

## Complex quantitative assessment of social research survey results

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**Abstract.** Research on social problems of various natures is gaining more and more attention. Their primary tool is surveying. Various computer programs have been developed to process and analyse the results. On the other hand, the characteristics they calculate may be used only for specific purposes. Their main drawback is that they must provide a generalized picture of the problem in question, i.e., the whole remains unclear. Without this, analogous objects cannot be compared with each other. The proposed methodology, which has the acronym QEQS (Quantitative Evaluation of Quantitative Sizes), provides such opportunities. Its main advantages are that it is possible to combine an unlimited number of answers to questions into a single summarizing size index; any range of scales may be used for assessment; consider the importance of different options for answering the questions; determines not only the aggregated value of the answers to the individual queries but also the index that aggregates them.

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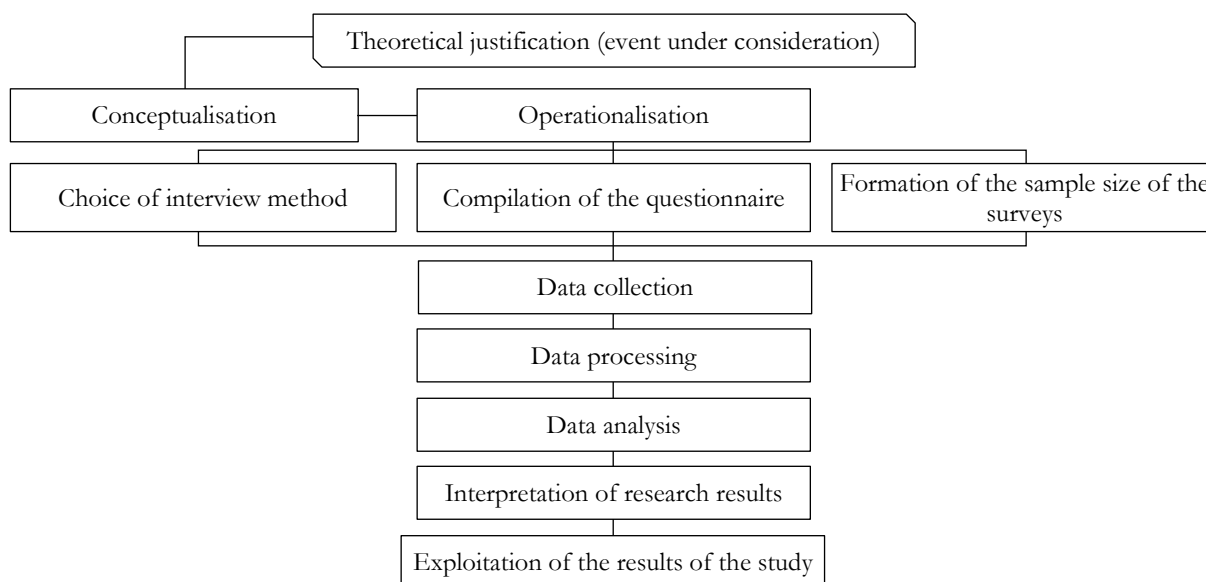
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### 1. INTRODUCTION

Every day, the world around us becomes more complex, dynamic, and drowning in the flow of information. Problems of various natures and levels are increasingly emerging in this ambiguous environment. Their effective decision depends mainly on the availability of the reliable information necessary for that purpose. These opportunities are provided primarily by social research (SR). Their essence can be described as follows: it is a method aimed at collecting systematic quantitative data on the phenomenon under consideration (PC) based on a purposefully formulated questionnaire (Gažauskaitė, Mikėnė, 2014). Assessing the importance of SR, this phenomenon is considered in the scientific literature in a multifaceted and comprehensive manner. An essential part of this is their classification. This is done in different aspects. For example, according to the approach to reality, social research methodology is divided into objective and subjective. In the first case, the survey data are presented in numbers, and the second -

qualitative methods are used, allowing the self-expression of respondents and individualism in the treatment of the subjects under investigation. This study will be based on an objective methodology, taking into account its subject matter.

