Multi-paradigm Approaches to Mathematical Modelling as a Research Tool

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ABSTRACT

This article is devoted to mathematical modeling as a research tool. The article is based on statistics of the joint Fund of electronic resources "Science and education" for the period from 1998 to the present. The selection of information about developments in mathematical modeling and statistical processing is carried out automatically by the collector_stat program developed by the authors of the article. The beginning of modernization of higher education is accompanied by the development and growth of scientific research, both theoretical and practice-oriented. The reconstruction of the higher school, which started in 2013 and is one of the active participants in the development of science in the country, is the object of research by Ofernio. The subject of research is electronic and information developments on the topic of mathematical modeling. Methods of research are methods of statistics, expertise, content analysis.

Keywords: Tool; mathematics; modelling; multi-paradigm; scientific research; methodological approaches; e-education; e-resources of science; education; national economy.

1. INTRODUCTION

Nowadays, mathematical modelling is one of the most widespread, effective and applied methods of scientific research; research and algorithmization of areas of national economy [1,2]. For example, practically all modern sections of physics are devoted to construction and research of mathematical models of various physical objects and phenomena.

The beginning of modernization of higher education is accompanied by the development and growth of scientific research, both theoretical and practice-oriented. The data array extracted from the OFERNiO database allowed us to analyze the sorted data according to 20 characteristics, which allows us to draw a fairly complete picture of the application of mathematical modelling as an object of education, method of science, tools in sectors and areas of the economy of the country [3-7].

2. PURPOSE OF RESEARCH

The purpose of the research is to analyze electronic and information resources dedicated to the topic – "mathematical modeling", in order to indirectly assess the universities ' mastery of the research tool – mathematical modeling. The sorted data made up 0.7% of the total volume of the Ofernio database. 112 authors from 29 science cities of the country took part in the sorted developments (Fig. 1).

Data analysis shows that 26 universities participate in such developments on the topic of "mathematical modeling" (Fig. 2).

Content analysis of sorted data allows you to distribute development across pools education, science, and other (Fig. 3).

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3. ELECTRONIC AND INFORMATION RESOURCES FOR EDUCATIONAL PURPOSES

The primary representation of electronic (ER) and information resources (IR) of education on the topic "mathematical modeling" is implemented in the following forms (Fig. 4).
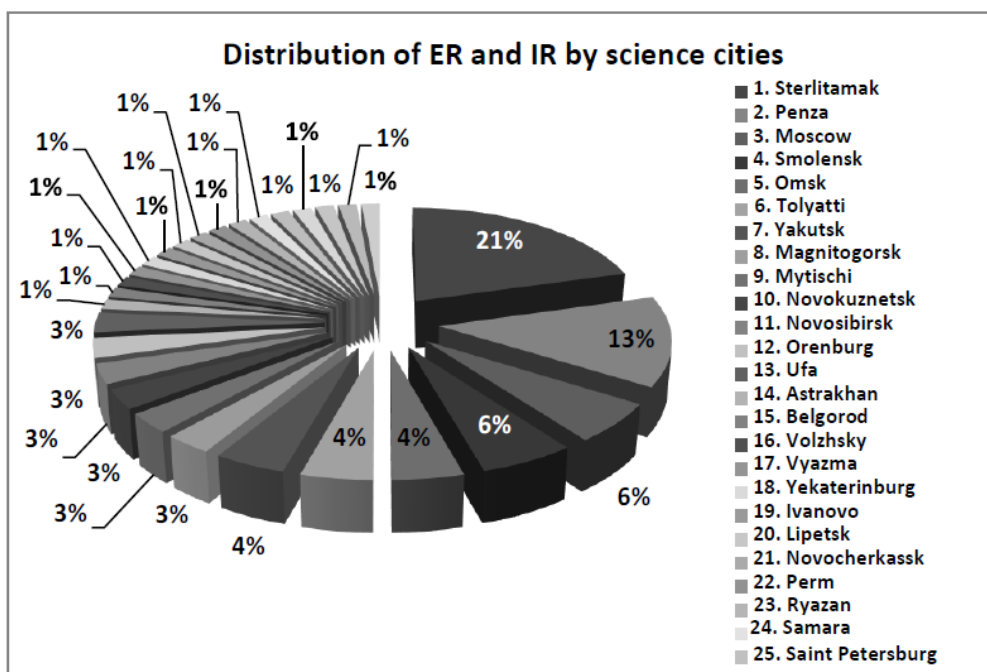

