

# Method for Assessing the Effectiveness of Regional Management

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**Abstract:** A unique aspect of the proposed approach is its capacity to establish weighting coefficients for evaluation indicators systematically, eliminating the need for expert involvement. The methodology encompasses four main calculation stages: gathering initial data, creating a structural matrix of achievements, evaluating the complexity of indicators and achievement structures, and measuring performance. The method's uniqueness is further highlighted by its capability to discern the relative complexity involved in addressing tasks and reaching socio-economic development objectives. This insight is derived from a comparative analysis of the formal weights assigned to assessment indicators. As such, this approach allows for a more objective assessment of performance outcomes across various regions


## 1 INTRODUCTION

The assessment of effectiveness of regional management is a priority task for government authorities. Effective evaluation methods help to formulate a balanced and well-founded policy, ensuring a more rational allocation of budgetary resources and regional development priorities. This not only enhances the quality of life for the population but also contributes to local economic development, improvement of social infrastructure, and the creation of a comfortable urban environment. Ultimately, effective regional management leads to an improved quality of life, which is the main objective for any state.

A review of the literature shows that studies of the effectiveness of regional policy in many cases use too simple approaches and very limiting assumptions (Koopmans, Bijvoet, 2011). However, the issue of improving regional governance will always be relevant, for example, both in terms of the regulatory framework (Fedorova, Chernikova, Musienko, 2019) and economic and mathematical modeling (Polyakova, Golovko, Kirichenko, 2024). When evaluating the effectiveness of regional management, a range of assessment indicators is utilized to represent the socio-economic development level of

the region. Typically, an overall assessment is derived through the aggregation of these indicators. While this process may result in some loss of information, it is unavoidable. Additionally, challenges arise when determining the weights for these indicators. To address this, experts may be consulted, and expert evaluations can be employed (Efremova, 2015). Therefore, the quality of work of regional executive bodies and the head of the constituent entity of the Russian Federation is often an indicator based on the experts' perception of the degree of public trust (Kogan, 2010; Nikiforov, 2018). At the same time, experts themselves admit that they do not always have sufficient information to substantiate recommendations. Therefore, methods of convolution of indicators that are not related to the expert choice of weight coefficients are of particular interest. One of these methods is component analysis. A correct idea of the specifics of the approach to assessing the results of the socio-economic development of regions on the basis of component analysis can be obtained, for example, by reading the monograph (Aivazian, 2012). It elaborates all the stages of this approach, brings the procedure for its implementation to the level of algorithmization, and gives all possible recommendations to reduce subjectivism.

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Our proposed assessment approach for performance does not incorporate component analysis and instead utilizes an alternative calculation method. We do not regard this as an alternative to established techniques for assessing regional development results since we have not yet performed a comparative study. At this point, we believe it is crucial to present a methodology that enables the formal derivation of weights for aligning evaluations. Essentially, this means that two assessors applying the same set of assessment indicators will arrive at identical results, supported by theoretical justification.

## 2 BRIEF DESCRIPTION OF THE APPROACH

To evaluate the effectiveness of regional management (hereafter referred to briefly as effectiveness), we utilize a set of evaluation indicators. This set, which has been tested for assessing living conditions, is described in the previously mentioned monograph (Aivazian, 2012). Our approach is founded on the belief that each evaluation indicator is associated with particular socio-economic development goals, and its value indicates the level of achievement of these goals by the region. Each assessment indicator must satisfy several conditions: it must yield quantitative values, the regional government's actions must have a direct or indirect effect on the indicator's value, and the desired direction of potential change (increase or decrease) should be established in advance.

Initially, a matrix of normalized values for the evaluation indicators was created, where rows correspond to regions and columns represent the assessment indicators. Each value is normalized to have a mean of zero and a standard deviation of one. When a normalized indicator value for a region exceeds the pre-defined threshold, the goal is considered reached. In some instances, particularly when evaluating senior officials' effectiveness, target values for the assessment indicators are also specified. In such cases, the region is determined to have achieved the goal if its actual indicator value surpasses the set target.