The most common data collection method used in social research is the survey. Literary sources provide a structured course for it (Figure 1).



**Figure 1. The course of the survey and its constituent elements**

*Source: compiled by the author based on (Gaižauskaitė, Mikėnė, 2014)*

Figure 1 shows that the study starts with a theoretical justification, the purpose of which is to formulate what is intended to be investigated and why it is needed, i.e. it justifies the study's objectives. The research problem, theme, purpose, tasks, and object are formulated. All this forms the context of the envisaged research.

In literature sources, the survey is attributed to the quantitative data collection strategy (Gaižauskaitė, Mikėnė, 2014). Its purpose and result are a set of data obtained in a certain way. The most common data collection form is structured, i.e. a questionnaire based on pre-defined multiple-choice questions. The number and nature of the questions depend on the study's purpose and the PC's complexity. There may be one question or their system. The scales used to measure the answers to the questions are an integral part of the questionnaire. They can be diverse. Responses are expressed both verbally and numerically. A typical example of the first case is the Likert five-point scale from 'strongly agree' to 'strongly disagree.' On digital scales, estimates may vary, e.g., from 1 to 5, 1 to 10, etc. The meaning of extreme estimates is indicated.

When planning a survey, it is important to reasonably determine the number of respondents to be interviewed and the criteria for their selection and inclusion in the survey. The base for this number is the population or population. It can be described as a set of aspects of the problem under consideration, the characteristics of which are investigated using a survey. A population survey is usually impossible and is therefore limited to a subset or sample, i.e. a group of respondents selected from the general population. The fundamental parameter is the sample volume (number of sampling elements).

Survey data can be obtained in different ways: handing questions to respondents and sending them by post or online. Today, the latter method is most often used. The effectiveness of the survey is demonstrated

by the degree of reversibility of responses, which depends on the research topic, the number of questions, the relevance of respondents to the problem under consideration, etc.

Many computer programs have been developed to process the survey data: Statistica, Stata, Excel, etc. SPSS is the most common and widely used statistical analysis software package. This package allows survey data to be processed and analyzed in several essential aspects. The first is descriptive statistics. Calculate frequencies, averages, mode, median and other characteristics, the relationship between two or more variables. The results of the calculations shall be presented in tabular or graphic form. Another aspect of data analysis is analytical statistics. This is hypothesis testing, correlation-regression analysis, multidimensional analysis – factorial, clusters, etc.

It is apparent from the literature that, in addition to the characteristics mentioned above, the calculation is usually limited to expressing the number of the same answers as a percentage. This is understandable when respondents are asked a single question. We have another situation where PC is represented by a more significant number of questions, i.e., their system. It is also limited to the same percentage of answers to individual questions or the calculation of statistical characteristics. Such analysis is limited because it does not convey the image as a whole. For example, in such a case, the popularity of political parties cannot be compared with each other; the quality of employees in enterprises is expressed in more indicators, etc. Statistical characteristics, such as average, mode, and median, give only an approximate picture, as they do not assess important aspects, such as the importance of questions in relation to PC. In other words, it is not a complex assessment of the situation. This raises a significant problem, both scientifically and practically, of quantifying the state of PC in a complex way based on a system of questions that reflect it.

The article aims to propose a methodology for complex quantitative assessment of the problem under consideration, which is described by a system of questions, and to approve it by a specific example. The study shall cover the following tasks: analysis of existing ways of processing survey results, development of the methodology, and verification of its effectiveness on the basis of a realistic example.