Fig. 1. Distribution of electronic and information resources by science cities
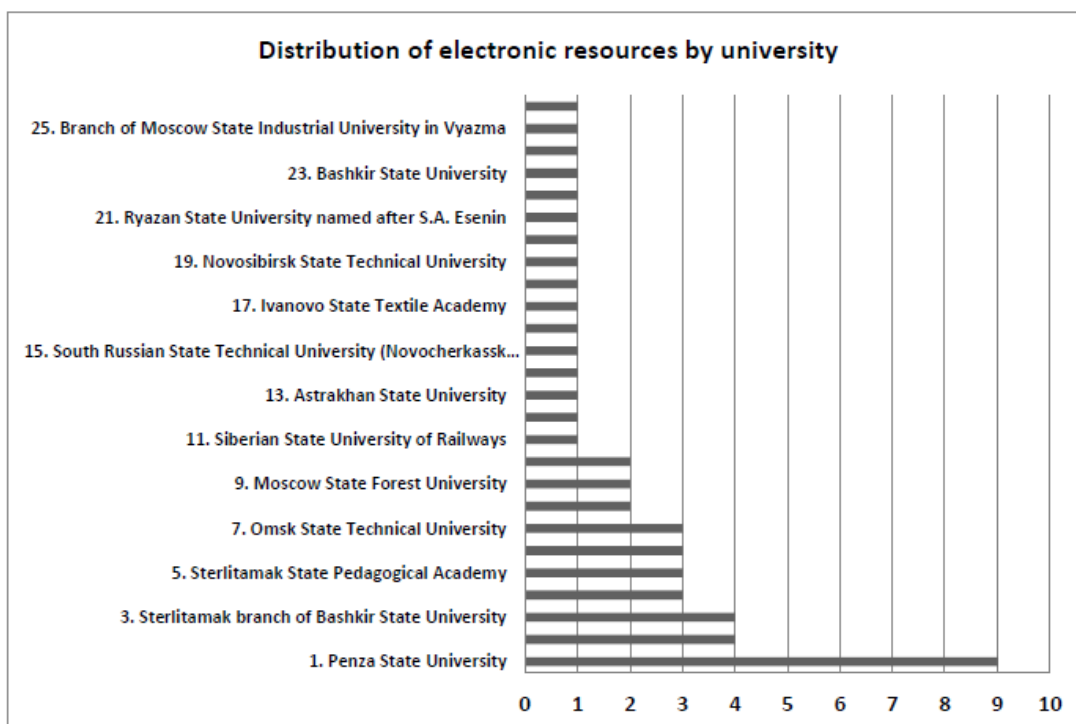

