

VII International Forum on Teacher Education

# Organizational and Technological Conditions for Providing Accessible Inclusive Higher Education

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## Abstract

The study is devoted to the analysis of the experience of universities in the South of Russia in ensuring the accessibility of higher education to persons with disabilities through the introduction of digital services for the subsequent development of a flexible and adaptive monitoring system for assessing the effectiveness of training using digital services and remote technologies. This descriptive study aimed to analyze the following aspects of the concept of "availability" of digital services: organizational and procedural accessibility; adaptive accessibility; psychological and pedagogical accessibility; human resources as a condition of accessibility; information and resource availability; a reflexive component of accessibility. The study relied on the methods of analysis, generalization, questionnaire, methods of visualization of study results. The research results showed the need to restructure the tools used for testing the monitoring system, develop the methodological guidelines for universities regarding the application of the monitoring system. In the result of the study, three groups of proposals were formulated to individualize educational trajectories and accompany students with disabilities via the means of digital services. The study showed the importance of improving the functionality of the university's information and educational environment in terms of creating the possibility of consolidating information about a student with disabilities at all stages of higher education.

Keywords: accessibility of education, digital services, inclusive education, students with disabilities.

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Published by Kazan federal university and peer-reviewed under responsibility of IFTE-2021 (VII International Forum on Teacher Education)

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## **Introduction**

Today, the implementation of the ideas of inclusive education, which is aimed at improving the effectiveness of the educational process in accordance with the peculiarities and educational needs of students with disabilities, has become a priority area for improving the educational system at the world level. Therefore, given the increasing use of distance learning, especially in view of the pandemic period, the issue of accessibility of higher education facilities, in particular e-learning, as one of the most appropriate learning technologies for persons with disabilities, has also been addressed in the education system.

The study of statistical data regularly submitted by the Federal State Statistics Service (2021) and the Federal Register of Disabled Persons (2020) indicates two significant trends in the area of inclusive higher education. On the one hand, there is an increase in the number of children with disabilities under 18 years of age (future applicants) – their number has approached 1 hundredth of the total population of the country (1.47 million people). On the other hand, there is a slight decrease in the number of young disabled people aged 18 to 30 years (age of students). Even if we consider that the number of persons with disabilities aged 18 to 30 years (age of students) is declining, their total number (more than 485 thousand people as of January 1, 2020) suggests that the society is confronted with an important social problem of ensuring equal rights of children with disabilities (applicants) and young disabled persons (students) to have access to quality education, including career guidance, preparation for admission and studies at universities. This provides an additional incentive to explore ways to ensure access to education for persons with disabilities.

## **Purpose and objectives of the study**

The purpose of the study was to analyze the experience of universities in the South of Russia in ensuring the accessibility of higher education to persons with disabilities through the introduction of digital services for the subsequent development of a flexible and adaptive monitoring system for assessing the effectiveness of training using digital services and remote technologies.

## **Literature review**

The works of Kurbangaleev & Veretennikov (2017), Ochkalova & Donghauser (2014), Terskova (2015) are focused on solving general conceptual issues related to the organization of inclusive education in universities. Gostev (2016), D. Hincapié, Duryea, & I. Hincapié (2019) studied the organization of support and support services for students with disabilities.

Blinova (2017) identified the risks that arise in the process of transforming higher education aimed at increasing its accessibility. Zaire-Beck, Sergeev, & Belikov (2016) identified the generalized approaches to ensuring the high quality of inclusive education.

Many foreign educational organizations (University of Minnesota, Vanderbilt University, University of Tasmania and others) independently initiate the development of regulations on the use of technical and program tools of availability. They create educational content for the electronic systems of training which considers students' personal features and features of their nosology. They can also use the guides developed by public organizations to ensure availability (Basham, Stahl, Ortiz, Rice, & Smith, 2015; Ontario Human Rights Commission, 2018; University of Washington College of Engineering UW Information Technology College of Education, 2020). In Russia, where the education system is centralized, in 2020, the Ministry of Education, issued the methodological recommendations on the implementation of educational programs of secondary special and higher education for persons with disabilities (Letter of the Ministry of Education of Russia, 2020). However, neither the foreign regulations nor the Letter of the Ministry of Education provide mechanisms for monitoring the effectiveness of the implementation of the recommendations, which is the basis for adaptive training.