## 2. LITERATURE REVIEW

Social research begins with the formulation of the problem. On this basis, a questionnaire shall be drawn up which adequately reflects it. It focuses on the number of question options and their scores or, in other words, the scoring scale. Analysis of literary sources shows that the Likert scale is used exclusively. It usually consists of 5 possible answers, expressed either verbally or digitally, e.g., from ‘strongly disagree’ (1 point) to ‘strongly agree’ (5 points) (Nugraha et al., 2022; Skačauskienė & Kiselevskaya, 2014; Al Azmeh, 2019; Goncharuk et al., 2024; Vranešević & Perić, 2019; Belás et al., 2024; Bengtsson & Teleman, 2019; Palmer et al., 2020). A different range of rating scales of 3 shall be used (Mikelson & Segers, 2022); 6 (Mumi, 2022); 7 (Le & Bui, 2022; Syed et al., 2020); 10 (Garškaitė-Milvydienė, 2011; Udayana, 2022); 100 (Bivainis & Morkėnas, 2008).

The answers received to the questions shall be summarised appropriately. Its method depends on the form in which it is received, whether verbal or numerical. In the first case, equal answers are summed up and expressed as a percentage of the number of answers to all questions (Al Azmeh, 2019; Vranešević, Perić, 2019). The second case calculates an average score for each question (Kristinsson et al., 2022; Marčinskas, Matonis, 2011; Roshchik et al., 2024; Samoliuk et al., 2023).

After summarizing the answers to the questions, a materiality and credibility check is carried out. T-test, Kronbach  $\alpha$  statistics, Bartlett test (Vranešević, Perić, 2019; Syed et al., 2020; Nugraha et al., 2022; Al Azmeh, 2019; Bengtsson, Teleman, 2019).

Other tests include the Levene-test (Sarantakos, 2004) and the Hazman-test (Podsakoff et al., 2003).

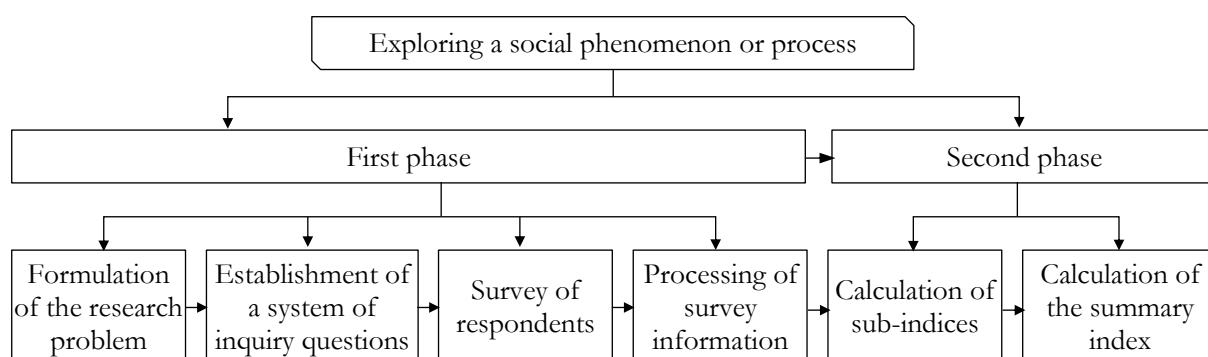
The evaluation of the relevance and reliability of the answers to the questions is followed by an analysis of the survey results obtained. It is based on various statistical data processing cross-cutting applications, such as Statistica, Stata, Excel, etc. The SPSS statistical analysis package is the most common. SPSS was developed in 1968 and often use to calculate the parameters of descriptive statistics - frequencies, averages, structural characteristics (mode, median), etc. (Tolėikiene, Rybnikova, 2013; Tilindienė et al., 2008; Stupuris et al., 2013; Tilindienė et al., 2013) and data relationships, i.e. correlation, regression, factorial analysis (Vranešević, Perić, 2019; Palmer et al., 2020; Savatsomboon, 2022; Simionescu, 2023; Syed et al., 2020; Zhidebekkyzy et al., 2023). This analysis seeks to confirm or refute the hypotheses raised (Udayana, 2022); Wiratama et al., 2022; Saraswati et al., 2022). On the other hand, the majority of cases are limited to weighting the answers to individual questions (Soe et al., 2022).