Fig. 2. Distribution of electronic and information resources by developer organizations
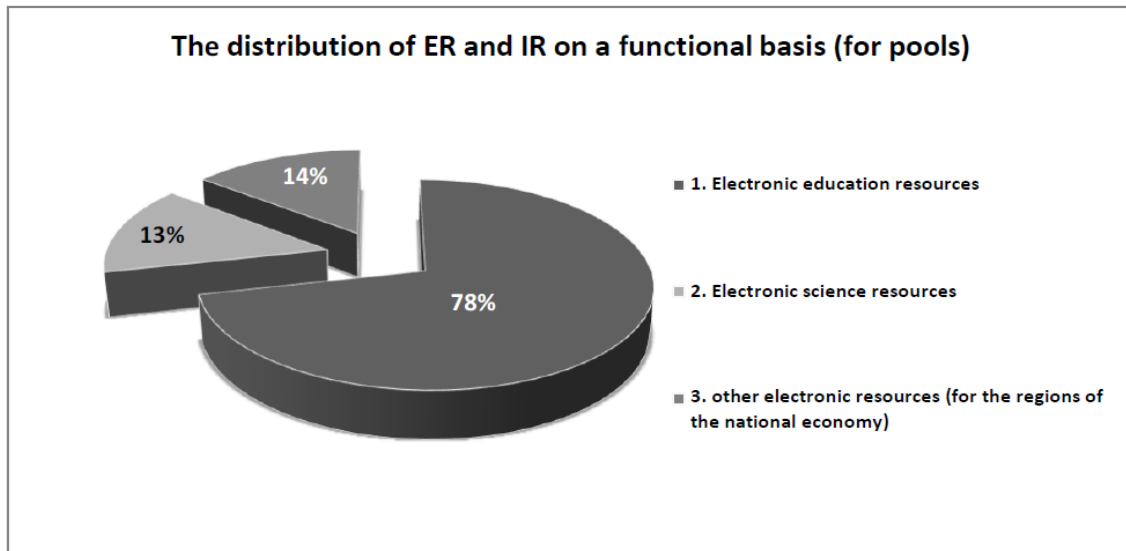
The distribution of ER and IR on a functional basis (for pools)

- 1. Electronic education resources
- 2. Electronic science resources
- 3. other electronic resources (for the regions of the national economy)

78%
14%
13%

Fig. 3. Distribution of electronic and information resources by pools

The distribution of electronic information and learning resources in the forms of implementation

- 10. Electronic educational resource
- 9. Electronic teaching materials
- 8. Electronic training manual
- 7. A software module
- 6. Software package
- 5. Computer workshop
- 4. Monograph
- 3. The software package
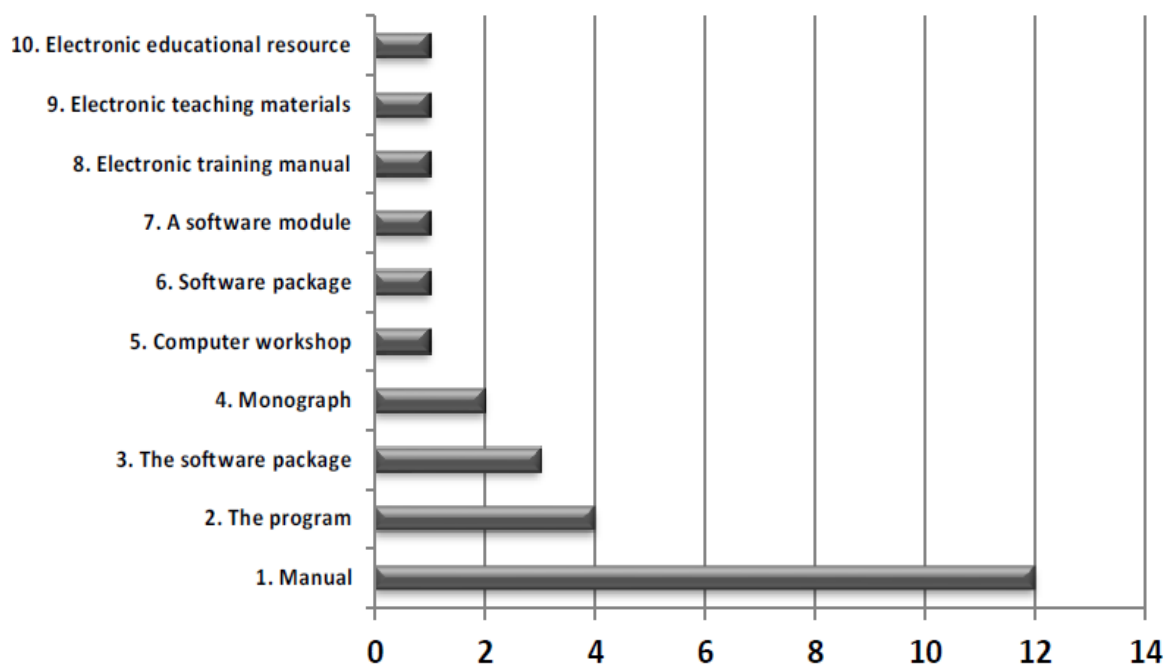- 2. The program
- 1. Manual

0 2 4 6 8 10 12 14

Fig. 4. Distribution of electronic and informational training resources on the topic – "mathematical modeling" by implementation forms

Distribution of electronic and information resources by academic disciplines is given in Fig. 5.

