

Empirical Study of Cultural Educational Organizations' Accessibility to the Disabled People in the Regions of the Russian Federation

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Abstract—This paper addresses the empirical study of the accessibility to the disabled people of educational organizations in the cultural sector in the constituent entities of the Russian Federation, including the description of steps, contents and conditions for carrying out such research. The latter assesses the accessibility to the disabled of different-level educational organizations in the regions of Russia by such statistical tools as the correlation and regression analysis, and the single-factor analysis of variance. These tools together provide for the identification of internal links and patterns of multilevel education for the people with disabilities and with special needs.

Keywords—research; education; culture; accessibility; disabled; people with special needs

I. INTRODUCTION

Today in Russia live around 13 million of the disabled people, accounting for approximately 8.8 percent of the populace, including 1 283 000 disabled people of the first group, 6 250 000 disabled people of the second group, 4 601 000 disabled people of the third group, and 617 000 disabled children. According to expert estimates, there are almost 190 000 hard of hearing people, about 320 000 wheelchair-users and 240 000 visually impaired people (from the interview with G.G. Lekarev, Russian Minister of Labour and Social Protection) [2]. The research shows that more than a third of all disabled people would like to engage in cultural activities, or 70% aged under 30 years and over 80% of the disabled aged 60 years and over [5].

According to the Information for general session of the Russian Ministry on the problems "Of accessibility of cultural goods to the disabled people", the Ministry and local cultural administrations in Russian regions have worked out and adopted regulations and requirements aimed at improving the accessibility of cultural goods and values to the Russians with disabilities [6].

In 2016, the Russian Ministry of culture had conducted monitoring of the accessibility of cultural goods to the people with disabilities and with special needs, the results of which are published on the Ministry's official website [7]. The monitoring was conducted in compliance with the Federal Law "On amendments to certain legislative acts of

the Russian Federation on social protection of the disabled people relating to the ratification of the Convention on the Rights of Persons with Disabilities" No.419-FZ as of 01.12.2014 [8].

Analysis of the records of monitoring the accessibility of cultural goods to the disabled people encloses the so-called "dark" data and their analytical pre-processing. At the same time, in the provided monitoring records there is no assessment of cause-and-effect, statistical or other relationship in the field under study. The said enables to identify the emerged contradiction between the need to established trends in the cultural goods' accessibility to the disabled people, in accordance with regulatory requirements, and the lack of such an assessment.

Today there is an apparent objective need to implement in the continuous multilevel education system the qualimetric algorithms and technology that would allow for a better assessment of the feasibility of implementing educational programs and of the conformance of achieved results of training to the requirements of the community and employers, as well as to the professional personal expectations of graduates themselves. Availability of the multilevel education for the people with disabilities and special needs, on the one hand, correlates closely with different-level educational organizations in the cultural sector and, on the other hand, with several other factors. Analysis of the monitoring data on the accessibility of facilities and services in the regions of the Russian Federation showed that educational services in the cultural sector are rendered by 5103 art schools for children, 241 professional education organizations, 26 higher education organizations, supervised by local cultural administrating authorities [7].

To resolve the detected conflict the authors intend to assess the accessibility of different-level educational organizations in the cultural sector to the disabled people so to identify the trends in ensuring the multi-level education for people with disabilities and with special needs.

According to the hypothesis, proposed and tested by the authors of this study, if to identify the trends that feature the accessibility to the disabled people of different-level

educational organizations in the cultural sector, this would allow to assess the availability of multi-level education for such people.

II. THE EMPIRICAL RESEARCH METHODOLOGY

The assessment of accessibility to the people with disabilities of different-level educational organizations working in the cultural sector in Russia's regions has applied the statistical techniques – the correlation-regression analysis and the single-factor analysis of variance [3] [4]. These tools together help identify intrinsic links and common factors of the availability of multi-level education for the people with disabilities and special needs.

Correlation is considered as the attribute that indicates the connectivity of a set of numerical sequences, it describes the data interconnection. The retrieval of correlative dependence helps determine probabilistic bonds between one variable x and another – y . Consequently, the correlation analysis carries the inference on the bonding strength of a pair of findings x and y . The more exact assessment of the extent of interconnection between the quantitative attributes can be obtained if to determine the measure of concordance of the resultant attribute's variation with the factorial attribute's variation. Closeness of the resultant y and factor x properties is measured by the linear correlation coefficient.