From literature sources dedicated to the analysis of respondents' survey results and their application, all research is limited to determining the relative weight of responses to individual questions or the interaction between individual questions. There is no general assessment of the situation. Meanwhile, such an assessment opens up new possibilities for socioeconomic research applications. For example, similar phenomena, such as political parties, can be compared to the state of affairs of businesses, regional activities, etc. This raises the important challenge of being able to carry out such an assessment, both scientifically and practically.

### 3. METHODOLOGY OF THE STUDY

The analysis of literary sources shows that the study of a social phenomenon or process is carried out in several stages. First of all, qualitative research helps to highlight the needs of different social groups, economic entities, etc., and on this basis, the research problem (event or process) is formed. This also helps to identify the range of survey questions that reflect it. Their number and nature must, on the one hand, make it possible to have a sufficiently deep knowledge of the situation under investigation and to obtain complete and reliable information; on the other hand, it is not appropriate to include non-essential, secondary issues in this framework, as this complicates the investigation process itself and reduces its adequacy.

The next step in the investigation is processing the information received, i.e., weighing the answers to the questions. With these percentages, an index is determined for each question, which combines all possible answers. If there is more than one question, they are combined in the final stage of the study into a complex index that reflects the overall situation (Figure 2).



**Figure 2. The fundamental scheme of the social study of a phenomenon or process**

*Source: compiled by author*

The number of questions and the survey evaluation scale shall be determined by its organizers.

The number of questions may vary depending on the complexity of the problem being investigated. If it is simple, a so-called closed question is formulated, which requires a single answer ('yes – no'); if it is more complex, the so-called open question is formulated, which requires a broader range of answers (e.g., from 'strictly yes' to 'strictly no'). A question system with a wide range of answer options is formed to study complex phenomena and processes.

Respondents are most often surveyed using a questionnaire. Response forms are verbal (oral) or digital. If numerical, the answers are scored on the given score scale (Table 1).

Table 1

Social research technology of a social phenomenon or process

|                       |           |               |           |
|-----------------------|-----------|---------------|-----------|
| Enquiry questions     |           |               |           |
| number                |           |               |           |
| one                   |           | more than one |           |
| Answers to questions  |           |               |           |
| two                   |           | more than two |           |
| Nature of responses   |           |               |           |
| verbal                | digital   | verbal        | digital   |
| Importance of answers |           |               |           |
| uniform               | different | uniform       | different |

Source: compiled by author

After aggregating the homogeneous answers for each question, their weight in the total survey volume is determined as follows:

$$q_{ij} = \frac{n_{ij}}{N_j} \cdot 100, \quad (1)$$

where  $q_{ij}$  is the percentage of question  $j(i)$  in the total number of answers;  $n_{ij}$  – the number of answers to question  $(i)$  of question  $(j)$ ;  $N_j$  – number of respondents to question  $j$ .

This marks the end of the first phase of research. Next, we move on to calculating a sub-index of a generalized size for each question. Regardless of the number and nature of the answers to the questions, they can distinguish between the best, worst, and intermediate options. In this situation, the importance of the answers in relation to the best will be different. This can be seen from such an example. If the 'yes' and 'no' answers have the same weight, their influence on the index value cannot be the same either, but the number of positive answers is more important. Literary sources indicate that the easiest way to assess this is to assign importance to answers (Šimelytė, 2014; Oželienė, 2019). The best answer is ranked 1, and the worst is  $N$ .

Table 1 shows that the number of answers to the questions may be the same or different. If this circumstance is not considered, a response with a lower ranking will have a more significant impact on the value of the index than a response with a higher ranking.

These problems will be solved by ranking all answer options in order of importance in relation to the best answer option. Its rank of importance is equated to one.