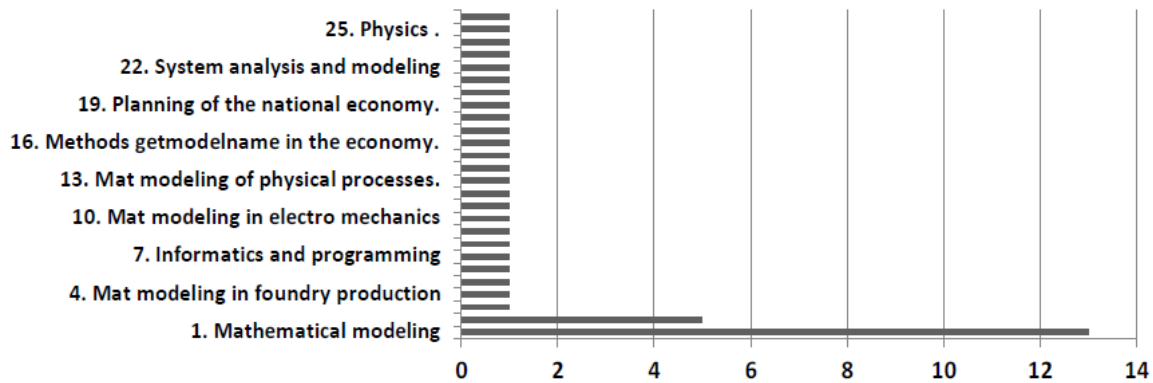## Distribution of ER and IR education by academic disciplines

Fig. 5. Distribution of electronic and information resources by academic disciplines

The analysis of e-education resources confirms that the resources are intended for the following forms of education and levels of education and sub-levels of higher education (Figs. 6-8).

Distribution of electronic and information resources by specialty is shown in Fig. 9.

4. ELECTRONIC AND INFORMATION RESOURCES OF SCIENCE

According to the diagram (Fig. 3), the science pool is the second largest in terms of ER and IR on the topic "mathematical modeling". Let's consider the distribution of ER and IR science in scientific areas (Fig. 10).

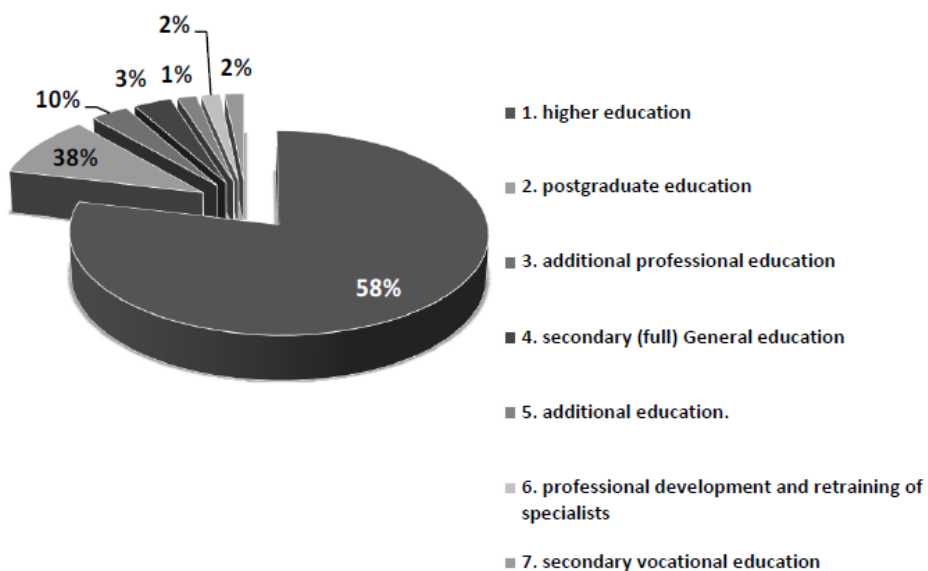## Distribution of ER and IR education by level of education

