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Comprehensive approach for assessment of internal control efficiency system

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Abstract: The article will be beneficial for professionals and managers of all levels, whether indirectly or directly involved in the process of organizing and implementing risk-based internal control in various fields of activity. The article summarizes the results of research in the direction of developing a scientific and methodological apparatus for assessing the effectiveness of the functioning of the internal control system of a budgetary institution within the system of the Ministry of Defense of Ukraine.

The study empirically confirms and theoretically proves that the approaches proposed in the comprehensive approach must be taken into account when assessing the effectiveness of the internal control system by representatives of internal audit, not only within the Ministry of Defense of Ukraine, but also in other central executive authorities.

The study presents the results of an empirical analysis of the choice and justification of indicators, which confirmed the possibility of taking them into account in further studies.

The article presents the algorithm of performing consecutive scientifically substantiated stages, which in its complexity makes it possible to distinguish a complex method of solving a scientific problem in assessing the effectiveness of the functioning of the internal control system of the Ministry of Defense of Ukraine.

Ключові слова: internal control, internal audit, risk management, evaluation of the effectiveness of internal control, complex method.

1. Introduction

Novelty of research is due to the implementation of a number of measures of national importance for the development of the state system of internal financial control, which is enshrined in the Strategy for Reforming the System of Public Finance Management for 2017-2020 approved with the resolution of the Cabinet of Ministers of Ukraine No. 142-p dated February 8, 2017, and the Plan of Action approved with the resolution of the Cabinet of Ministers of Ukraine No. 415-p dated May 24, 2017.

As of today, the implementation of the norm set out in Article 26 of the Budget Code of Ukraine (2010) has been accomplished through the approval of the Fundamental Principles of Exercising Internal Control by Budget Managers of Decree of the Cabinet of Ministers of December 12, 2018 No. 1062 “On Approving the Fundamental Principles of Implementing Internal Control by Budget Managers and

amending the Cabinet of Ministers of Ukraine Resolution No. 1001 of September 28, 2011 (2018).

The Ministry of Defense of Ukraine (hereinafter 'MoD') is one of the first at the level of central executive authorities to comprehensively approach and successfully implement a system of risk-oriented internal control, as evidenced by a number of issued guidance documents on these issues (Decree of the President of Ukraine No. 240/2016, 2016; Order of the General Staff of the Armed Forces of Ukraine No. 340/2016; Order of the Ministry of Defense of Ukraine No. 145/2019), but also practical implementation of internal control and risk management measures at all levels of military management encompassing not only military authorities, but also military units, institutions and organizations within the MoU system and the Armed Forces of Ukraine (hereinafter referred to as the Armed Forces).

As of today, the subsystem of internal control bodies, as direct participants of the said process, is represented and constantly improved in the system of the defense department, which are represented by the respective structural units in the headquarters of the species, individual genera of troops (forces).

Direct control over the organization and implementation of internal control and risk management in the MOU and AFS is the responsibility of the Main Inspectorate of MoD and the Internal Control Unit of the General Staff of the Armed Forces.

At the same time, in accordance with the Cabinet of Ministers of Ukraine Decree No. 1001 of September 28, 2011 "Some Issues of Internal Audit and Formation of Internal Audit Units" (2011), internal audit units assess the effectiveness of the internal control system (hereinafter 'ICS').

However, in practice, the methodology for assessing the effectiveness of the PEC in not only the MoU and the Armed Forces, but also in other central executive bodies of Ukraine has been lacking to date.

The approaches to risk management audit outlined in the order of the Department of Internal Audit of the Ministry of Defense of Ukraine dated October 06, 2017 No. 33 "On approval of the Interim Guideline on Risk Management Audit" (2017) make it impossible to assess the efficiency of the operation of the said process, and in our opinion the existing approach is to check the status of the risk management organization as an element of the ICS.

The solution of the scientific problem in the context of the mentioned problems is conditioned by the implementation of the research work "Internal Audit" and the dissertation research conducted at the Department of Economics and Financial Support of the National Defense University of Ukraine named after Ivan Chernyakhovskyi.

1.2. Setting objective

The purpose of the article is to highlight the practical results of the development of a scientific and methodological apparatus for evaluating the efficiency of the ICS of the MoD institution through the presentation of the comprehensive approach for evaluating the performance of the ICS of the MOU (hereinafter referred to as a comprehensive methodology).