In particular, for each question, the number of answer options for which priority grades are to be set shall be determined:

$$x_j = N_j - 1, \quad (2)$$

where  $x_j$  is the number of possible answers to question  $j$ ;  $N_j$  – the maximum number of answers among all questions.

Based on the size,  $x_j$  the change in ranks of each question relative to the best answer, i.e. the unit,  $\Delta x$  is determined as follows:

$$\Delta x_j = \frac{1}{x_j}. \quad (3)$$

Based on the size,  $\Delta x_j$  it is possible to determine the transformed ranks of the response options:

$$r_{ij} = 1 + (i - 1)\Delta x_j, \quad (4)$$

where  $r_{ij}$  is the transformed rank of the answer option to question  $(j)$ .

Based on the size  $r_{ji}$  values, it is possible to determine the transformed values of the answers to the variants of question  $j$ -i:

$$\tilde{q}_{ij} = r_{ij} \cdot q_{ij}, \quad (5)$$

where  $\tilde{q}_{ij}$  is the transformed value for the answer to sub-question  $j$ -i;  $q_{ij}$  – the primary value of the answer to sub-question  $j$  (percentage of the answer in the total number of answers).

From the formula (5), it appears that for the best answer option, the value  $\tilde{q}_{ij}$  will be  $q_{ij}$  equal to because the value  $r$  is equal to 1.

We set out below the values of the answers to question  $(j)$  in relation to the best answer:

$$\Delta q_{ij} = \frac{\tilde{q}_{ij}}{q_j^{\max}}, \quad (6)$$

where  $\Delta q_{ij}$  is the value of the variants of the answer to question  $j$  in relation to the best answer;  $q_j^{\max}$  – Transformed value of the best answer to question  $j$  (identical to the original value).

To sum up, we'll sum up the sizes:  $\Delta q_{ij}$

$$Q_j = \sum_{i=1}^m \Delta q_{ij}, \quad (9)$$

where  $Q_j$  is the sum of all answer options for question  $j$ ;  $m$  is the number of questions ( $i = \overline{1, m}$ ).

The  $Q_j$  meaning of the size becomes clearer if it is expressed in relative rather than absolute terms. To that end, it is necessary to determine its maximum possible significance and to compare it with the actual value, that is to say, with  $Q_j$ . We will receive it if the answers of all respondents correspond to the most ranked, i.e. , the best version of the answers. In this case, the transformed values for all other answers will be 0. Then  $\tilde{q}_{ij} = q_j^{\max}$ . Based on formula (7) we will get that  $Q_j = 1.0$ . The index you are looking for will look like this:

$$R_j = \frac{q_j^{\max}}{q_j} = \frac{1}{q_j}, \quad (8)$$

where  $R_j$  is the sum of the answers to question  $j$ , sub-index;  $q_j^{\max}$  – the maximum possible value of the answers to question ( $j$ ).

The second phase of the survey (Figure 2) ends with the aggregation of sub-indices into a generalised size. The solution to this challenge is facilitated by the fact that they are all dimensionless, i.e. comparable.

The aggregation of sub-indices into a single size can be done in two ways: first, it is read that the issues that reflect the phenomenon or process in question are of equal importance; secondly, they are of varying significance.

In the first case, the value  $R$  is the sum of sub-index values:

$$R = \sum_{j=1}^m R_j, \quad (9)$$

In the second case, the most common SAW model (Simple Additive Weighting) can be used to combine index values (Hwang, Yoon, 1981):

$$R = \sum_{j=1}^m \omega_j R_j, \quad (10)$$

where  $\omega_j$  is the importance of the  $j$ -th sub-index ( $\sum_{j=1}^m \omega_j = 1.0$ ).

The highest aggregate value of all sub-indices will be obtained by summing their highest values. This value was shown to be 1 for the  $j$ -th sub-index. In that case,

$$R_j^{\max} = \sum_{j=1}^m q_j^{\max} = 1, \quad (11)$$

where is  $q_j^{\max}$  the maximum value of the  $j$ -th sub-index.

