Quantitative Evaluation of Involvement of Counties in the International Open Access Movement

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Abstract
The present paper investigated a developed method for the quantitative evaluation of involvement of countries in the international open access movement. It identified eight country open access indices which were initially connected with open access initiatives and instruments, their weighing, normalization and aggregation in a weighted average value. In a second more strict approximation, the number of indices was reduced up to six for the account of discarding duplicated data in ROAR and Open DOAR. Budapest initiative and Berlin declaration were considered as OA-initiatives; and data of the international registers, DOAJ, SHERPA/RoMEO, ROAR MAP and the Webometrics OA-repositories ranking, was considered as the tools. The calculation was done on the basis of a developed method for 133 countries.

Keywords: Open access; Involvement of countries in open access; Budapest initiative; Berlin declaration; ROAR; Open DOAR; DOAJ; SHERPA / RoMEO; ROAR MAP; Webometrics.

1. Introduction
A fair number of scientific works are devoted to the problem of movement of the open access to scientific knowledge launched at the turn of the century. In the advanced search of “Google Scholar”, there are 394 responses to the request of the term “Open access to scientific knowledge” in the exact word combination line (8 June, 2017). Furthermore, there are very few works dedicated to the quantitative analysis of involvement of countries in this movement (Faraji et al., 2018; Villalobos, 2003). Among the above-mentioned responses, we managed to single out five papers that considered the distribution of the open access repositories and journals on a country-by-country basis. The work [1] gives the distribution of OAR (Open Access Repositories) in the Open DOAR register across the leading countries of the world (Tab. 1).

| Table-1. Distribution of the OAR in the Open DOAR Across the Countries of the World (7-8 October, 2008) |
|---------------------------------|------------------|----------|
| Country                        | OAR Number       | %        |
| USA                            | 317              | 25.36    |
| United Kingdom                 | 136              | 10.88    |
| Germany                        | 129              | 10.32    |
| Japan                          | 69               | 5.52     |
| Australia                      | 68               | 5.44     |
| Netherlands                    | 45               | 3.60     |
| Canada                         | 44               | 3.52     |
| Italy                          | 42               | 3.36     |
| 68 other countries             | 400              | 32.00    |
| Total                          | 1250             | 100      |

More up-to-date data on the OAR distribution in the Open DOAR and ROAR registers are shown in the Table 2 (Das, 2014).

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According to the comparison of these tables, we see what fold the OAR has increased in the Open DOAR for four and a half years. The greatest increase of the OAR has been observed for the USA. Also this article describes the growth dynamics of the number of the OA-journals (OAJ) in the DOAJ register for the period from 2002 to 2013. Let’s give the data obtained at the ends of this time interval (Tab.3).

According to tables, the number of the OAJ grows much faster than of the OAR. The work (Cuestas et al., 2017; Roy et al., 2013) provides the OAR distribution across 11 leading countries distinguishing those of them which function within the frameworks of the Open Archives Initiative Protocol for Metadata Harvesting (PMH, OAII), and the work (Moskovkin et al., 2014) gives the distribution of a wider set of the open access resources and instruments for the Sub-Saharan African countries. The work (Usova, 2009) describes the data of distribution of OAR and OAJ numbers across CIS countries (Tab. 4).

2. Materials and Methods

We characterized the involvement of countries in the international open access movement by the statistical data from registers of the largest open access initiatives and instruments. We considered Budapest initiative “Open access” (2002) and Berlin Declaration of the open access to scientific and humanities knowledge (2003) as such initiatives; and the international registers ROAR, Open DOAR, SHERPA/RoMEO, ROAR MAP, DOAJ and Webometrics ranking for the OA-repositories as instruments. In general, we used 8 quantitative indices (a number of organizations which signed Budapest initiative and Berlin declaration shall be taken for the first two). Values of these eight indicators are also recorded in a form of a matrix (Table) for fifteen ex-USSR countries and based on it the average values for each index per one country and the total quantitative potential of the open access initiatives and instruments on a country-by-country basis shall be calculated by summation of lines of this matrix. As far as all these indices are not equal and some of them are replicated, we offer the following procedure for more precise calculation of the quantitative potential of involvement of countries in the open access. Let’s choose one most essential index out of three indicators which relate to the OA-repositories. It should be understood that organizations usually register their OA-repositories simultaneously in two registers, ROAR and Open DOAR, provided that the first register is more popular. Besides, the actual number of records in these registers usually exceeds the real number of functioning OA-repositories. Replication of records takes place, for examples, due to the change of an
OA-repository name or its re-registration. Similarly, the real number of functioning OA-repositories, in which data is indexed by search engines, is reliably disclosed in the Webometrics ranking. We take this index as a basis. Let’s break down six selected indicators into three groups in order of importance with assignment weighting coefficients to them (Tab. 5).