2. Material and Method

During the research, a number of scientific methods of theoretical and empirical research were used, namely: comparison, analysis, synthesis, induction, deduction, systematic approach, as well as the method of expert assessments.

To ensure achievement of the article's purpose, it is recommended to decompose the objective of the scientific research and to describe each stage of the complex method.

During the study, the following were analyzed and used: Ambarnova O.Y., Varkulevych T.V. (2017), Belov V. A (2007), Chumakov V. (2011), Bosalko D.S. (2011), Bardash S.V., Osadcha T.S. (2011), Daudov S.D., Kovalov O.N. (2017), Dorosh N.I., Fesai M.O. (2018), Horlo I.V. (2007), Kendall M. G. (1958), Korol V.V. (2013), Makarenko S.A. (2017), Maksymova H.V. (2017), Maksimova V.F. (2005), Mochernyi S.V. (2002), Novosad V., Seliverstov R., Artim I. (2009), Patramanska L. Yu. (2016), Permyakov O. (2005), Rakhmankulov I. Sh. (2007), Tarasova T.M (2013), Tykhomyrov A. Yu. (2002), Traskovetska L., Borovik L., Borovik O. (2013), Yakimova V.A. (2016), Yevtushevska O.A. (2015), Zastelo O. (2015).

3. Results and Discussion

3.1. The comprehensive approach consists of the implementation and implementation of three interrelated key steps that, collectively, enable us to determine the level of effectiveness of the functioning of the risk-oriented internal control system of the MoD.

The main task in developing a comprehensive method was:

to develop a scientifically reasonable methodological apparatus that, in its totality, will allow to determine the level of efficiency of the functioning of the ICS by identifying and substantiating a certain generalized numerical indicator, which, when applying a certain evaluation criterion, will indicate the level of the ICS functioning.

Also, a comprehensive approach has been developed with a view to achieving a high level of practicality and the possibility of widespread use by audit professionals of different levels of training in different fields.

A limitation of the scientific study was the neglect of uncontrolled factors of influence in determining the indicators of the efficiency of the functioning of the ICS. The timing of the comprehensive methodology is determined by the subject of the audit, taking into account the control period covered.

Specialists, who will practically apply a complex method, following a certain sequence, can change the content of control procedures during the audit, taking into account changes in the organization of the ICS.

The complex method developed consists of three interconnected sequential elements, namely:

1. Identification, formulation and scientific substantiation of the system of indicators of efficiency of functioning of the ICS;

2. Selection of key performance indicators for the functioning of the ICS, their evaluation.

3. Formation of a matrix of key indicators, definition of a generalized indicator of the efficiency of the functioning of the ICS and its evaluation.

In order to achieve the goal of the study, it is proposed to elaborate on each of the presented elements of the complex method.

3.2. Identification, formulation and scientific justification of the system of indicators of efficiency of functioning of the ICS.

The first stage of the complex methodology is carried out in order to carry out work on the identification and selection of available-possible indicators that can testify to the efficiency of the functioning of the ICS.

The implementation of the first stage involves the choice of indicators of the efficiency of the ICS and their scientific substantiation.

To determine the list of performance indicators of the ICS it is necessary:

Identify the factors that affect the functioning of the ICS;

To explore approaches to assessing the performance of ICS for indicators;

To analyze the information received in the course of the conducted activities and to formulate appropriate indicators of the functioning of the said system based on the influence of the identified factors.

A thorough analysis is required to identify the factors:

Regulatory and other regulatory documents regulating the organization and functioning of the ICS;

Domestic and foreign scientific sources, in relation to previous research.

When examining existing approaches to assessing the performance of the ICS in the presence of indicators, it is imperative to draw attention to existing foreign and international experience on the subject.

In addition to conducting analysis of sources and guidance documents, interviews with internal control and internal audit professionals are required.

In the course of the study, a number of factors were identified, which were distributed by degree of controllability, that is, the factors of managed and unmanaged influence on the functioning of the ICS in the MoD.

This is done to determine the limitations of scientific research.

Therefore, in the proposed comprehensive methodology, factors of unmanaged influence were not taken into account in the process of selecting indicators.

On the basis of the work performed, a number of indicators have been identified that influence the efficiency of the functioning of the ICS and their distribution by qualitative and quantitative characteristics.

It should be added that in the course of the research, most experts and scholars in the analyzed approaches to performance evaluation tend to use predominantly qualitative characteristics.