On the basis of the normalized values of the estimated indicators, a *structural matrix of achievements* is formed  $A = (a_{kj})$  with elements zero or one. The matrix element is equal to one if the normalized value of the estimated indicator exceeds the threshold value. In this case, the assessment indicator  $j$  is *effective* for the region  $k$ . Otherwise, the

indicator is not effective for the region and the element of the achievement matrix is zero. Matrix string vector  $A$  identifies a set of performance indicators for which the region exceeds the established threshold value. Further, we will call this vector *the structure of the region's achievements*, and the matrix  $A$  – a structural matrix of achievements. The recommended threshold is zero.

Complexity  $SCI_k$  of structure of achievements of region  $k$  is considered as a value proportional to the average level of complexity of the effective assessment indicators of this region. Complexity  $ECl_j$  estimated indicator  $j$  is considered as a value proportional to the average level of complexity of the structures of achievements of the regions in which this indicator is effective. To get complexity scores  $SCI_k$  regional achievement structures and complexity assessments  $ECl_j$  It is enough to construct two matrices that are unambiguously determined by the matrix of structural achievements  $A$ , compute the eigenvalues and eigenvectors of these matrices. The implementation of this stage of the approach to assessing performance is based on the calculation scheme characteristic of the assessment of economic complexity (Hidalgo, Hausmann, 2009; Afanasiev, Kudrov, 2021; Afanasiev, Gusev, 2024).

Further estimates of the complexity of indicators  $ECl_j$  are normalized in such a way that each normalized value  $eci_j$  takes a value in the zero-one interval and the sum is equal to one. Therefore, standardized estimates of the complexity of indicators can be considered as their weights in the calculation of assessments of the effectiveness of achievement structures. Sought-after performance evaluation  $LE_k$  for a region is the sum of normalized estimates of the complexity of all its effective indicators and can be calculated as a dot product of the corresponding row of the achievement matrix by the vector of normalized estimates of the complexity of indicators.  $eci_j$  For any region, performance assessment  $LE_k$  is in the zero-one interval. Moreover, for a region where all assessment indicators are effective, this assessment is equal to one.

### 3 ASSESSMENT OF THE EFFECTIVENESS OF REGIONAL MANAGEMENT ACCORDING TO THE DATA OF 2020 AND 2021

The method was put to the test by selecting a range of indicators from a comprehensive set that reflects the socio-economic development levels of regions, specifically focusing on those that the authors believe best signify the outcomes of regional government performance. A selection of 29 assessment indicators from Rosstat for 2020 and 2021 was applied, as indicated in Table P1 of the Appendix. These indicators encompass factors related to population material well-being, demographic variables, and various other socio-economic development sectors. While this collection does not purport to be exhaustive, it showcases the potential for applying the proposed method to evaluate regional government effectiveness in pertinent socio-economic areas. Structural matrices of achievements have been established for 85 regions based on the 29 selected indicators, which led to standardized complexity estimates represented as  $eci_j$ . Estimates for the year 2021 are detailed in column (4) of Table P1, while estimates for 2020 are found in column (5). These estimates reflect the weights of indicators and their contributions to performance evaluations. The entries in Table P1 are arranged in descending order according to the weights of indicators for 2021, with the ranks indicated in column (1) while the ranks for 2020 are listed in column (6). High weight values are characteristic of indicators measuring population material well-being. Figure 1 depicts the correlation between the weights of assessed indicators for 2021 and their prevalence  $q_{j0}$  – the number of regions in which the indicator is effective (as shown in column (3) of Table P1). Indicators with elevated weights are often those with low prevalence—specifically, those effective only in 21-23 regions, indicating that a limited number of regions can meet their threshold requirements. As the prevalence of an indicator increases, its weight coefficient typically declines. Meanwhile, reaching threshold values for indicators with higher prevalence is feasible for a majority of regions. It's particularly interesting that two indicators, despite having a prevalence of 42-43 regions—namely "Investments in fixed assets per capita" and "Average size of pensions assigned"—still possess high weight coefficients. These indicators, effective in regions with complex achievement structures, exhibit substantial weights and complexity

estimates. Similar trends of decreasing weight coefficients with increasing prevalence were observed in 2020 as well.