Table-5. Quantitative Indices of Involvement of Countries in the International Open Access Movement: Their Groups, Designations and Weighting Coefficients.

| Group Name                | Included Indices in the Group Name | Designation | Weighting Coefficient |
|---------------------------|-----------------------------------|-------------|-----------------------|
| OA repositories and journals | Number of OA-repositories included in Webometrics | I₁         | 1/4                   |
|                           | Number of OA journals included in DOAJ | I₂         | 1/4                   |
| OA-policy                 | Number of publishing OA policies on self-archiving and copyright in SHERRA/ROMEO | I₃         | 1/6                   |
|                           | Number of institutional OA mandates in ROAR MAP | I₄         | 1/6                   |
| OA initiatives            | Number of signatories-organization of the Budapest initiative | I₅         | 1/12                  |
|                           | Number of signatories-organization of the Berlin Declaration | I₆         | 1/12                  |

When distributing weighs for these six indicators, we proceeded from the following considerations. Groups were chosen with the uniform indices (carriers of the OA-results, OA-policy, OA-initiatives), that is why there were taken equal weighting coefficients among indices of one group. The significance of the very groups (summary weighting coefficient for a group) was supposed to be increasing with the uniform interval according to the procedure specified in the table 5. Herewith the sum of group weighting coefficients was taken to be equal to one. Thus, the integrated index of involvement of countries in the international open access movement can be calculated using the weighted average value.

\[
I_{OA} = \frac{1}{4} (I_1 + I_{1\text{max}} + I_2 + I_{2\text{max}}) + \frac{1}{6} (I_1 + I_{3\text{max}} + I_4 + I_{4\text{max}}) + \\
\frac{1}{12} (I_1 + I_{5\text{max}} + I_6 + I_{6\text{max}}),
\]

Where, \(I_{i\text{max}}\) – maximum value of i index over the whole sampling of countries. There is carried out the correlation analysis between \(I_{OA}\) and indicators normalized to the maximum value according to the sampling of countries \(N \approx N/N_{max}\). The total number of estimated countries turned out to be 133.

3. Results and Discussion

Table 6 presents initial values of eight indices of involvement of fifteen ex-USSR countries in the international open access movements, which were collected by us on 24-26 June, 2017 from the OA-initiatives and OA-instruments Websites. This table shows calculated values of \(N, N \approx N/N_{max}\) and \(I_{OA}\). Countries in the table are ranked by values of the index \(N(N)\). There has been obtained a good correlation relationship between \(N\) and \(I_{OA}\) (Fig. 1).

Figure-1. Linear Regression Equation Between \(N^I\) and \(I_{OA}\)

\[
y = 0.8521x + 0.0009, \quad R = 0.9942
\]

76.5% of the total number of the OA-initiatives and OA-instruments is accounted for 20% of countries (27 countries) (Tab. 6), i.e. we obtained the distribution closed to Pareto distribution.