At the same time, in our opinion, the main task of internal control is to prevent losses and shortages of property and resources and implementation of inefficient management decisions.

Then, the loss and shortfall index over the relevant period plays a significant role in assessing the performance of the ICS.

Thus, the result of the first part of the first stage of the comprehensive method is the selection of a list of quantitative and qualitative indicators that can testify to the effectiveness of the object of research and the formation of the appropriate database.

The second part of the first stage provides for the scientific substantiation of the indicators selected during the analysis and research.

In the course of the justification, we apply the method of expert assessments by compiling an appropriate questionnaire and a subsequent survey to evaluate the proposed indicators by the experts.

In order to achieve the goal of the second part of the first stage, it is necessary to take a number of measures, which are:

1. Expert Group Formation - The team is formed by internal control and internal audit specialists; due to the fact that the internal control specialists directly organize the functioning of the ICSs and the audit experts evaluate the effectiveness of the ICSs;

2. Questionnaire development – the questionnaire includes all identified indicators;

3. Conducting a survey – conducting a personal written survey without the work of experts in groups;

4. The results are calculated in the following sequence:

4.1. Calculation of the finite sum for each factor (1):

$$S_{ij} = \sum bij, \tag{1}$$

4.2. Calculation of the arithmetic mean rank:

$$rj = \frac{S_{ij}}{n}, \tag{2}$$

Following the determination of the mean scores, the median method was applied to verify and confirm the results obtained.

4.3. Building a new factor ranking.

4.4. Verify the consistency of experts.

To verify the consistency of experts (W), the coefficient of concordance was determined using the Eq. (3), that is, the total rank correlation coefficient for a group consisting of *m* experts.

$$W = \frac{S}{\frac{1}{12} * m^2(n^3 - n) - m * \sum T_i}, \tag{3}$$

where, $T_i = \frac{1}{12}\sum_{t_i}(t_l^3 - t_l)$,

t_l – is the number of identical rank in i^{th} row.

4.5. The last stage of the mathematical processing of the results of expert evaluation was the determination of the significance of the concordance coefficient by its conduction using the Pearson criterion given in Eq. (2); this is due to the fact that in some blocks the number of factors is n > 7:

$$x^2 = \frac{S}{\frac{1}{12} * mn(n+1) + \frac{1}{n-1} * \sum T_i}, \quad (4)$$

Carrying out all the above measures and calculations in the proposed sequence makes it possible to form a database of a system of evidence-based indicators.

The first stage is schematically depicted in the figure (Fig.1).