The regression analysis can reveal the analytical dependence that shows the dynamics of the resultant characteristic's mean value as effected by one or several independent variables. Many other factors that influence the resultant characteristic, however, are taken as permanent or average levels. Therefore, the regression analysis is indicative of how one value, for example, y , changes on average under corresponding changes in the other value x , and similarly, of how the variable x varies depending on the exponent y .

On the one hand, the correlation-regression analysis allows the identification of the nature of statistical relationship of two or more accidental variables, and, on the other hand, the identification of mathematical expressions delineating the pattern of relationship between these accidental variables. The accessibility of higher education (regional and municipal universities), of secondary professional establishments and of children's art schools in Russian regions' cultural sector is presenting under our study accidental variables – k .

The one-way analysis of variance (ANOVA) is applied to compare the mean values for three or more samples. A factor is identified as an independent variable the influence of which on the response variable is investigated. The investigation uses as the response variable the accessibility to the people with disabilities and with special needs of educational organizations and as the factor variable (independent variable) – the categories of educational organizations in Russia's regions. In our case, the factor (regional and municipal higher educational organizations, secondary professional establishments and art schools for children) comprises three independent one-dimensional samples – k , whose entries are measured in alike units

(pieces). In addition, the crucial prerequisite for ANOVA is fulfilled—the independent variable is categorical and the response variable is metric.

"Table I" summarises the data available in the third volume of the document "The Accessibility status of cultural institutions and educational organizations. Results of monitoring the provision of conditions for accessibility of cultural goods to the persons with disabilities and with special needs in the Russian Federation" [7]. The paper is a part of the five-volume report on "Review of the results of monitoring conditions of the availability of cultural goods to the persons with disabilities and with special needs" [7].

TABLE I. ACCESSIBILITY OF EDUCATIONAL ORGANIZATIONS IN THE CULTURAL SECTOR IN REGIONS OF THE RF

No	Region	Number of educational organizations in the RF entities		
		Accessibility of high education in cultural sector (regional and municipal universities)	Accessibility of secondary professional organizations in cultural sector	Accessibility of art schools for children in cultural sector
1	Altai Territory	0	5	111
2	Amur Region	0	1	34
3	Arkhangelsk Region	0	2	39
4	Astrakhan Region	1	3	26
5	Belgorod Region	1	2	65
6	Bryansk Region	0	0	53
7	Vladimir Region	0	2	51
8	Volgograd Region	1	1	82
9	Vologda Region	0	3	44
10	Voronezh Region	0	6	71
11	Moscow	1	10	144
12	Jewish Autonomous Region	0	1	9
13	Trans-Baikal Territory	0	2	65
14	Ivanovo Region	0	5	30
15	Irkutsk Region	0	5	100
16	Kabardino-Balkarian Republic	0	0	30
17	Kaliningrad Region	0	1	40
18	Kaluga Region	0	2	53
19	Kamchatka Territory	0	1	31
20	Karachayev-Cherkessian Republic	0	1	28
21	Kemerovo Region	1	5	122
22	Kirov Region	0	3	74
23	Kostroma Region	0	3	54
24	Krasnodar Territory	0	6	180
25	Krasnoyarsk Territory	0	6	126
26	Kurgan Region	0	2	42
27	Kursk Region	0	4	48
28	Leningrad Region	0	1	66
29	Lipetsk Region	0	2	37
30	Magadan Region	0	1	14
31	Moscow Region	0	4	217
32	Murmansk Region	0	1	55
33	Nenets Autonomous District	0	3	2
34	Nizhny Novgorod Region	1	7	122
35	Novgorod Region	0	1	32
36	Novosibirsk Region	1	3	91