If we divide all countries into 5 groups according to the five-level uniform classification scale by \(N^I\) index, then we can see their very non-uniform distribution. Only USA falls into a group of countries with very high level of involvement in the OA-movement \((0.8 < N^I \leq 1.0)\), the United Kingdom falls into a group of countries with a high level \((0.6 < N^I \leq 0.8)\), Brazil falls into a group of countries with the average level \((0.4 < N^I \leq 0.6)\), Spain, Germany, Indonesia, Japan, Poland, Italy, India, Egypt, France fall into a group of countries with a low level \((0.2 < N^I \leq 0.4)\).
The rest of countries (121 countries) fall into a group with a very low level of involvement in the OA-movement that amounts to 91% of their total number.

| Country         | SHERPA/RoMEO | DOAJ | ROAR | DOAR | ROAR MAP | Webometric OA-Repositories | Berlin Declaration | Budapest Open Access Initiative | N  | N' | OOA |
|-----------------|---------------|------|------|------|----------|------------------------------|--------------------|-------------------------------|-----|----|-----|
| United States   | 558           | 987  | 808  | 498  | 137      | 391                          | 98                 | 98                            | 3063|    |     |
| United Kingdom  | 280           | 886  | 258  | 252  | 120      | 141                          | 44                 | 1982                         | 0.64| 71 | 0.58|
| Brazil          | 67            | 987  | 138  | 92   | 20       | 52                           | 1                  | 1386                         | 0.45| 25 | 0.33|
| Spain           | 93            | 539  | 178  | 125  | 38       | 67                           | 32                 | 1130                         | 0.36| 89 | 0.32|
| Germany         | 96            | 262  | 239  | 195  | 58       | 116                          | 98                 | 33                            | 1097|    |     |
| Indonesia       | 28            | 613  | 111  | 62   | 16       | 69                           | 1                  | 918                          | 0.29| 97 | 0.24|
| Japan           | 19            | 18   | 228  | 211  | 6        | 276                          | 0                  | 779                          | 0.25| 43 | 0.21|
| Poland          | 29            | 449  | 120  | 92   | 3        | 32                           | 0                  | 730                          | 0.23| 83 | 0.15|
| Italy           | 47            | 282  | 93   | 110  | 24       | 53                           | 83                 | 20                            | 711 |    | 0.23|
| India           | 118           | 233  | 118  | 76   | 16       | 39                           | 3                  | 98                            | 701 |    | 0.22|
| Egypt           | 3             | 602  | 11   | 5    | 0        | 1                            | 2                  | 627                          | 0.20| 47 | 0.15|
| France          | 45            | 191  | 96   | 119  | 23       | 115                          | 23                 | 625                          | 0.20| 40 | 0.19|
| Turkey          | 28            | 203  | 62   | 75   | 45       | 31                           | 0                  | 499                          | 0.29| 44 | 0.25|
| Canada          | 75            | 122  | 96   | 81   | 27       | 48                           | 13                 | 488                          | 0.15| 93 | 0.15|
| Colombia        | 31            | 255  | 65   | 44   | 5        | 43                           | 1                  | 460                          | 0.15| 92 | 0.12|
| Portugal        | 129           | 77   | 59   | 55   | 22       | 35                           | 7                  | 389                          | 0.12| 70 | 0.11|
| Russian Federation | 31        | 187  | 61   | 28   | 6        | 23                           | 1                  | 383                          | 0.12| 50 | 0.09|