Due to an increased use of digital means in inclusive higher education, the number of studies has also increased, which can be conditionally divided into several areas related to the understanding of the term "accessibility". Some researchers expand the list of material structure requirements as they view accessibility as the methodology for submitting educational material. They propose changes in the concept of organizing educational content (Karpova, Guterman, Mareev, Goryunova, & Fkopyan, 2017; Koreneva, Chernysheva, & Akimova, 2016; Margolis, Rubtsov, Panyukova, & Sergeeva, 2018), extension of additional methodological guidelines to explain the underlying content (Butcher, Kanwar, & Uvalic-Trumbic, 2011). The second group of the researchers focuses on understanding of accessibility as the technical means of accessing educational materials. They analyze new formats for presenting educational content, including those based on the principles of universal design (Atkins, Brown, & Hammond, 2007; Arrigo, 2005; Chan, Ed., Lee, & Chan, A., 2009; Dell, C. A., Dell, T. F., & Blackwell, 2015; He, 2014), methods of improving the interfaces of electronic learning systems (Kharade & Peese, 2012) or digital means of providing real-time access to training (Armstrong, Murray, & Mohamadi, 2010), the use of assistive technologies (Bühler & Fisseler, 2007; Lersilp, Putthinoi, & Chakpitak, 2016; Lyner-Cleophas, 2019).

A separate group of studies is devoted to such a not always obvious understanding of accessibility as the psychological and methodological readiness of university teachers to provide conditions for students with disabilities to learn educational content by means of distance learning (Dyachkova, 2016; Evlanova, 2020; Narbut, Aleshkovsky, Gasparishvili, & Krukhmaleva, 2020).

Thus, the analysis of the research in the studied field demonstrates that the experience of teaching people with disabilities in universities where education is implemented through remote educational technologies using digital tools, on the basis of which it is possible to build an adaptive system for monitoring the accessibility of inclusive higher education, which can be used in various universities, has not yet been fully studied. To ensure the necessary combination of universality and flexibility, it is critical to develop tools based on an integrated, comprehensive approach to understanding the term "accessibility" based on the preliminary, intelligence analysis of the already accumulated experience of universities in electronic and distance learning of students with disabilities.

### **Methodology**

The design of the study was determined by the requirements of the state task. The questionnaire consisting of 22 close-ended and open-ended questions was aimed at identifying various aspects of the concept of "accessibility" and clarifying its certain characteristics. Partner universities that provide support and take an active part in the organization of resource centers for supporting higher inclusive education in the South of Russia took part in the survey (information was provided under cooperation agreements within the framework of the state task, which determined the procedure for providing information and responsibility for its reliability). Since the questions reflected various organizational, administrative, technical, technological and methodological aspects, official representatives of universities took part in the survey. The survey was conducted in a remote form. Informed consent was obtained from all individual participants included in the study.

Considering the need to study the experience of implementing digital services from the point of view of an integrated approach to understanding accessibility, the questionnaire touched upon the following groups of issues: organizational forms of implementing inclusive education by means of remote technologies; digital services used to organize distance education of persons with disabilities (platforms for distance education, software, including methodological software); the legal framework of educational organizations regulating distance education of persons with disabilities; the readiness of the staff to introduce digital services into the practice of teaching their disciplines to students with disabilities; analysis of availability of these services for trainees with disabilities, availability and analysis of feedback from trainees.

The data obtained were digitally encoded and processed by the simplest statistical methods (measures of the central trend) in order to identify the main patterns for the subsequent refinement of the list and the wording of the questionnaire questions. Processing and visualization of the results was carried out using the MS Excel table processor.

## **Results**

The current descriptive study analyzed the following aspects of the concept "accessibility" of digital services of inclusive higher education:

- Organizational and procedural accessibility (creation of conditions for teaching using e-learning and distance education technologies);
- Adaptive accessibility (accounting of nosology when organizing access to educational content through digital services);
- Psychological and pedagogical accessibility (psychological, pedagogical, organizational, and methodological readiness of teachers to ensure the availability of educational content, readiness to interact with students with disabilities);
- Instrumental accessibility (availability and nature of the use of tools that partially automate the educational process);
- Personnel provision as a condition of accessibility (development of the university's personnel potential to ensure the process of applying digital services in inclusive higher education: accompany students with disabilities in the digital environment, ensure the continuity of digital services, test their accessibility to students with various nosologies in the case of universities generating their educational content);
- Information and resource availability (creation of a database of lesson records);
- Reflective component of accessibility (experience of using analytical tools by universities to process reviews of students with disabilities about the availability of electronic educational content and how to work with digital services as well as to analyze the characteristics of the educational process that are provided by electronic educational systems and other services to increase the availability of educational content).