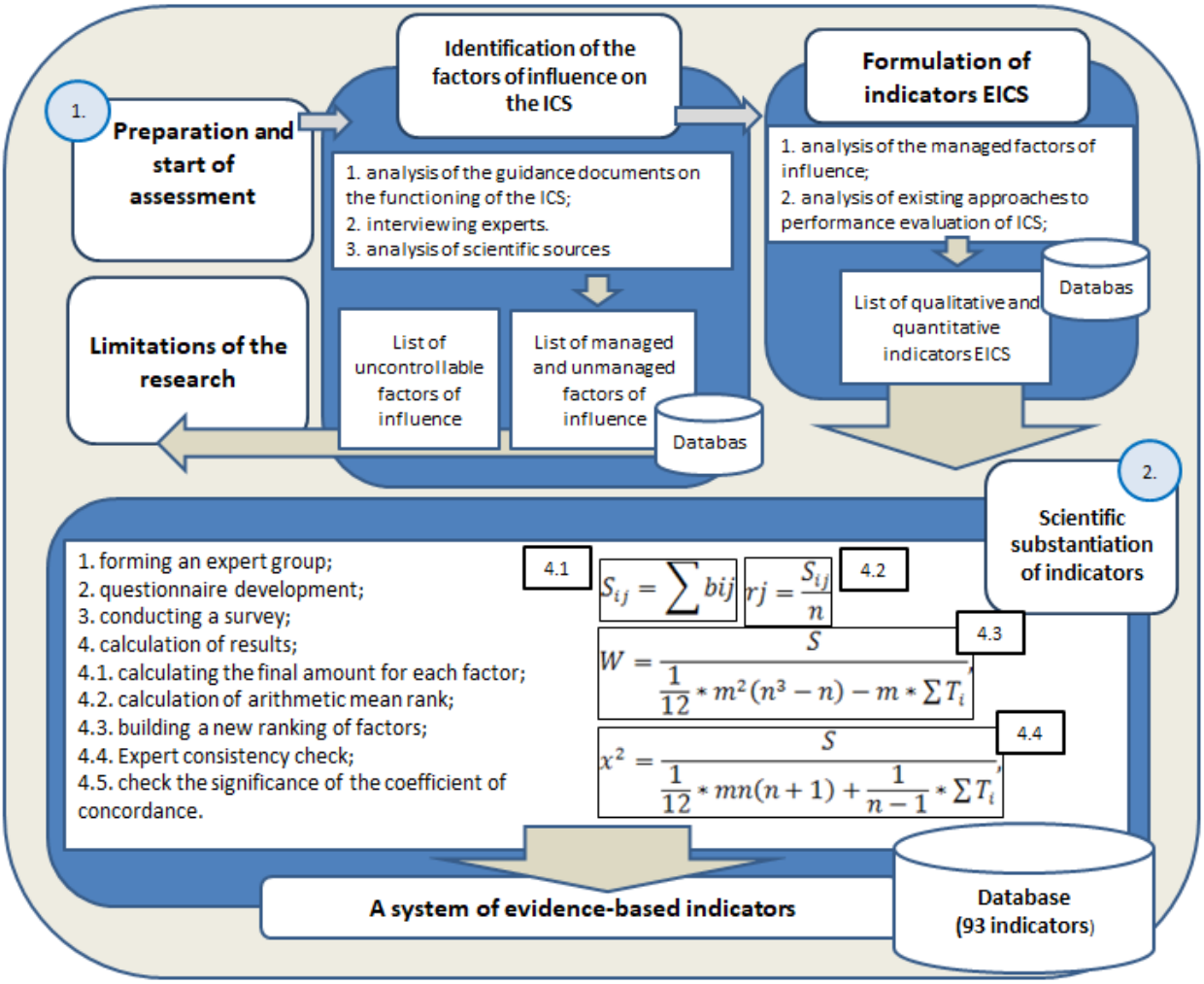

Fig. 1. Methodology for conducting the first stage of evaluating the efficiency of the ICS

3.2. Selection of key performance indicators for the functioning of the ICS, their evaluation

The stage implementation includes of two parts:

1. Determination of weighting coefficients chosen in different cases;
2. Evaluation of selected indicators.

Formed during the first stage, the database consists of 93 indicators, which can testify to the effectiveness of the operation of the ICS.

In the light of the foregoing, the subject of the valuation may increase their number in the course of the assessment, as well as the approach to their calculation.

The complex method assumes the use of a matrix of key performance indicators, which is usually used by 6-7 key indicators.

The expert evaluation and calculation made it possible to identify 6 key indicators of the efficiency of the ICS:

The level of competence of those involved in control measures;

The quality of risk identification;

The quality of risk assessment;

State of implementation of control measures;

Quality of financial (accounting) reporting;

Indicator of loss and shortage.

Next, we calculate the weighting of the selected key performance indicators given in Eq. (5):

$$S_{ij} = x_{max} - x_{ij}; \quad (5)$$

Based on the available mathematical results, the information obtained from the practice of expert questionnaire was published, which presented the significant characteristics of the selected key results (Table 1).

Table 1. The weights of the selected indicators

Indicator		experts												∑	Weight, λ
		1	2	3	4	5	6	7	8	9	10	11	12		
The quality of risk identification	x_1	3	3	4	4	3	4	3	4	4	4	4	4	44	0,1781
The quality of risk assessment	x_2	4	4	4	1	4	4	3	4	3	4	4	4	43	0,1741
The level of competence of those involved in control measures	x_3	3	3	4	3	3	2	4	4	4	4	4	4	42	0,17
State of implementation of control measures	x_4	4	4	4	3	3	2	3	4	3	4	4	4	42	0,17
Quality of financial (accounting) reporting	x_5	3	3	4	2	4	2	3	4	1	4	4	4	38	0,1538
Indicator of loss and shortage	x_6	4	4	4	2	4	2	3	4	3	0	4	4	38	0,1538

The second part of the second stage of the complex method is the evaluation of selected indicators.

The method of estimating an indicator depends on its qualitative or quantitative characteristics.

Indicators: quality of risk identification; the quality of risk assessment; the level of competence of those involved in control measures; state of implementation of control measures; the quality of financial (accounting) reporting is a qualitative indicator in its content.

The loss and shortfall indicator is quantitative.