Based on (11) formula

$$R^{\max} = \sum_{j=1}^m R_j^{\max} = m, \quad (12)$$

where  $R^{\max}$  is the maximum sum of sub-indices.

Based on the (12) formula, it is possible to determine the state of the considered phenomenon in comparison with the best possible case.

$$R = \frac{R}{R_{\max}}. \quad (13)$$

#### 4. EMPIRICAL RESEARCH

The methodology for complex quantitative assessment of social research is tested in this paper based on the analysis results obtained in a survey aimed at monitoring the impact of the COVID-19 pandemic on people's psychological state (Ginevičius et al., 2022). Respondents were asked four questions about the monitoring system for these effects from different angles. The required statistical sample  $n$  was calculated based on the formula:

$$n = \frac{\chi^2 pq}{\Delta^2}, \quad (14)$$

where  $\chi^2$  is a coefficient, the size of which depends on the chosen degree of reliability of the studies (social sciences usually accept a value of 0.95, i.e. 95% confidence);  $p$  – the proportion of respondents with survey characteristics;  $q$  – the proportion of respondents who do not have these attributes ( $q = 1 - p$ , this value is unknown primarily before the survey, so the value is 0.5);  $\Delta$  – boundary error (in social studies, its value equals 7%).

Based on the formula (14), the required number of respondents is 195. They were asked the following questions:

1. Has the COVID-19 pandemic changed your view on the scope of psychological services?
2. How do you assess the availability of psychological services?
3. Do you think there is a need for a law regulating the activities of service-providing psychologists?
4. Is the price of psychological services in the public sector adequate compared to the prices of similar services, wages, and salaries in respect of professionals providing these services?

The survey organizers reported a different number of options for answering the questions (Table 2).

Table 2

Variants of the answers to the questions

| Questions | Options for answering the questions |           |                  |                 |    |                |
|-----------|-------------------------------------|-----------|------------------|-----------------|----|----------------|
|           | answer options numbers              |           |                  |                 |    |                |
|           | 1                                   | 2         | 3                | 4               | 5  | 6              |
| 1, 3, 4   | Unequivocally yes                   | Yes       | More so than not | More than that  | No | Definitely not |
| 2         | Options for answering the questions |           |                  |                 |    |                |
|           | 1                                   | 2         | 3                | 4               |    |                |
|           | Significant increase                | Increased | Slight increase  | Stayed the same |    |                |

Source: compiled by author based on Ginevičius et al., 2022

The survey of respondents produced the following results (Table 3).

Table 3

Respondents' survey results

| Questions | Numbers of options for answering the questions |    |      |    |      |    |      |    |       |    |       |    | Total |     |
|-----------|------------------------------------------------|----|------|----|------|----|------|----|-------|----|-------|----|-------|-----|
|           | 1                                              |    | 2    |    | 3    |    | 4    |    | 5     |    | 6     |    |       |     |
|           | res.                                           | %  | res. | %  | res. | %  | res. | %  | res.. | %  | res.. | %  | pcs.  | %   |
| 1         | 130                                            | 40 | 51   | 16 | 11   | 3  | 0    | 0  | 80    | 24 | 57    | 17 | 329   | 100 |
| 1a        | 78                                             | 40 | 31   | 16 | 6    | 3  | 0    | 0  | 47    | 24 | 33    | 17 | 195   | 100 |
| 2         | 35                                             | 18 | 82   | 42 | 60   | 31 | 18   | 9  | —     | —  | —     | —  | 195   | 100 |
| 3         | 53                                             | 27 | 47   | 24 | 51   | 26 | 20   | 10 | 8     | 5  | 16    | 8  | 195   | 100 |
| 4         | 2                                              | 1  | 4    | 2  | 10   | 5  | 21   | 11 | 43    | 22 | 115   | 59 | 195   | 100 |