| Switzerland     | 28            | 257  | 19   | 18   | 10       | 11                           | 27                 | 374                          | 0.12| 21 | 0.11|
| Ukraine         | 19            | 81   | 94   | 75   | 15       | 54                           | 3                  | 373                          | 0.12| 18 | 0.10|
| Australia       | 44            | 83   | 86   | 57   | 34       | 51                           | 0                  | 363                          | 0.11| 85 | 0.11|
| Iran            | 17            | 290  | 9    | 10   | 0        | 4                            | 0                  | 341                          | 0.11| 13 | 0.09|
| Romania         | 26            | 286  | 13   | 3    | 1        | 2                            | 1                  | 341                          | 0.11| 13 | 0.09|
| Netherlands     | 23            | 178  | 44   | 35   | 12       | 15                           | 20                 | 333                          | 0.10| 87 | 0.09|
| Argentina       | 17            | 145  | 49   | 41   | 5        | 22                           | 0                  | 288                          | 0.09| 40 | 0.06|
| China           | 10            | 71   | 92   | 39   | 4        | 31                           | 2                  | 260                          | 0.08| 49 | 0.05|
| Sweden          | 19            | 50   | 75   | 42   | 12       | 40                           | 6                  | 247                          | 0.08| 66 | 0.06|
| Norway          | 51            | 57   | 59   | 53   | 10       | 9                            | 5                  | 244                          | 0.07| 97 | 0.05|
| Taiwan          | 1             | 28   | 83   | 60   | 1        | 57                           | 1                  | 231                          | 0.07| 54 | 0.04|
| Mexico          | 7             | 98   | 41   | 30   | 3        | 13                           | 1                  | 212                          | 0.06| 92 | 0.05|
| South Africa    | 17            | 63   | 49   | 24   | 9        | 21                           | 18                 | 204                          | 0.06| 66 | 0.06|
| Belgium         | 18            | 33   | 35   | 25   | 19       | 14                           | 17                 | 173                          | 0.05| 65 | 0.07|
| Hungary         | 32            | 26   | 40   | 36   | 4        | 19                           | 2                  | 163                          | 0.05| 32 | 0.03|
| Peru            | 6             | 33   | 43   | 42   | 7        | 20                           | 0                  | 155                          | 0.05| 32 | 0.03|
| Country                          | A   | B   | C   | D   | E   | F   | G   | H   | I   | J   | K   | L   | M   | N   | O   | P   |
|---------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Austria                         | 23  | 37  | 19  | 28  | 8   | 8   | 23  | 4   | 150 | 0.04| 0.05| 40  |
| Chile                           | 9   | 76  | 22  | 20  | 0   | 15  | 1   | 3   | 146 | 0.04| 0.03| 49  |
| Greece                          | 16  | 29  | 39  | 35  | 4   | 13  | 6   | 3   | 145 | 0.04| 0.03| 40  |
| Czech Republic                  | 15  | 75  | 13  | 17  | 4   | 10  | 7   | 2   | 143 | 0.04| 0.04| 24  |
| Finland                         | 41  | 20  | 22  | 16  | 31  | 11  | 0   | 0   | 141 | 0.04| 0.06| 21  |
| Malaysia                        | 8   | 41  | 37  | 21  | 1   | 28  | 0   | 2   | 138 | 0.04| 0.03| 36  |
| Serbia                          | 11  | 91  | 9   | 9   | 2   | 2   | 4   | 0   | 128 | 0.04| 0.03| 34  |
| Croatia                         | 10  | 69  | 7   | 21  | 2   | 3   | 1   | 5   | 118 | 0.03| 0.02| 99  |
| Ecuador                         | 5   | 25  | 30  | 26  | 2   | 0   | 23  | 0   | 4   | 113 | 0.03| 0.02| 59  |
| Denmark                         | 27  | 23  | 17  | 12  | 8   | 8   | 7   | 4   | 106 | 0.03| 0.03| 81  |
| Korea, Republic of              | 8   | 45  | 0   | 33  | 0   | 15  | 0   | 1   | 102 | 0.03| 0.02| 42  |