Fig. 6. Distribution of electronic and information resources by level of education
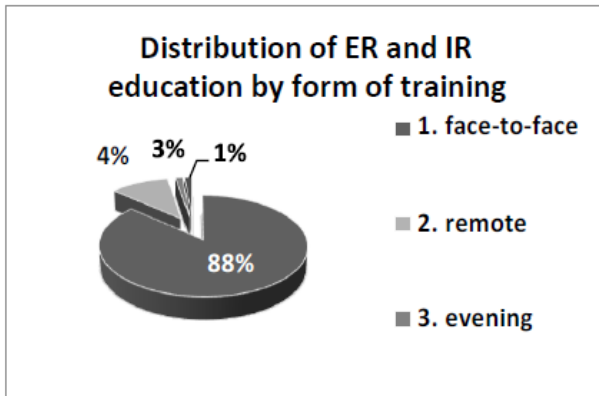
Fig. 7. Distribution of electronic information resources by forms of training
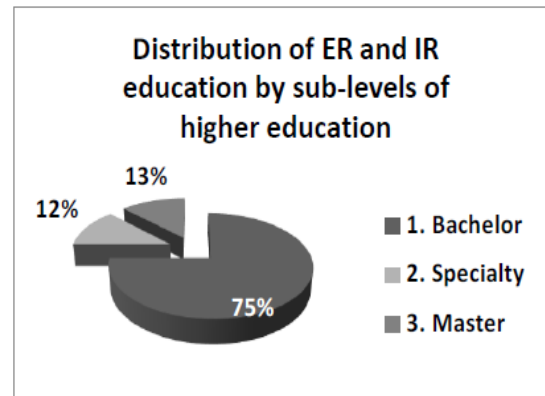

Fig. 8. Distribution of electronic and information resources by sub-levels of higher education
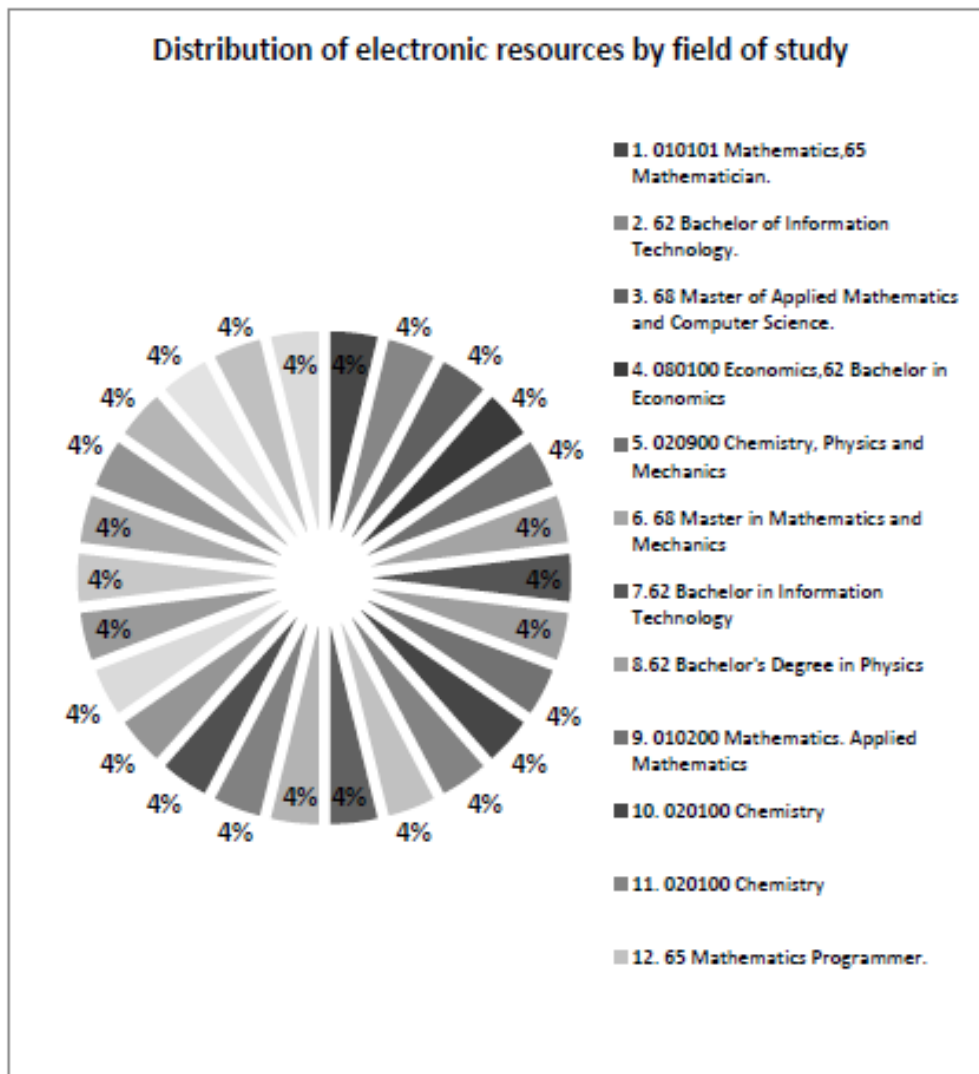