Source: compiled by author based on Ginevičius et al., 2022

Table 3 shows that the number of answer options is the same for questions 1, 3, and 4 and different for question 2. In particular, the value  $x_j$  shall be determined on the basis of formula (2). The first, third and fourth questions will be equal to:  $x_{1,3,4} = 6 - 1 = 5$ ; the second question  $x_2 = 4 - 1 = 3$ . Size  $\Delta x_j$  value, changes in grades, for the following questions 1, 3, 4 we will determine based on the formula (3):  $\Delta x_{1,3,4} = \frac{1}{5} = 0.2$ . For these questions, the formula (5) provides transformed values and sub-indices

summarising the options for answering the questions (Table 4). For the second question, the calculation of the sub-index is similar, except for changes in grades, which are determined on the basis of formula (3):  $\Delta x_r = \frac{1}{4-1} = 0.33$ . The results of the calculations are given in Table 4.

Table 4

Results of the calculation of the value of survey indicators

| Indicators   | Question number |        |       |        |
|--------------|-----------------|--------|-------|--------|
|              | first           | second | third | fourth |
| $x_j$        | 5               | 5      | 3     | 5      |
| $\Delta x_j$ | 0.20            | 0.20   | 0.33  | 0.20   |
| $Q_j$        | 3.515           | 7.974  | 4.934 | 185.6  |
| $R_j$        | 0.285           | 0.125  | 0.203 | 0.005  |

Source: compiled by author

The expert survey generated the following weights of questions reflecting the state of the system for monitoring the impact of the COVID-19 pandemic on people's psychological state (Table 5).

Table 5

Importance of issues reflecting the status of the monitoring system

| Questions | First | Second | Third | Fourth | Total |
|-----------|-------|--------|-------|--------|-------|
| Relevance | 0.20  | 0.30   | 0.15  | 0.35   | 1.0   |

Source: compiled by author

Value representing the monitoring status obtained from formula (10) and Table 4: 0.127.

In order to answer the question of what monitoring status that value represents, it is necessary to determine what that maximum value may be. From the formula (11) it can be seen that it  $R_j^{\max}$  is equal to one. By inserting the  $R_j^{\max}$  values in formula (12), you will get the maximum value you are looking for  $R^{\max}$  equal to 1. From this we can conclude that respondents consider that the system of localisation of the consequences of the COVID-19 pandemic, compared to the best possible option, only meets the needs by 3.2%.

## CONCLUSIONS

The rapidly increasing complexity and changing reality pose a growing number of problems that need to be addressed. In this situation, social research is of particular importance, the main instrument of which is the survey of respondents. Despite the development of methods for processing and analyzing its results, there are still issues to be addressed on which the usability of these results depends to a large extent. Analysis of literature sources shows that today's calculation of characteristics, frequencies, averages, moda, and median needs to cover those aspects of evaluation necessary for solving relevant scientific and practical problems. One such aspect is the generalized assessment of the phenomenon under consideration, the process of studying, which is carried out based on a more significant number of questions and options for answering them.

Today, it is limited to determining the weighting of the answers to individual questions, i.e., percentages. The possibilities of using the results of such calculations to solve the problem under consideration are somewhat limited, as they do not represent an overall assessment. Without it, analogous

objects cannot be compared, thus limiting the possibilities of improving the situation. These problems are exacerbated by the increase in the number of questions and the range and diversity of the assessment scale. The proposed methodology avoids all these shortcomings. Its main advantages are: first, the questionnaire may consist of an unlimited number of questions; secondly, scales for measuring responses of any range can be assessed and may vary from question to question; thirdly, the varying importance of variations in the answers to the questions is assessed; fourthly, not only the sum of the answers to the individual questions is determined, but also the index that aggregates these values.

The proposed methodology has been validated based on a real example. It is universal and can, therefore, be applied in a wide range of ways, both in research and in solving practical problems.

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