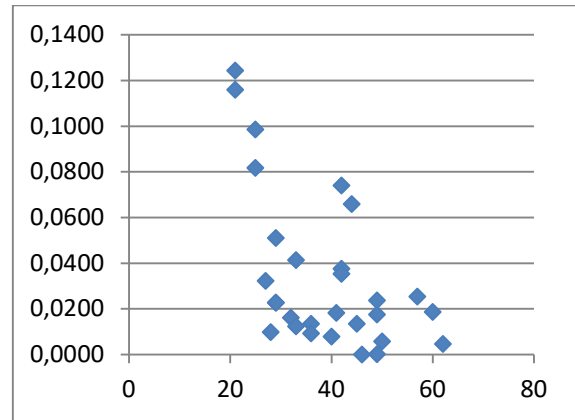


Figure 1: Dependence of the weight coefficients of the estimated indicators (ordinate axis) on their prevalence (abscissa axis) for 2021. The point corresponds to the estimated indicator. *Source:* authors' calculations based on Rosstat data for 2021.

Effectiveness assessments of regional management, known as  $LE_k$ , were conducted for 85 regions for the year 2021. The highest rankings in the performance assessment are taken by the Moscow Region, Moscow, St. Petersburg, and the Republic of Tatarstan, achieving scores of 0.9865, 0.9622, 0.9263, and 0.8754, respectively. These regions are characterized by having numerous performance indicators (more than 26) that involve a fairly high level of achievement complexity. It is noteworthy that these four regions also led the performance estimates for 2020, although their rankings were slightly altered.

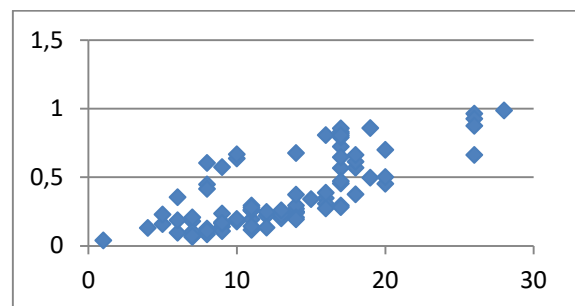


Figure 2: Dependence of the assessment of performance (ordinate axis) on the number of effective indicators (abscissa axis) for 2021. The point corresponds to the region. *Source:* authors' calculations based on Rosstat data for 2021.

Figure 2 illustrates points for each region plotted across two dimensions: the number of effective indicators (on the abscissa) and the performance assessment (on the ordinate) based on data from 2021. A trend is evident whereby an increase in the number of effective indicators generally coincides with higher performance evaluations, which is a reasonable expectation. Moreover, in the center of the figure, there are points representing regions that have a relatively low number of performance indicators yet still achieve high performance scores. This includes the Sakhalin Region (0.8566), Magadan Region (0.8304), and Murmansk Region (0.8066). These regions feature between 16 and 17 effective indicators, including some with notably high complexity ratings.

## 4 DISCUSSION OF THE RESULTS

A key aspect of the proposed approach is its ability to convey the relative challenges involved in solving socio-economic development issues and reaching set goals. This understanding is developed through a comparative analysis of the weights assigned to different indicators. High weights for indicators typically signify that only a limited number of regions can achieve elevated values for those indicators, indicating that they are effective only in certain areas. Conversely, lower weights suggest that a broader range of regions can reach high values for these indicators, indicating their wide applicability. In 2021, four indicators that specifically mirror the financial status of the population have the highest weights, with the leading indicator being "Average monthly nominal accrued wages (rubles)", effective in 21 regions. This indicator also topped the weight rankings in 2020, signaling significant income variation across regions over that two-year span. In 2020, high weights were recorded for the indicators "Number of deaths of working age (per 100,000 population)" and "Mortality rate of the working-age population due to major causes of death," securing the 2nd and 3rd positions in the weight ranking (see column (6) of Table P1 in the Annex). In the subsequent year, as the coronavirus pandemic waned, these two indicators slid to the 14th and 15th positions, respectively. This illustrates how the weights of indicators correspond to the real challenges present in the management of regional socio-economic development. By comparing the rankings of indicator weights between 2020 and 2021, one can discern variations in the complexity of addressing specific socio-economic objectives. For