To determine the numerical value of some of the qualitative indicators (quality of risk identification, quality of risk assessment, state of implementation of control measures), appropriate questionnaires are developed, which provide a number of questions or statements, which, in their totality, give an idea to the person performing the assessment of the state of functioning of an element of assessment (Table 2).

Table 2 The structure of the questionnaire to determine the numerical value of qualitative indicators

№	Question / Rating	Content of the question (statement)		Levels of maturity (quality)				Sum of points	Audit evidence
		yes	no	situational	initial	repetitive	controlled		
		1	0	1	2	3	4		
1.	Content of the question (statement)								

The content of the question is determined taking into account the requirements of the governing documents and rules of organization and functioning of the ICS at the time of the evaluation.

When assessing a question (statement), not only its presence and regulation, but also the level of maturity or quality of implementation (regulation) are taken into account.

The level of maturity (quality) of completion, or regulation of the content of the issue (approval) is determined based on the requirements of the order of the Internal Audit Department of MOU No. 33 (2016).

The numerical value of the indicator will be equal to the ratio of points received on the questionnaire to the maximum possible amount of points on the questionnaire, based on the maximum number of questions (elements) considered.

Qualitative Indicator – The level of competence of those involved in control activities is suggested to be determined through the development of tests on the organization and implementation of internal control.

The list of control questions is determined in accordance with the procedure of organization and functioning of the ICS, which is relevant on the day of the ICS performance evaluation.

The evaluation of the received answers is suggested to be carried out in accordance with the evaluation of the results of the final control of the students' educational achievements on the 100-point national scale and the ECTS scale, corresponding to:

90-100 grade points – ‘excellent’;

65-89 points – ‘good’;

50-64 points – ‘satisfactory’;

1-49 points are ‘unsatisfactory’.

That is, an appropriate percentage of correct answers will indicate the presence of a certain level of ownership and awareness of the functioning of the ICS.

The technique proposes to carry out this testing among the direct participants of the internal control process, namely:

The head of the institution;

Manager of internal control;

Members of the risk assessment team;

Heads of structural units directly responsible for the organization and implementation of key processes within the organization or responsible for the processes in which the risks identified in the risk management plan for the year are identified.

To determine the quantitative indicator – the loss and lack of property and resources, it is necessary to use the data of accounting (financial) statements, as well as materials of previous audit reports, taking into account data from other sources and registers of analytical and synthetic accounting.

The loss and shortfall ratio can be defined as the average value of the loss and shortfall ratio for each asset recorded in the entity's financial statements by using the Eq. (6):

$$\text{ВтН} = \sum \frac{\text{ВтН}_n}{A_n}, \tag{6}$$

In order to reflect – a qualitative model (accounting) ability to formulate a list of issues that need to be investigated during some assessments among representatives (accounting ability). Identified questions evaluating the use of critical issues related to regulation, namely: remain a sophisticated, private issue, not a clarified issue, with a score of 2, 1, 0 posts.

So, check out the top performance data revisions that allow you to generate the information you need to check the third phase of a functionally functioning JMC. Graphically revealed another stage, shown in figure (Fig. 2).

3.3. Formation of matrix of key indicators and definition of the general indicator of efficiency of ICS operation.

The result of applying the complex methodology is the completion of the third stage, which consists of three interconnected sequential parts:

Formation of a matrix of key indicators;

Determination of the generalized indicator of efficiency of functioning of the VEC;

An assessment of the performance of the audit entity's ICS.

The KPI matrix should reflect, in the context of selected indicators, the following elements: weights, goal achievement levels, calculated KPI index (Table 3).

We fill the specified matrix as follows:

1. We make a selection from the base of available indicators, the indicators that most significantly characterize the efficiency of the functioning of the DMS:

The level of competence of those involved in control measures;

The quality of risk identification;