No	Region	Number of educational organizations in the RF entities		
		Accessibility of high education in cultural sector (regional and municipal universities)	Accessibility of secondary professional organizations in cultural sector	Accessibility of art schools for children in cultural sector
37	Omsk Region	0	3	78
38	Orenburg Region	1	4	64
39	Orel Region	0	3	39
40	Penza Region	0	3	50
41	Perm Territory	0	5	100
42	Primorye Territory	1	3	56
43	Pskov Region	0	1	29
44	Republic of Adygeya	0	1	21
45	Republic of Altai	0	1	15
46	Republic of Bashkortostan	0	8	129
47	Republic of Buryatia	0	2	53
48	Republic of Dagestan	0	4	93
49	Republic of Ingushetia	0	1	8
50	Republic of Kalmykia	0	1	17
51	Republic of Karelia	0	2	32
52	Komi Republic	0	3	43
53	Republic of Crimea	2	3	67
54	Republic of Marij El	0	2	46
55	Republic of Mordovia	0	2	51
56	Republic of Sakha (Yakutia)	1	5	85
57	Republic of North Ossetia-Alania	0	3	24
58	Republic of Tatarstan	2	9	104
59	Republic of Tuva	0	1	31
60	Republic of Khakassia	0	0	37
61	Rostov Region	0	5	113
62	Ryazan Region	0	0	0
63	Samara Region	1	7	109
64	Saint-Petersburg	0	7	57
65	Saratov Region	0	2	93
66	Sakhalin Region	1	1	34
67	Sverdlovsk Region	1	9	161
68	Sebastopol	0	0	9
69	Smolensk Region	1	2	53
70	Stavropol Territory	0	4	97
71	Tambov Region	1	1	36
72	Tver Region	0	3	64
73	Tomsk Region	0	2	29
74	Tula Region	0	3	37
75	Tyumen Region	1	2	42
76	Republic of Udmurtia	0	2	58
77	Ulyanovsk Region	2	3	53
78	Khabarovsk Territory	1	1	44
79	Khanty-Mansijsk Autonomous District - Yugra	0	3	58
80	Chelyabinsk Region	2	2	130
81	Chechen Republic	0	1	40
82	Chuvash Republic - Chuvashia	1	3	46
83	Chukotka Autonomous District	0	0	6
84	Yamalo-Nenets Autonomous District	0	0	37
85	Yaroslavl Region	0	3	37
Number of organizations		26	241	5103
Average		0.31	2.84	60.04

The "Table I" data is going to serve as reference information for further investigation.

III. EVALUATION

Let us perform the necessary calculations consistent with the following steps:

- Construction of the complete correlation matrix and assessment of the variables' bond character;
- Construction of the regressions and identification of the mathematical expressions characterizing relationship between the variables.
- ANOVA and the assessment of the effect of educational organizations' categories on the accessibility of educational organizations in Russia's regions to the disabled people.

The first step of building the correlation matrix is Microsoft Excel-based. Based on the "Table I" data, we get the following correlation matrix "Table II".

Based on the correlation matrix calculations "Table II" and given Cheddock scale for the correlation estimate, the following conclusions were made [1]:

- The relation between the accessibility of secondary professional education organizations in the culture sector and that of children's art schools in Russian regions should be interpreted as direct and high;
- The relation between the accessibility of high education in the cultural sector (regional and municipal universities) and that of the secondary professional establishments in the same sector in Russian regions should be interpreted as direct and weak;
- The relation between the accessibility of high education in the cultural sector (regional and municipal universities) and that of the children's art schools in the same sector in Russian regions should be interpreted as direct and weak.

Particular interest for the research, obviously, focuses on the most correlative relationship on between the accessibility of secondary professional education in the cultural sector in Russia's regions and the accessibility of children's art schools in the cultural sector in Russia's regions, expressed by the correlation coefficient 0.71. Meantime, subsequently other distinguished relations will be studied as well.

The second step envisages the construction of regressions and the identification of mathematical expressions, which are a descriptor of the variables' relationship.

TABLE II. COMPLETE CORRELATION MATRIX OF EDUCATIONAL ORGANIZATIONS' ACCESSIBILITY IN CULTURAL SECTOR IN THE REGIONS OF THE RUSSIAN FEDERATION

	Accessibility of high education in cultural sector (regional and municipal universities) in Russian regions	Accessibility of secondary professional education in cultural sector in Russian regions	Accessibility of children's art schools in cultural sector in Russian regions
Accessibility of high education in cultural sector (regional and municipal universities) in Russian regions	1		
Accessibility of secondary professional education in cultural sector in Russian regions	0.28	1	
Accessibility of children's art schools in culture in the RF territorial entities	0.28	0.71	1

Let us present initially the regression which reflects the approximant of the ratio of secondary professional organizations' accessibility in the cultural sector in Russia's regions to the children's art schools' accessibility "Fig. 1".