Based on the analysis of the data obtained as a result of monitoring and taking into account the aspects of accessibility of digital services of inclusive higher education, the following conclusions were drawn. At the organizational and procedural accessibility level:

- 1) The use of e-learning and distance education technologies to the full (i.e. the learning process is fully implemented with their help) is the characteristic of the correspondence form of training, while, in the case of face-to-face form of training, digital services are used situationally.
- 2) More than half of the surveyed universities (65%) strive to ensure the availability of digital services for additional education of students (language studies, related specialties).
- 3) The use of digital services to individualize the training of students with disabilities in terms of providing conditions for studying according to an adapted program or an individual plan is provided by less than half of universities (45%).
- 4) Most universities (95%) currently use distance learning platforms with the most used platform being Moodle. Most universities use several digital services for video conferencing (Zoom, Teams, Skype and others).
- 5) 70% of surveyed universities noted the presence of local regulatory legal acts regulating the organization of distance education for persons with disabilities.
- 6) Analysis of the use of proctoring in universities suggests that for persons with disabilities it is preferable to use manual proctoring taking into account the nosology of the student.

At the level of adaptive accessibility, the following conclusions were drawn:

- 1) As a means of regulating accessibility of studied material, most universities use the built-in capabilities of digital platforms and training systems, while only 10% of respondents have a special module developed by the university for "other restrictions" (without specifying their type) and often, for many nosologies, the training systems cannot regulate accessibility.
- 2) The development and/or adaptation of the means used by the university to organize distance learning on nosologies in the practice of universities is used in the following ratio: for persons with visual impairment in 50% of the surveyed universities, for persons with hearing impairment – in 35%, for persons with musculoskeletal impairment – in 35%, for persons with other restrictions – in 45% of universities.

At the level of instrumental accessibility, the analysis of the results showed what means of organizing distance learning by universities are used in the practice of inclusive learning.

Monitoring showed that 90% of respondents use platforms for organizing webinars and videoconferences, 70% – the e-learning system, and 35% – ready-made online courses to conduct training sessions. During internships, 80% of the respondents use platforms for organizing webinars and videoconferences, 65% use e-learning systems, and 15% use ready-made online courses. When organizing consultations, 90% of the respondents use platforms for organizing webinars and videoconferences, 65% – e-learning systems, 15% – ready-made online courses. During the certification, a similar situation is observed. 90% of universities use platforms for organizing webinars and videoconferences, 70% use e-learning systems, and 20% use ready-made online courses (Fig. 1).