| Slovenia                        | 7   | 47  | 10  | 11  | 8   | 5   | 2   | 1   | 91  | 0.02| 0.02| 95  |
| Ireland                         | 6   | 13  | 24  | 22  | 10  | 14  | 1   | 0   | 90  | 0.02| 0.02| 71  |
| Belarus                         | 3   | 5   | 23  | 24  | 3   | 18  | 1   | 2   | 79  | 0.02| 0.01| 99  |
| New Zealand                     | 11  | 15  | 21  | 12  | 7   | 10  | 2   | 7   | 78  | 0.02| 0.02| 37  |
| Veneuela                        | 1   | 18  | 21  | 16  | 4   | 8   | 2   | 7   | 77  | 0.02| 0.02| 25  |
| Cuba                            | 9   | 39  | 11  | 10  | 0   | 2   | 1   | 2   | 74  | 0.02| 0.01| 64  |
| Pakistan                        | 12  | 40  | 4   | 3   | 1   | 0   | 1   | 10  | 71  | 0.02| 0.02| 43  |
| Bulgaria                        | 9   | 33  | 9   | 8   | 1   | 6   | 2   | 3   | 71  | 0.02| 0.02| 43  |
| Costa Rica                      | 4   | 44  | 9   | 6   | 0   | 6   | 1   | 1   | 71  | 0.02| 0.01| 79  |
| Lithuania                       | 3   | 27  | 11  | 11  | 9   | 4   | 0   | 1   | 66  | 0.02| 0.02| 21  |
| Kenya                           | 1   | 2   | 19  | 26  | 5   | 8   | 3   | 1   | 65  | 0.02| 0.01| 54  |
| Nigeria                         | 6   | 8   | 15  | 15  | 1   | 1   | 12  | 58  | 0.01| 0.01| 64  |
| Thailand                        | 2   | 21  | 11  | 12  | 0   | 10  | 0   | 1   | 57  | 0.01| 0.01| 32  |
| Moldova                         | 2   | 16  | 9   | 7   | 8   | 1   | 1   | 11  | 55  | 0.01| 0.02| 52  |
| Bangladesh                      | 7   | 16  | 10  | 10  | 0   | 4   | 0   | 6   | 53  | 0.01| 0.01| 38  |
| Korea, Democratic People's Republic | 1   | 5   | 44  | 0   | 0   | 0   | 0   | 50  | 0.01| 0.00| 16  |
| Algeria                         | 3   | 12  | 8   | 13  | 4   | 7   | 0   | 3   | 50  | 0.01| 0.01| 58  |
| Hong Kong                       | 2   | 28  | 4   | 4   | 6   | 1   | 1   | 46  | 0.01| 0.01| 81  |
| Slovakia                        | 5   | 34  | 0   | 0   | 1   | 0   | 0   | 40  | 0.01| 0.01| 13  |
| Estonia                         | 1   | 14  | 4   | 7   | 3   | 3   | 1   | 0   | 33  | 0.01| 0.01| 03  |
| Philippines                     | 2   | 9   | 11  | 7   | 0   | 2   | 2   | 33  | 0.01| 0.00| 59  |
| Zimbabwe                        | 0   | 0   | 9   | 9   | 0   | 6   | 7   | 1   | 32  | 0.01| 0.00| 60  |
| Sri Lanka                       | 2   | 8   | 1   | 12  | 0   | 6   | 3   | 32  | 0.01| 0.00| 90  |
| Macedonia                       | 8   | 9   | 1   | 3   | 0   | 1   | 1   | 8   | 31  | 0.01| 0.01| 30  |
| Bosnia and Herzegovina          | 6   | 13  | 3   | 2   | 0   | 2   | 1   | 3   | 30  | 0.00| 0.00| 98  |
| Sudan                           | 0   | 0   | 10  | 8   | 0   | 8   | 0   | 1   | 27  | 0.00| 0.00| 60  |
| Tanzania                        | 0   | 0   | 9   | 10  | 0   | 5   | 1   | 25  | 0.00| 0.00| 40  |
| Country          | 2015 | 2014 | 2013 | 2012 | 2011 | 2010 | 2009 | 2008 | 2007 | 2006 | 2005 |
|------------------|------|------|------|------|------|------|------|------|------|------|------|
| Iraq             | 3    | 15   | 1    | 1    | 0    | 4    | 0    | 1    | 25   | 0.00| 82   |
| Ghana            | 2    | 4    | 6    | 4    | 1    | 2    | 3    | 2    | 24   | 0.00| 78   |
| Cyprus           | 1    | 4    | 7    | 4    | 0    | 4    | 2    | 0    | 22   | 0.00| 72   |
| Uruguay          | 2    | 15   | 2    | 3    | 0    | 0    | 0    | 0    | 22   | 0.00| 72   |
| Iceland          | 1    | 5    | 2    | 3    | 5    | 1    | 4    | 0    | 21   | 0.00| 69   |
| Nepal            | 3    | 13   | 3    | 1    | 0    | 0    | 1    | 0    | 21   | 0.00| 69   |
| Kazakhstan       | 1    | 1    | 5    | 5    | 1    | 7    | 0    | 0    | 20   | 0.00| 65   |
| Singapore        | 3    | 0    | 6    | 4    | 3    | 3    | 0    | 0    | 19   | 0.00| 62   |
| Morocco          | 1    | 10   | 3    | 2    | 0    | 1    | 1    | 1    | 19   | 0.00| 62   |
| Kyrgyzstan       | 0    | 2    | 4    | 9    | 2    | 0    | 0    | 0    | 17   | 0.00| 56   |