Fig. 9. Distribution of electronic and information resources by specialty

Distribution of electronic resources according to the national rubric for scientific and technical information
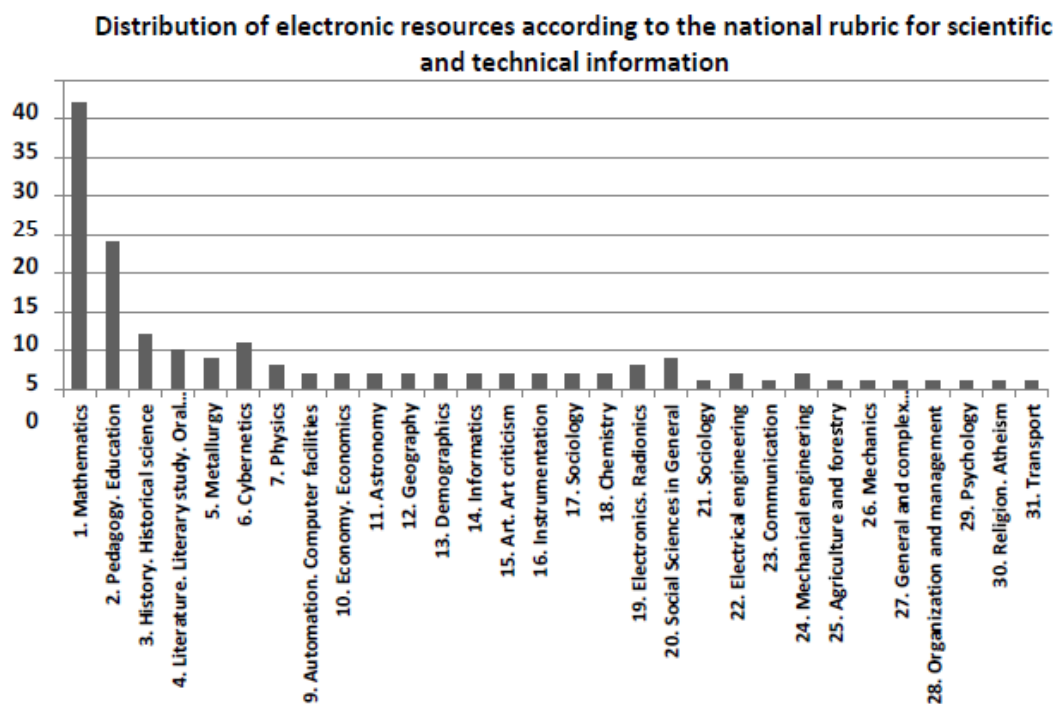

Fig. 10. Distribution of electronic and information resources of science by State rubricates of scientific and technical information other electronic and information resources

Other electronic and information resources are practice-oriented resources, which are distributed among the regions of the national economy as follows (Fig. 11).