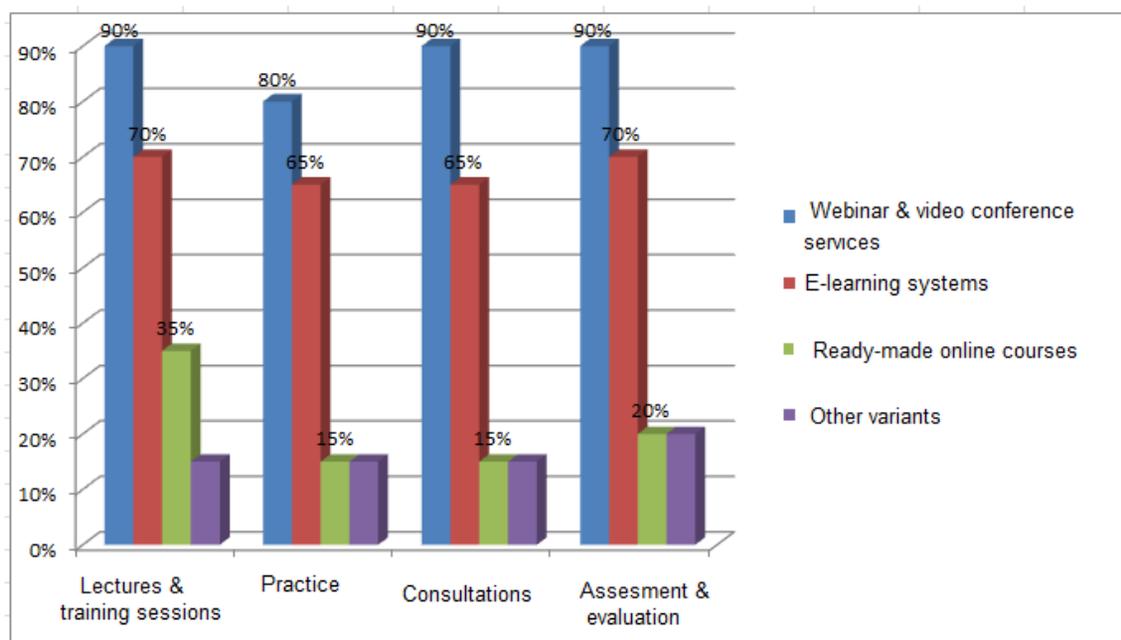


Figure 1. Remote learning tools used for students with disabilities

The representatives of the universities also noted the following distribution of the total number of open online courses used in the education of persons with disabilities at different levels of education. At the undergraduate level in the educational process of persons with disabilities, more than ten open online courses are used in 15% of surveyed universities, ten or fewer courses – in 20% of universities, and 65% of the respondents do not use such courses. In the master's degree, the number of online courses used is reduced. Only 5% of surveyed universities use more than ten open online courses, ten or fewer courses – 25%, and 70% of respondents do not use such courses. In graduate school, more than ten open online courses are used by 5% of the respondents, and 95% of the respondents do not use them (Fig. 2).

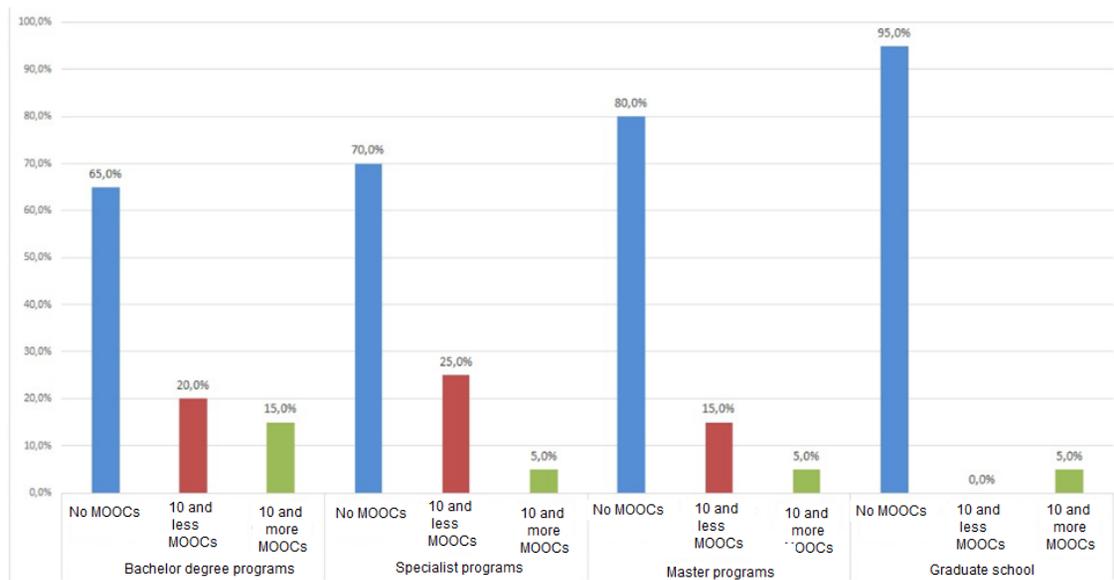


Figure 2. Total number of open online courses used in the education of persons with disabilities

As for the psychological and pedagogical accessibility, the monitoring revealed the following features. Currently, 55% of the universities have less than 50% of professors and teachers trained in the area of distance education to teach persons with disabilities. This indicates the need to continue staff development. In particular, attention should be given to the technical and programmatic component, which will include the study of the tools for working with various DOS platforms and the organization of videoconferences and webinars. The results revealed that some respondents confused distance learning platforms as tools for organizing webinars and videoconferences or learning environments.