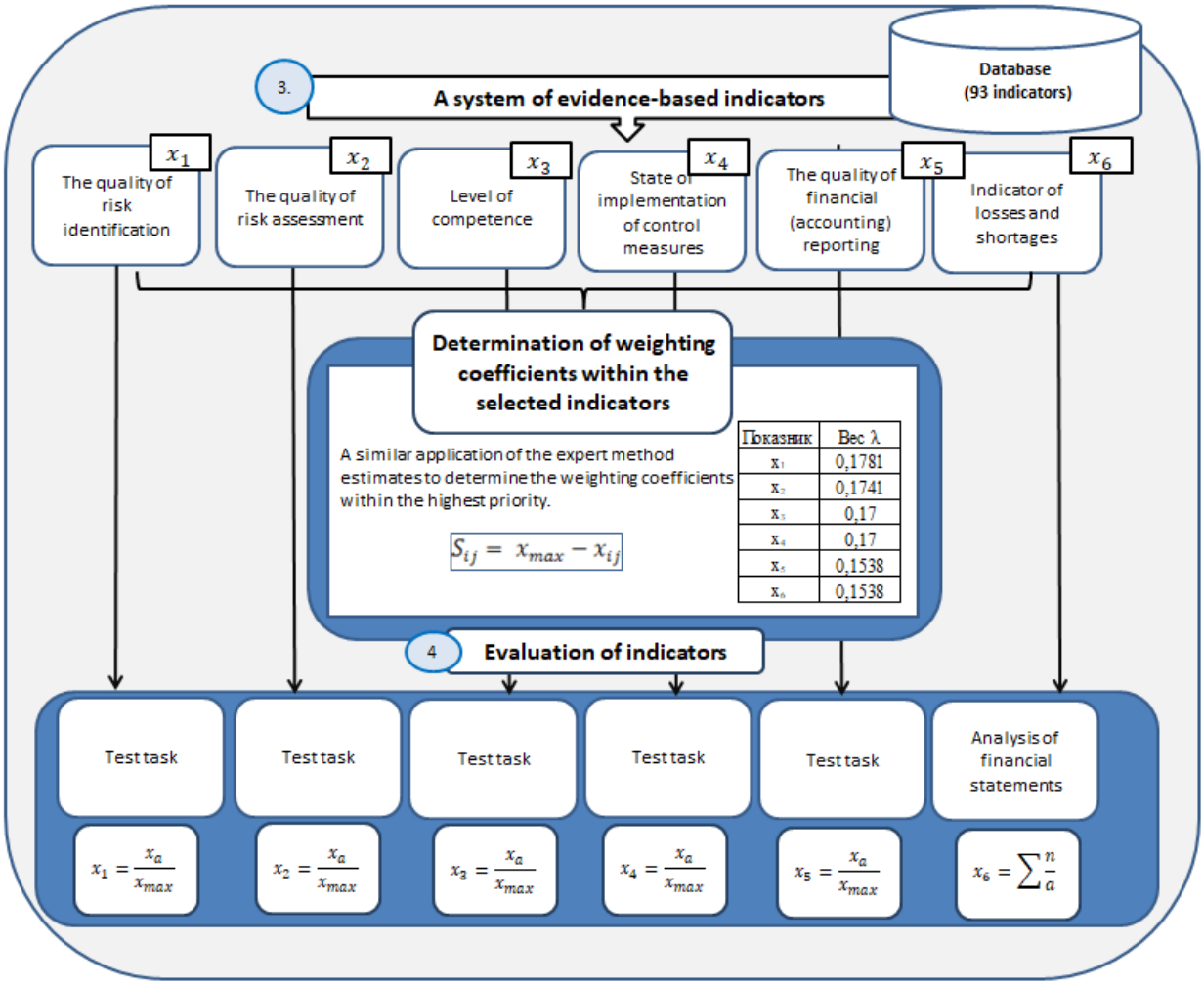

Fig. 2. Method of conducting the second stage of ICS performance evaluation

The quality of risk assessment;
State of implementation of control measures;
Quality of financial (accounting) reporting;

Table 3. Matrix KPI

№	The name of the key indicator	Weighting coefficients	Goal achievement levels, %				Index KPI,%
			Initial	Satisfactory	Target	Actual	
1.	x_1	value	Relevant values in terms of metrics and levels of goal achievement				The block of direct determination of CRI indices according to the corresponding the Eq. (7)
2.	x_2	value					
3.	x_3	value					
4.	x_4	value					
5.	x_5	value					
6.	x_6	value					

Loss and shortage.

2. Determine the weighting coefficients of the selected indicators, such that their total is equal to one.

The weights for the selected indicators are defined in Table 1.

3. Determine the initial efficiency level of the ICSs, at which the efficiency of the ICSs is considered to be the most negatively acceptable indicator, that is, the degree to which the ICSs performance level is rated as the worst. The entry-level is the starting point for taking into account the efficiency of the operation of the ICS;

4. Determine a satisfactory level of efficiency of the functioning of the ICS. That is, the level at which the values and performance of the system are acceptable and at which the said performance satisfies the achievement of the institution's goals;

5. Determine the target level of efficiency of the functioning of the ICS, which may be an indicator of the desired level of achievement of efficiency. The target level should be set above a satisfactory level.