| Latvia           | 0    | 0    | 11   | 0    | 2    | 3    | 0    | 0    | 16   | 0.00| 52   |
| Georgia          | 1    | 3    | 2    | 2    | 0    | 1    | 0    | 7    | 16   | 0.00| 52   |
| Azerbaijan       | 0    | 0    | 4    | 2    | 2    | 2    | 1    | 3    | 14   | 0.00| 46   |
| Bolivia          | 1    | 4    | 3    | 2    | 1    | 1    | 0    | 2    | 14   | 0.00| 46   |
| Nicaragua        | 1    | 4    | 3    | 3    | 0    | 2    | 0    | 0    | 13   | 0.00| 42   |
| Ethiopia         | 0    | 4    | 2    | 2    | 0    | 1    | 2    | 0    | 11   | 0.00| 36   |
| Albania          | 3    | 3    | 1    | 2    | 0    | 1    | 0    | 1    | 11   | 0.00| 36   |
| Qatar            | 1    | 6    | 1    | 1    | 0    | 1    | 0    | 0    | 10   | 0.00| 33   |
| Israel           | 2    | 5    | 1    | 0    | 0    | 0    | 2    | 0    | 10   | 0.00| 33   |
| Armenia          | 1    | 1    | 2    | 2    | 0    | 0    | 0    | 3    | 9    | 0.00| 29   |
| Senegal          | 1    | 0    | 2    | 2    | 0    | 0    | 0    | 3    | 8    | 0.00| 26   |
| United Arab Emirates | 2   | 6    | 0    | 0    | 0    | 0    | 0    | 0    | 8    | 0.00| 26   |
| Tunisia          | 0    | 4    | 2    | 1    | 0    | 1    | 0    | 0    | 8    | 0.00| 26   |
| Jordan           | 1    | 3    | 0    | 0    | 3    | 0    | 1    | 0    | 8    | 0.00| 26   |
| Botswana         | 0    | 0    | 3    | 2    | 0    | 1    | 0    | 1    | 7    | 0.00| 23   |
| Namibia          | 0    | 0    | 2    | 2    | 0    | 1    | 0    | 2    | 7    | 0.00| 23   |
| Cameroon         | 0    | 1    | 1    | 2    | 0    | 0    | 3    | 0    | 7    | 0.00| 23   |
| Uganda           | 0    | 1    | 0    | 2    | 0    | 1    | 2    | 0    | 6    | 0.00| 20   |
| Saudi Arabia     | 0    | 13   | 0    | 0    | 0    | 6    | 0    | 0    | 6    | 0.00| 20   |
| Puerto Rico      | 2    | 1    | 1    | 1    | 0    | 1    | 0    | 0    | 6    | 0.00| 20   |
| Vietnam          | 0    | 1    | 0    | 0    | 0    | 3    | 0    | 1    | 5    | 0.00| 16   |
| Montenegro       | 2    | 4    | 0    | 0    | 0    | 0    | 0    | 0    | 5    | 0.00| 16   |
| Guatemala        | 1    | 3    | 0    | 1    | 0    | 0    | 0    | 0    | 5    | 0.00| 16   |
| Lebanon          | 0    | 2    | 1    | 0    | 0    | 1    | 0    | 0    | 4    | 0.00| 13   |
| Lesotho          | 0    | 0    | 2    | 1    | 0    | 0    | 0    | 1    | 4    | 0.00| 13   |
| Libya            | 0    | 3    | 0    | 0    | 0    | 0    | 0    | 0    | 3    | 0.00| 10   |
| Rwanda           | 0    | 0    | 1    | 2    | 0    | 0    | 0    | 0    | 3    | 0.00| 10   |
| Palestinian Territories | 0 | 1    | 1    | 0    | 0    | 2    | 0    | 0    | 3    | 0.00| 10   |
| Yemen            | 0    | 2    | 0    | 0    | 0    | 0    | 0    | 0    | 3    | 0.00| 10   |
1. Burkina Faso 0 0 0 0 0 1 0 1 2 0.00 07 0.00 15
1. Cape Verde 0 0 0 2 0 0 0 0 2 0.00 07 0.00 00
1. Madagascar 0 1 0 0 0 0 0 1 2 0.00 11 0.00 00
1. Mauritius 1 1 0 0 0 0 0 2 0.00 07 0.00 06
1. Afghanistan 0 0 0 1 0 0 0 1 2 0.00 07 0.00 09
1. Oman 0 2 0 0 0 0 0 0 2 0.00 07 0.00 05
1. Syria 1 0 1 0 0 0 0 0 2 0.00 03 0.00 06
1. Angola 1 0 0 0 0 0 0 0 1 0.00 03 0.00 03
1. Côte D'Ivoire 0 0 0 0 0 0 0 1 1 0.00 03 0.00 09
1. Guinea 0 0 0 0 0 0 1 0 1 0.00 03 0.00 00
1. Liberia 0 0 0 0 0 0 0 1 1 0.00 03 0.00 09
1. Mali 0 0 0 0 0 0 0 1 1 0.00 03 0.00 09
1. Reunion 1 0 0 0 0 0 0 1 0 0.00 03 0.00 03
1. Somalia 0 0 0 0 0 0 0 1 1 0.00 03 0.00 09
1. Gambia 0 0 0 0 0 0 1 0 1 0.00 03 0.00 09
1. Bahrain 1 0 0 0 0 0 0 0 1 0.00 03 0.00 03
1. Macau 0 0 0 0 0 1 0 0 1 0.00 03 0.00 06
1. Seychelles 1 0 0 0 0 0 0 1 0 0.00 03 0.00 03
1. Uzbekistan 0 0 0 0 0 0 0 1 1 0.00 03 0.00 09
1. Isle of Man 1 0 0 0 0 0 0 1 0 0.00 03 0.00 03
1. Kosovo 1 0 0 0 0 0 0 0 1 0.00 03 0.00 03
1. Luxembourg 0 0 0 0 0 1 0 0 1 0.00 03 0.00 06
1. Malawi 0 0 1 0 0 0 0 0 0 0 0.00 00 0.00 00
Summa 2342 938 4 4201 3287 856 2250 529 820 2365 4 7.72 35
Summa/133 17.609 70.5 56 31.5 86 24.7 1 6.43 6 16.917 3.977 6.165 177.8 49