In addition, the analysis showed that the main burden falls on IT specialists (their presence and responsibility for supporting students who use digital services was mentioned by 50% of the universities) and psychologists (in 45% of the universities), while tutors and volunteers are involved in only a third of the interviewed universities (Fig. 3). Thus, the personnel potential of the interviewed universities is rather modest to fully ensure the individualization of the educational process in the digital environment.

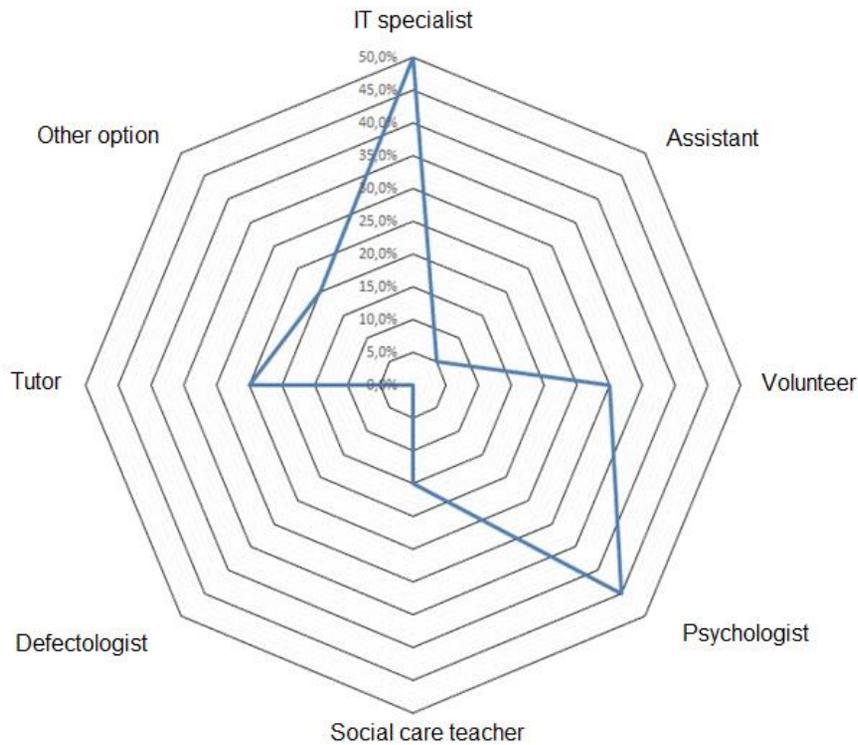


Figure 3. Specialists providing support for students with disabilities in distance learning

Information and resource accessibility is ensured by the fact that almost all universities provide the possibility of remote access to educational materials. However, at the same time, in cases when the student has no opportunity to attend classes, most universities provide access to remote full-time classes only occasionally. Only 30% of the universities have a database of educational materials which includes records of missed online classes. Only 50% of the universities strive to ensure optimal access to digital services, using applications for mobile devices, including cross-platform applications.

According to the data obtained, the reflexive component of accessibility can currently be characterized by the presence of feedback from the university with students with disabilities. The analysis of the availability of online courses in LMS using metrics built into the system occurs only in 15% of the universities; but third-party digital services do not use universities to assess the availability of presentation of educational material (0% of the universities). Moreover, in 85% of universities, such an analysis is not carried out at all. The university's assessment of distance learning facilities based on student feedback in 40% of the universities is carried out systematically, in 45% – if necessary, and in 15% of the universities do not assess.

Updating of distance learning facilities on the basis of student feedback is performed continuously during the academic year in 35% of the universities; regularly at the end of the school year – in 0%; when new services appear – in 50%; and is not performed – in 15% of universities.

## **Discussion**

The first stage of the study of the availability of digital learning tools for students with disabilities showed that not only quantitative but also qualitative analysis of the availability of digital learning tools for students with disabilities in partner universities is necessary. It is necessary to introduce tools that can provide additional information on the conditions for the implementation of inclusive higher education. This can be implemented in two ways. Firstly, through the development of a descriptive section in the questionnaire with the questions related to the description of the information and educational environment of the university (simplicity and accessibility of all tools and resources of the educational organization for students taking into account their nosology; access to electronic educational resources and electronic library systems and the possibility of their adjustment to a certain nosology; information about the competence of the representative of the university responding to questions of the questionnaire). Secondly, it is necessary to specify some questions of the questionnaire, in order to clarify the experience of universities with students with certain nosologies, their methods, the selection of interaction technologies and tools for optimizing such interaction.