"Fig. 1" demonstrates the line of regression, highlighting the character of interrelatedness of the accessibility of secondary professional organizations and of children's art schools in the cultural sector in Russian regions. In addition, the function (equation) approximating the regression line is being defined (1):

$$y = -0.1533x^3 + 1.7472x^2 + 8.8903x + 24.066 \quad (1)$$

The computed function is polynomial and is described by the reliability of $R^2 = 0.5091$ approximation value. The function allows calculation of the values of two-way relation, namely, of the extent to which the secondary professional education organizations' accessibility in the cultural sector varies under the corresponding change in the accessibility of children's art schools.

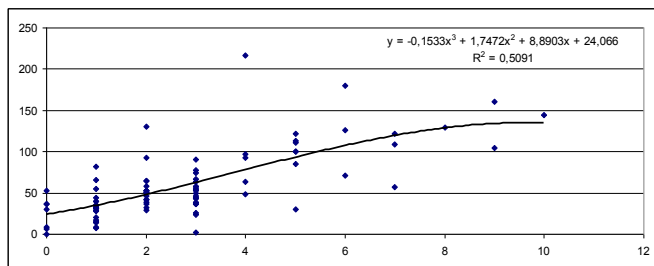


Fig. 1. Regression of the balance between the accessibility of secondary professional organizations and of children's art schools in cultural sector in Russian regions.

Let us calculate the regression approximating the dependency function for the accessibility of secondary professional education organizations and of children's art schools in the cultural sector in Russian regions "Fig. 2".

"Fig. 2" depicts the line of regression identifying the character of interrelation between the accessibility of high education (regional and municipal universities) and of the secondary professional education in Russian region's cultural sector. This regression line is approximated by the following function (equation) (2):

$$y = -0.4782x^2 + 1.8512x + 2.4603 \quad (2)$$

The computed function is polynomial and is described by the reliability of $R^2 = 0.0845$ approximation value. It allows calculating the values of two-way relation—to what extent the accessibility of high education organizations in the cultural sector is subject to modification under appropriate changes in the secondary professional organizations' accessibility in the cultural sector of Russian regions.

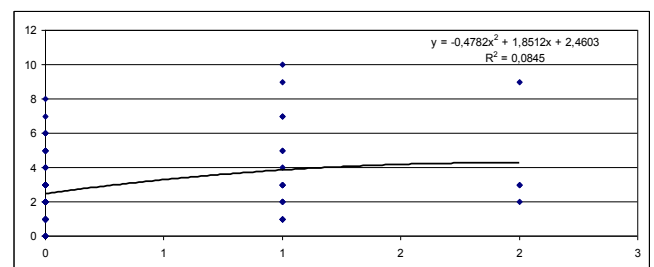


Fig. 2. Regression of the balance between the accessibility of higher education in the cultural sector (regional and municipal universities) and of secondary professional organizations the cultural sector of Russian regions.

Let us calculate the third regression, approximating the balance between the accessibility of high education in the cultural sector (regional and municipal universities) and of children's art schools in Russian regions' cultural sector "Fig. 3".

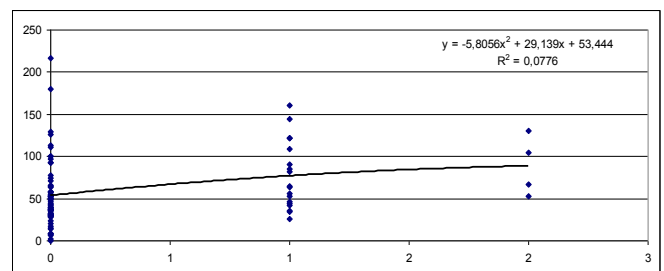


Fig. 3. Regression of the balance between the accessibility of high education (regional and municipal universities) in cultural sector and of children's art schools in Russian regions.

"Fig. 3" presents the line of regression identifying the nature of relationship between the accessibility of high education (regional and municipal universities) and children's art schools in the culture sector in the regions of the Russian Federation. This regression line is approximated by the following function (equation) (3):

$$y = - 5.8056x^2 + 29.139x + 53.444 \quad (3)$$

The computed function is polynomial and features the reliability of $R^2 = 0.0776$ approximation value. The received function allows calculating two-way relation values, namely, how far the accessibility of high education (regional and municipal universities) in the cultural sector is subject to modification under corresponding changes in the accessibility of children's art schools in the cultural sector of Russian regions.