Distribution of other electronic resources by functional purpose

- 1. The construction of roads
- 2. Management of environmental security
- 3. Mathematical modeling
- 4. Beekeeping
- 5. Communication
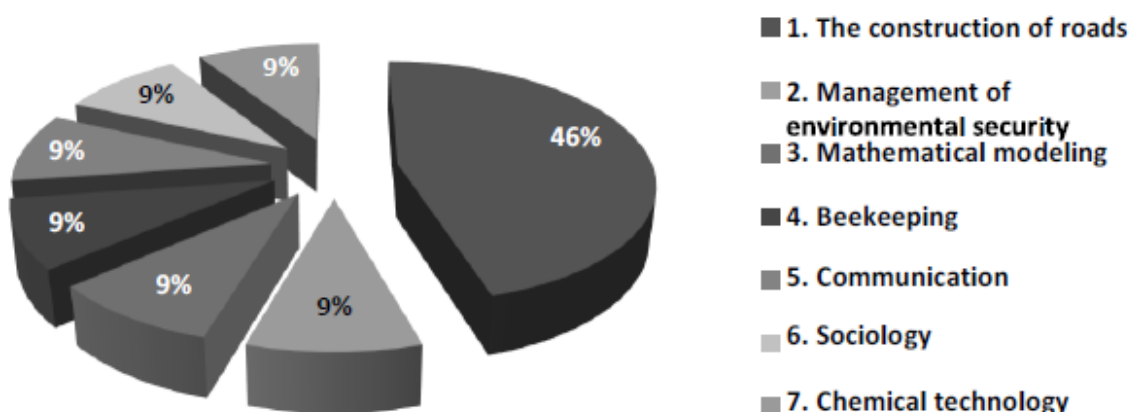- 6. Sociology
- 7. Chemical technology

Fig. 11. Distribution of other electronic and information resources of science by areas of research

5. CONCLUSIONS

Thus, the analysis of electronic and information resources devoted to "mathematical modeling" demonstrated [6-7]:

☐ availability of ER and IR education designed to prepare bachelors, masters and specialists in 26 specialties;

☐ The presence of other ER and IR allows you to assess the consolidation of students ' knowledge in the development of practice-oriented projects for 7 areas of n/a under the guidance of teachers. countries;

☐ The presence of ER and IR science demonstrates the use of mathematical modeling by faculty and students as a method of scientific research in theoretical and applied research in 35 scientific areas (State rubricates of scientific and technical information).

That is, the country's universities (26) demonstrate the chain of education - > consolidation of acquired knowledge in applied projects -> further theoretical and practical research in order to train highly qualified personnel [8].

6. CONFIRMATION

ER and IR on the subject "mathematical modeling" like many other free on the portal of the United Fund of electronic resources "Science and education", in a publicly accessible database of OFERNIO.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Research and academic experience: Research activities from 1971 to the present, academic activities from 1994 to the present

Field of study: Standardization, unification, classification and rubricisation of scientific and educational information, registration and establishment of property rights to the results of intellectual activity, introduction of information and communication technologies in the procedures for registration of electronic educational resources.

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Special prize: Awarded the title "Honorary Worker in Science and Technology of the Russian Federation

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- - Honorary diploma of the Ministry of Education of the Russian Federation, order number 3599 of 09.11.2001 "Honorary diploma of the Ministry of Education of the Russian Federation, order No. 13-95 of May 06, 2002, "For many years of fruitful and scientific work for the development of the Russian Fund of the Computer Curriculum. "For many years of fruitful work in the system of education and in connection with the jubilee
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Any other noteworthy item(s): Number of citations from publications on elibrary.ru - 251
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Number of citations from publications included in the core of the Russian Science Citation Index 18

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