The following can be identified as promising areas for further research:

- 1) Creation of a system for monitoring the satisfaction of students with disabilities with the availability of digital services used for distance learning, socialization, employment, professional development. The process of developing this system may include: highlighting the components of the satisfaction indicator for the availability of online courses of students with disabilities of various nosologies and metrics that will reflect them; conducting a special study on the satisfaction of students with disabilities with the availability of distance education tools (in the areas of study, socialization, employment, professional development) using selected metrics; development of methodological recommendations for designing a monitoring system in each university, as well as recommendations for modernizing "collections" of online courses to increase the quality satisfaction index of online courses for students with disabilities.
- 2) Development of a system for monitoring the availability of online courses on various platforms, which are part of a single digital space, created as part of the priority project "Modern Digital Educational Environment in the Russian Federation" (n.d.).

- 3) Development of adapted online courses for continuing inclusive education at various levels of the education system: undergraduate, master's, postgraduate, including the system of additional education of students and graduates of universities with disabilities.
- 4) Development of human resources potential: formation of the value orientation of employees of educational institutions with regard to the importance of correct development of content for digital services; advanced training of teachers; helping employees (tutors, volunteers) to create content for digital services, and design an adaptive information and educational environment using digital services adequate to the features of students with disabilities in nosologies.
- 5) Development of methodological recommendations for colleges and universities on the use of metrics to assess the activity of students including the methods that do not compromise students' mental and physical health.

## **Conclusion**

After conducting the first iteration of the study of the accessibility of digital learning tools for students with disabilities, three groups of proposals were formulated to individualize educational trajectories and accompany students with disabilities using digital services.

The first is to create the possibility of consolidating information about students with disabilities at all stages of higher education: at the preparatory (career guidance and admission); at the stage of direct education; at the initial skills testing stage (during the internship); at the assistance stage (employment, the process of adaptation at the workplace, additional vocational education programs).

From the technical point of view, this proposal can be implemented using several modules of the information and educational environment of the university. Such a multi-component environment, containing comprehensive information about the planned, present and subsequent interaction of the university and students with disabilities, will contribute to the maximum individualization of the trajectory of their training, socialization, personal and professional development.

To increase the individualization of digital services, it is also necessary to use a multi-code approach when forming the content of courses that are developed by universities themselves: to present materials taking into account the characteristics of students of various nosologies and test the content of recommended sites using specialized plugins and services (for example, WCAG Contrast Checker, Siteimprove Accessibility Checker, axe-Web Accessibility Testing, WAVE Evaluation Tool).

The second proposal for the university is to use a system of metrics to analyze the availability of electronic educational content as part of the digital services (including e-learning platforms). Among the metrics that are recommended to be taken into account in the accessibility analysis, three groups can be identified. The first group includes the metrics related to the generalized characteristics of the course (student's progress, course status, attendance (or "popularity" of the course), course learning results. The second group includes the metrics related to different activities of the student (average duration of viewing various types of content, speed of practical tasks, activity of participation in discussions, number of completed homework tasks focused on self-test, analysis of answers, and number of test attempts). The third group contains the metrics aimed at the characteristics of communication (student feedback, expert feedback).

The third proposal is the systematic monitoring of the availability of digital services at the university level. The monitoring includes the research on the use of assistive tools and technologies by universities for students with various nosologies; assessment of the quality of training of university teachers in terms of readiness to implement inclusive education through digital services; monitoring of services that are used to reflect educational experience in the framework of digital courses; research on the organization of conditions for the availability of online mass courses (especially on the Open Education platform).

### **Funding**

The authors have no funding to report.

### **Competing interests**

The authors have declared that no competing interests exist.

### **Acknowledgements**

The study was carried out within the framework of the State task "Ensuring the activities of the resource educational and methodological center for the training of disabled people and people with disabilities (hereinafter - RMC)" and the planning period 2020 and 2021. Dated October 18, 2017, no. R-696

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