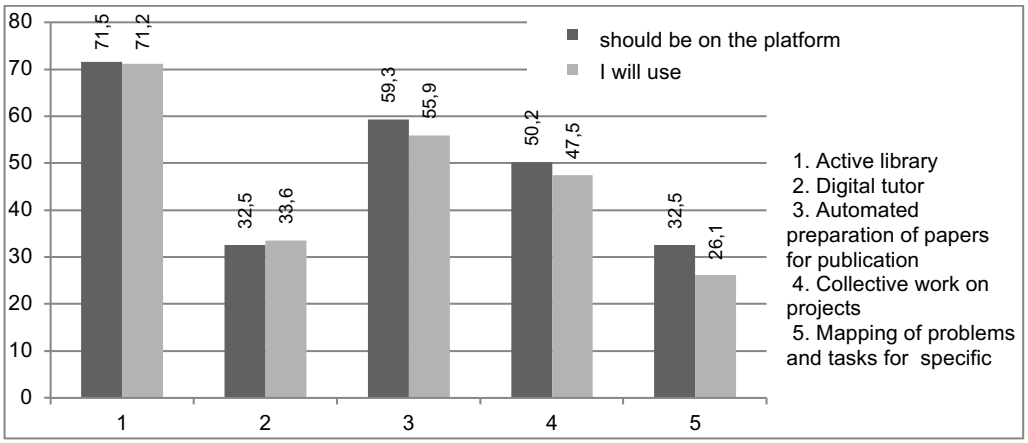

Figure 7. Distribution of respondents' answers to the question "What functions in your personal account should be provided (from services that are under development) (% of respondents who noted answer option)

The distribution of respondents' answers to the question "What functions in your personal account should be provided (from services that are under development)?" is presented in Fig. 7.

Respondents believe that the following functions should be implemented in the first place:

- active library (the bot searches and offers new publications in the field of user's interests) ("should be" – 71.5 %; "I will use – 71.2 %);
- automated preparation of papers for publication (online editors of texts, formulas, graphic files; automated design of links and bibliographic lists; automatic translation into foreign languages) ("should be" – 59.3 %; "I will use – 55.9 %);
- organization of collective work on projects (team building, roadmap, work schedule, shared library for the project, reminders, presentation of interim results, promotion of project results, etc.) ("should be" - 50.2 %; "I will use – 47.5 %);

In general, the distribution of answers about what "should be" on the digital platform and what a particular user "will use" (or what "will participate") coincide on all questions of the questionnaire. However, there is a general pattern: the percentage of answers "should be" in most cases is slightly higher than the percentage of answers "I will use, participate." Obviously, in the first case, a respondent means a wide range of users, and in the second only himself / herself, therefore, he / she notes a smaller range of necessary functions, types of content, etc.

4 CONCLUSIONS

Analysis of the responses of potential users of the digital platform of the regional scientific and educational ecosystem allows us to draw the following conclusions.

1 The target groups, which should be primarily attracted to the digital platform, are: leaders of scientific projects; students, undergraduates; scientists and young scientists; experts and consultants, representatives of the business community.

2 On the digital platform, there must be mandatory "representations" of universities and other educational institutions, research institutions; research and project support funds; institutions supporting science, education, and innovation; leading scientific schools and scientists of the region. Online educational programs and courses are in great demand.

"Representations" of business organizations, engineering companies, education management bodies and descriptions of leading research projects are somewhat less in demand.

3 The most requested information, which should be posted and kept up to date, is information about the events held (conferences, seminars, discussions, master classes, etc.); announcements of competitive selections of projects; information on ongoing scientific, educational and innovative projects in the region; invitations to participate in projects (research, technological, educational, social, cultural, etc.). Online discussions of topical scientific, social, and cultural issues are also important.

4 The digital platform should provide opportunities for: mobilizing resources (organizational, financial, intellectual, infrastructural, etc.) for projects and events; search for partners for joint projects and events; submitting applications for grants (templates of documents, etc.); communication support for scientists, teachers, students – online discussions, network communities, chats, etc.

5 The most popular functions and services of the digital platform for the scientific and educational ecosystem are the following: information proceeding (search, filters, ratings, subscriptions to newsletters, etc.); the opportunity to ask personal or general questions to experts, consultants and other participants in the ecosystem; submission of applications for competitions of the regional fund for the support of scientific and technical activities; user self-organization (event reminders, personal organizer, etc.); active library (the bot searches and offers new publications in the field of user's interests); automated preparation of papers for publication (online editors of texts, formulas, graphic files; automated design of links and bibliographic lists; automatic translation into foreign languages); tools for organizing teamwork on projects (team building, roadmap, work schedule, shared library for the project, reminders, presentation of intermediate results, promotion of the project results, etc.).

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