example, the fall in the ranking of the indicator "Public satisfaction with the quality of tourism services" from 16th to 25th may reflect progress in tourism development across various regions where this indicator has become effective.

## 5 CONCLUSION

The proposed method can be used in a variety of fields. One of its practical areas of application, as noted earlier, is the assessment of the performance of senior officials of the Russian Federation. We also consider the possibility of using this method to assess the quality of living conditions, based on a set of assessment indicators that fully describe the main directions of socio-economic development of the regions.

## ACKNOLEGEMENT

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## APPLICATION

Table P1: Estimates ordered by impact scores.

(1)	(2)	(3)	(4)	(5)	(6)
Rank $eci_j$ 2021	Name of the estimated indicator	$q_{jo}$ 2021	$eci_j$ 2021	$eci_j$ 2020	Rank $eci_j$ 2020
1	Average monthly nominal accrued salary (RUB)	21	0.1244	0.0785	1
2	Cash income per capita (RUB)	21	0.116	0.0645	4
3	Consumer spending per capita (RUB)	25	0.0985	0.0581	5
4	Retail trade turnover per capita (RUB)	25	0.0817	0.0541	6
5	Investments in fixed assets per capita (RUB)	42	0.074	0.0478	9
6	Average amount of pensions assigned (RUB)	44	0.0659	0.0389	12
7	Volume of consumer services provided to the population per capita (RUB)	29	0.051	0.0393	11
8	Number of people with cash incomes below the subsistence level (%)	33	0.0414	0.0258	19
9	Satisfaction of the population with their financial situation (%)	42	0.0376	0.0482	8
10	Improvement of the housing stock - share of the area equipped with sewerage (%)	42	0.0354	0.0384	13
11	Share of costs for innovation activity in the total volume of shipped goods, work performed, services	27	0.0322	0.0219	22
12	Unemployment rate (according to the methodology of the International Labor Organization)	57	0.0254	0.0176	23
13	Improvement of the housing stock with water supply (%)	49	0.0237	0.0367	15
14	Number of deaths of working age (per 100 thousand population)	29	0.0227	0.0657	2
15	Mortality rate of the working-age population by main causes of death	29	0.0227	0.0657	3
16	Share of the population positively assessing the state of interethnic relations in the total population (%)	60	0.0186	0.0285	18

17	Road traffic accident injury rate (per 100,000 population)	41	0.0183	0.0431	10
18	Satisfaction of the population with the activities of public authorities to combat corruption	49	0.0176	0.0308	17
19	Commissioning of residential buildings per 1000 people (thousand sq.m.)	32	0.0162	0.022	21
20	Share of innovative products in % of the total volume of shipped goods, work performed, services (%)	36	0.0135	0.0049	26
21	Satisfaction of the population with the medical care provided (in percentage)	45	0.0135	0.037	14
22	Life expectancy at birth	33	0.0124	0.0536	7
23	Number of museum visits per 1000 population (units)	28	0.0098	0.0111	24
24	Level of innovation activity of organizations	36	0.0092	0.0022	27
25	Satisfaction of the population of the Russian Federation with the quality of services provided in the field of tourism (%)	40	0.0078	0.0336	16
26	Average area of dwellings per inhabitant (sq.m. of total area)	50	0.0057	0.0052	25
27	Proportion of the population with a positive assessment of the state of interfaith relations in the total population (%)	62	0.0046	0.0249	20
28	Average age of the resident population at the beginning of the year - women (years)	49	0.0002	0	29
29	Average age of the resident population at the beginning of the year - men (years)	46	0	0.002	28