As provided for by the third step of the research, the one-way analysis of variance (ANOVA) and assessment of the effect of educational organizations' categories on the accessibility to the disabled persons of educational organizations in the Russian regions is carried out. Let us find out whether there are discrepancies in the different categories of educational organizations' accessibility and how these different categories affect the accessibility to the people with disabilities and with special needs of educational organizations in Russia's regions.

According to the formulated main hypothesis, all average values from different aggregates k (the accessibility of higher education (regional and municipal universities) in the cultural sector in Russian regions, the accessibility of secondary professional organizations in the cultural sector in Russian regions, the accessibility of children's art schools in the cultural sector in Russian regions) are equal.

$$H_0: \mu_1 \neq \mu_k \text{ (all equal), (or } X_1 = X_2 = \dots = X_k).$$

The alternative hypothesis states that a minimum of any two mean values are not equal.

$$H_1 : \mu_1 \neq \mu_k \text{ (a minimum two are not equal), (or } X_j \neq X_k).$$

For calculations, we will use the Microsoft Excel tool. The calculation data is provided in "Table III".

TABLE III. ONE-WAY ANALYSIS OF VARIANCE (ANOVA) OF THE ACCESSIBILITY TO THE DISABLED PEOPLE OF EDUCATIONAL ORGANIZATIONS IN THE REGIONS OF THE RUSSIAN FEDERATION

Groups	Score	Total	Average	Variance
Column 1	85	26	0.305882353	0.310084034
Column 2	85	241	2.835294118	4.901120448
Column 3	85	5103	60.03529412	1690.105882

ANOVA						
Source of variation	SS	df	MS	F	P-Value	F Critical
Between groups	193965.4824	2	96982.74118	171.6187643	9.24E-48	3.031628943
Inside groups	142406.6353	252	565.1056956			
Total	336372.1176	254				

The carried out calculations point to a significant difference in the accessibility of different categories of educational organizations, implied by the ratio $F > F_{\text{critical}}$ ($171.6187643 > 3.031628943$) and the unlikely acceptance of the null hypothesis (P-value = 9.24E-48, which is less than 0.05), i. e. the null hypothesis (H_0) may be rejected while an alternative hypothesis (H_1) is adopted.

In this regard, the fact that the accessibility of different categories of educational organizations significantly varies has been proved. Therefore, it is especially important to assess the effect of various categories of educational organizations on their accessibility to the disabled people in Russian regions. To estimate this effect the correlation ratio η^2 (eta squared) is applied; η^2 (eta squared) is calculated as a ratio of between-group variation (SS between groups) to the total variance (SS total). Following the corresponding division, we receive the value of the force of factorial effect $-\eta^2 = 0.576639597$ (~0.58 or 58% in percentage terms).

Therefore, it can be concluded that the accessibility to the people with disabilities and with special needs of educational organizations in Russian regions is 58% dependent on the accessibility of various categories (k) of such educational organizations. The remaining 42% of the accessibility to the disabled people of educational organizations in Russian regions is bound to other variables (factors), the analysis of which is beyond the scope of this study.

IV. CONCLUSION

It can be ascertained from the above that the hypothesis put forward has been confirmed. Findings of the correlation-regressive and ANOVA analyses of the accessibility to the people with disabilities and with special needs of educational organizations in the regions of the Russian Federation verify that the use of specified techniques of statistical analysis allows revealing the trends and assessing the availability of multi-level education for the disabled people. Assessment of the multi-level education's availability for the people with disabilities and with special needs in the regions of the Russian Federation depends upon the accessibility of the educational organizations' different categories. This dependency relation is most pronounced for the secondary professional education organizations and children's art schools in the cultural sector in Russian regions. The research findings provide theoretical and methodological basis for addressing current theoretical and practical problems of applying the methods of assessment and analysis of educational organizations' accessibility in Russia's regions to the people with disabilities and special needs. Also, the findings contribute to the development of theoretical bases for the creation and introduction of the most innovative procedure for the study of educational organizations' accessibility to the people with disabilities and with special needs.

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