6. Determine the actual level of the key indicators being evaluated;

7. Perform the final assessment for the reporting period in the context of each selected key indicator by calculating the obtained values of the actual level in relation to a satisfactory level:

$$index \text{ KPI} = \frac{AL * IL}{SL} * 100\%, \quad (7)$$

Where AL – actual level;

IL – initial level;

SL – satisfactory level;

Since the comprehensive methodology justifies and proposes to use the Harrington utility criterion to evaluate the overall effectiveness of the JMC, then the calculations made it possible to determine the initial level of achievement of the targets at 37% (IL), satisfactory level (SL) – 63%.

Defining a target level (TL) of 100% is due to the effort to maximize the effectiveness of the operation of the ICS.

Thus, the resulting KPI index as a percentage will indicate the efficiency of the ICSs functioning according to the selected key indicator.

Next, we determine the generalized indicator (coefficient) of the efficiency of the ICS in percentage using the Eq. (8):

$$GI \text{ KPI} = \sum(indeces \text{ KPI} * Weighting\ coefficients) - ILS\ , \quad (8)$$

Where ILS – loss and shortage indicator;

The loss and shortfall (ILS) ratio is defined as the average of the ratio of the loss and shortfall ratio for each asset reflected in the entity's financial statements using the Eq. (9):

$$ILS = \sum \frac{ILS_n}{A_n} * m, \quad (9)$$

Where m – the weighting coefficient is defined for the loss and shortfall index.

The aforementioned generalized indicator of the efficiency of the operation of the ICS indicates the weighted average efficiency in the reporting period, taking into account the selected key performance indicators and their weighting factors.

Reduction of the summary summarized indicator is done by subtracting the loss and shortfall indicator. This is due to the fact that when calculating the Key Performance Indicators (KPI), the appropriate size of the indicator is expressed in a certain percentage, where the approximation to 100 percent or more indicates the effectiveness of the respective direction.

In determining the loss and shortfall ratio, it is certainly considered positive to approximate its figure as a percentage to 0.

Thus, in order to practically complete the specified matrix of the audited entity, it is necessary to determine only the actual level of the selected indicator, which is determined in percentage by the method defined in the second stage.

It should be added that, if necessary, the audit entity may vary the set of key indicators generated during the first phase of the comprehensive methodology.

Then, depending on the characteristic of the indicator (quantitative or qualitative) it is necessary to determine the mechanism of its formulation. Qualitative indicators should be subject to test and questionnaire procedures, and it is advisable to use financial (accounting) reporting and appropriate statistics to determine quantitative indicators.

Harrington's utility theory function is used to evaluate the aggregate performance indicator obtained by the ICS and to determine the level of ICS performance of the audited entity.

This is due to the possibility of using qualitative and quantitative indicators, both individually and by evaluating the generalized performance indicator in the overall scale of assessment.

The formula used to determine the Harrington utility function (10):

$$Y = e^{-e^{-y'}}, \quad (10)$$

Where y' – converted value of indicator.

The value of the indicator can be determined using to Eq. (11):

$$Y_{i'} = \frac{X_i - X_{min}}{X_{max} - X_{min}}, \quad (11)$$

X_i – the primary value of the data array,

X_{max}, X_{min} – the maximum and minimum values of the estimates for the upper and lower bounds of the Harrington interval, corresponding to a value of “satisfactory”.

The final calculation is an assessment of both a single indicator and a generalized indicator of the performance of the PEC on the Harrington scale using to Eq. (12):

$$Y = e^{-e^{-\frac{x_2 - x_{min}}{x_{max} - x_{min}}}}, \quad (12)$$

The generalized ICS performance indicator on the proposed scale will be in the range of 0 to 1, where 1 is the highest degree of efficiency and the approximation of the indicator to 0 is to minimize the performance of the ICS.