4. Conclusion
The present paper presented a developed method for the quantitative evaluation of involvement of countries in the international open access movement in which principles consisted in the identification of indices of involvement of countries in the open access, their weighing, normalization and aggregation on the weighted average value basis. Two global initiatives – Budapest initiative and Berlin declaration, were considered as the OA-initiative, and particularly, databases according to their subscribers. The international registers according to the OA-repositories (ROAR, Open DOAR), OA-journals (DOAJ), OA-policies (SHERPA/RoMEO, ROAR MAP) and ranking of the OA-repositories in Webometrics were initially considered as the OA-instruments. During more strict selection of indices, we excluded the data of ROAR and Open DOAR registers from consideration due to their errors and duplication. Finally, six quantitative indices were divided into three groups (OA-initiatives, OA-policies, OA-initiatives) with different weighing coefficients. Weighing and normalization of these indices provided the opportunity to obtain the weighted average integrated index of involvement of countries in the open access which varied from 0 to 1. There was a high correlation relationship between values of this index and the total number of the OA-initiatives and OA-instruments. It was found that 76.5% of the total number of these initiatives and instruments was accounted for by the first 20% of countries. The application of the uniform five-level classification scale according to N' index indicated that 91% of countries (121 countries) fell into the group with very low level of involvement of countries in the OA-movement.

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