The indicated value of the indicator (generalized indicator) of the degree of efficiency of the ICS using the utility function scale proposed by Harrington can be depicted as follows (Table 4):

Table 4. Scale of determine of ICS level

Generalized indicator for the evaluation of the efficiency of ICS	Levels of ICS	Function status of ICS
D >0,8	managed level	proper level
0,63<D <0,8	recurring level	sufficient level
0,37< D <0,63	initial level	insufficient level
0,2< D <0,37	situational level	poor level
D <0,2	lack of efficiency	

Where, $D = \sqrt[1/n]{Y_i}$

D – an integral indicator of the efficiency level of the ICS;

Y_i – Evaluation of a separate indicator of the effectiveness of the ICS;

n – The number of performance indicators.

Thus, the calculated generalized indicator of the efficiency of the ICS evaluated by the proposed path will testify to the state of the ICS's efficiency in the MoD.

Graphically, the implementation of the third stage is shown in the figure (Fig. 3).

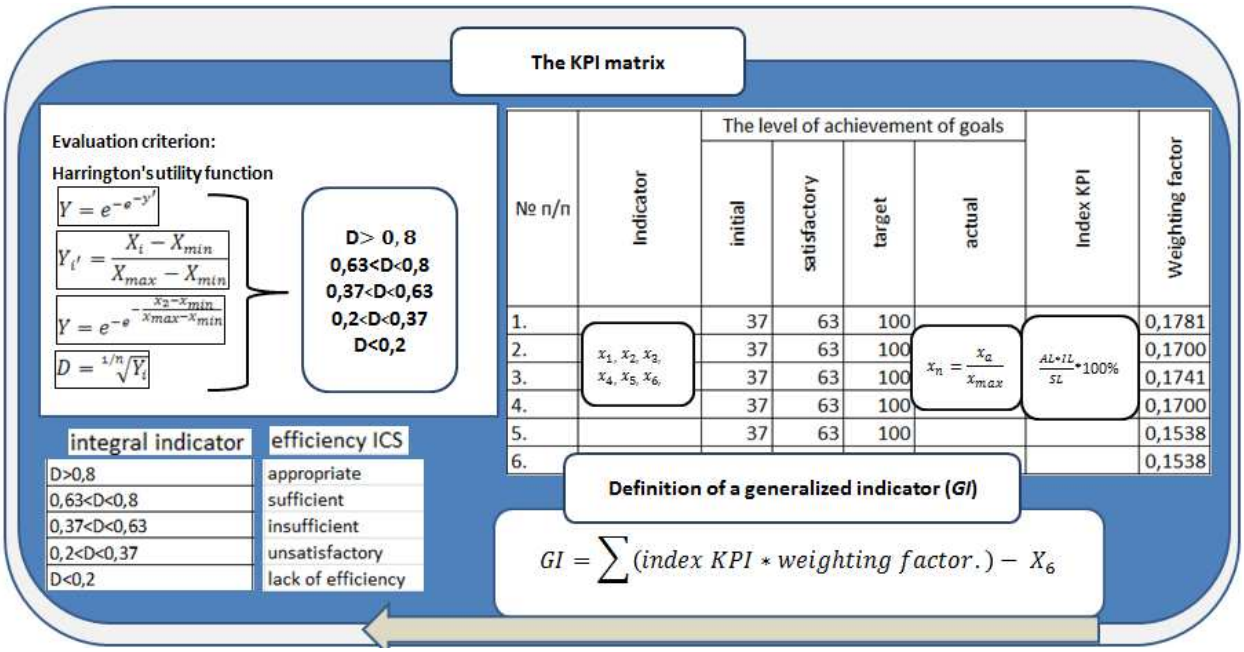

Fig. 3. Third stage of complex method of evaluation of ICS efficiency

4. Conclusions and prospects of further research

As of today, under the conditions of formation, risk-oriented internal control, both in the MoD system and in the Armed Forces and in the country as a whole, there is an urgent need to evaluate its effectiveness. This is due not only to the requirement for guidance documents on the organization and conduct of the audit, but also to the need to provide comprehensive information to the managers on the effectiveness of the internal control functioning in the subordinate institutions. This will enable managers to see the consequences of the implementation of their managerial function.

A comprehensive approach enables audit service representatives to use a scientifically sound approach to assessing the effectiveness of the ICS. Development of the method was carried out taking into account its further practicality in application.

When applying a comprehensive approach, it is suggested that the representative of the audit service, through the application of testing procedures, questionnaires and analysis of financial (accounting) reporting to determine the value of the selected indicators and simple mathematical calculations to determine the effectiveness of the operation of the ICS institution.

The prospects for further research are seen in the practical validation of this approach to assessing the performance of the institution's ICS.

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