Article

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Study of the Sustainable Functioning of Construction Companies in the Conditions of Risk Factors

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Abstract: Sustainability is a characteristic manifested in the ability to maintain the necessary level of performance for construction companies when risk factors arise during the implementation of investment and construction projects. The risk factors that arise during the implementation of investment and construction projects differ in nature, degree of influence, and other characteristics. Ignoring these factors and measures to manage them often leads to critical consequences in the form of disruptions in the timing of work. Risk is a combination of the probability and consequences of the occurrence of adverse events. The article considers the concept of risk as a potential possibility of occurrence of adverse situations and related consequences when exposed to these factors. Risk factors are characterized by surprise, discreteness of changes, the presence of threshold values, upon reaching which a transition to a different mode of operation is required. The article discusses the risk factors arising at the construction stage, their classification. A methodology has been developed that includes conducting a survey in the form of a questionnaire in order to collect information about risk factors that affect the implementation of investment and construction projects. Experts with experience in the construction sector were involved in the survey. The processing of the survey results made it possible to assess the significance of various risk factors in investment and construction projects. Thus, statistical and expert methods were used in the study. The results showed that financial, technical, legal, economic, managerial and natural factors have the greatest impact on investment and construction projects. It is recommended to pay special attention to the listed factors when developing measures aimed at preventing risks and their consequences. The methodology described in the study can be used by construction companies in strategic planning. The analysis of the stability of construction companies, depending on their use of various ways to counteract risk factors, allowed us to develop a number of practical recommendations to reduce the impact of the studied factors on achieving the goals of investment and construction projects.

Keywords: construction production; construction companies; sustainable functioning; risk factors; uncertainty; TOPSIS

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1. Introduction

The sustainable functioning of a construction company is ensured by its ability to withstand risk factors and achieve the final goals of construction.

Risk management in the implementation of investment and construction projects is necessary for companies operating in the construction sector, as it represents a clear and applicable strategy to ensure their survival in the market [1,2].

Construction companies need reliable and easy-to-implement procedures to achieve the goals of investment and construction projects (compliance with estimated cost standards, proper quality of the construction object, completion of construction and installation works on schedule). In most cases, construction companies are exposed to a large number of risk factors, which are often the result of incompetent management decisions, entailing uncertainty in achieving the final result of an investment and construction project and the loss of sustainable functioning [3–5]. The uncertainty

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that has appeared during the implementation of the investment and construction project creates the possibility that the final result of the project will exceed the desired expectations or the other way around [6].

The need to assess the effective functioning of construction companies is due to market competition, when each business entity strives to improve its performance. Development of algorithms for assessing the sustainability of construction companies in order to improve technical and economic indicators in conditions of risks and uncertainty should be carried out on the basis of system engineering principles for the construction and development of complex systems [4,7,8].

In modern theoretical studies, the issues of risks of the organization and management of construction are considered; methods of assessing and improving the efficiency of construction processes; the capacity of individual elements of construction production and the system as a whole; methods of identifying, assessing and managing risks in construction; problems of the effectiveness of the functioning of construction companies in conditions of uncertainty [9–13].

Algorithm for increasing the sustainability of construction companies in order to improve their technical and economic indicators in the implementation of investment and construction projects should include the following stages [14,15]:

- attracting the attention of participants of investment and construction projects to the problem of risks and uncertainty;
- Determination and assessment of the degree of influence of risk factors on the activities of companies implementing investment and construction projects;
- Development of a structure for the implementation of compensatory measures to exclude or reduce the impact of risk factors on the activities of construction companies;
- Providing contractors with a risk factor management structure and demonstrating the impact of these factors on achieving the goals of the investment and construction project.

Two types of risk factors were selected for the study:

1. Anthropogenic factors.
2. Natural factors.

The difference between anthropogenic and natural risk factors is that anthropogenic factors arise as a result of human actions, while natural factors arise as a result of various natural disasters [10,11,16–22]. The description of the considered risk factors is presented in Table 1.

Table 1. Types of risk factors.

Anthropogenic factors	Natural factors
Financial factors. These risk factors are mainly related to the financing of construction projects, when local and global events can lead to unexpected changes in interest rates, the degree of solvency, an increase in inflation, additional costs, etc.	**Adverse weather conditions.** Floods, sudden temperature fluctuations and precipitation have a significant impact on the final indicators of investment and construction projects. So, if there is continuous rain during construction for a month, the delivery of a construction object on time can be significantly difficult.
Social factors. The commission of crimes such as vandalism, arson, destruction or theft of construction equipment and various acts of sabotage are risk factors that threaten the implementation of construction projects. Construction work may be suspended for an extended period of time while the trials related to the listed criminal actions last.	**Pollution.** In addition to adverse weather conditions, pollution is another risk factor when it comes to natural disasters, since harmful gases and waste have a negative impact on the environment, which, in turn, may affect the quality of construction.

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Legal factors. Some legal risks in the construction sector may be related to the terms of contracts. For example, contracts often stipulate the obligation of contractors to pay fines in case of non-compliance with the deadlines for completion of construction.	**Geological processes.** The intensification of dangerous geological processes, such as earthquakes or geological faults, similar to those that have occurred in recent years in different regions of the world, is another type of natural risk factors faced by the construction sector.
Health factors. Viral and infectious diseases can spread among construction site workers, as well as in any labor collective. The occurrence of an epidemic or even a pandemic as long-lasting as Covid-19 poses a serious danger to the health of construction site workers. The health of workers may suffer as a result of accidents related to errors or negligence in the operation of construction machinery and equipment. The loss of employees' ability to work for the above reasons may lead to interruptions in the company's activities.	
Technical factors. These factors include design errors and lack of resources. For example, a shortage of qualified personnel or issues related to the difficulty of access to the construction site, as well as failures in the operation of machinery and equipment leading to undesirable consequences during the implementation of an investment and construction project.	

2. Materials and Methods

During the analysis of scientific literature, data from various studies, factors influencing the sustainable functioning of construction companies were selected.

To assess the degree of influence of various risk factors on the activities of construction companies and identify the most significant factors, the expert survey method was used [23–25].

In order to conduct an expert survey, a questionnaire was developed. Each indicator of the impact of a specific risk factor was obtained by summing up the actual scores set by experts. The degree of influence of risk factors was assessed by experts on a scale from 1 to 18, where 1 point was assigned to the least influential factor, and 18 points to the most influential [26,27].

According to the applied methodology [28], it was determined that the minimum number of experts for the study is 4. However, in order to increase the reliability of the survey results, the authors decided to increase the number of experts to 5. Thus, the expert group consisted of 5 experts, including managers and specialists of construction companies.

To assess the consistency of the results of the expert survey using the concordance coefficient (W), the closeness of the relationship between the ranked factors was determined:

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

where S is the summarization of the squared deviations of the sum of ranks from the arithmetic mean of the sum of ranks.

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$$S = \frac{1}{n}\sum_{i=1}^{n}(x_i - \mu)^2, \quad (2)$$

$$T_i = \frac{1}{12}\sum(t_i^3 - t_i) \ , \quad (3)$$

where t_i is the number of repeating elements in the estimates i of one expert;
m is the number of experts;
n is the number of ranked factors;
μ is the arithmetic mean.

Table 2 shows the weight of each risk factor based on the opinion of 5 experts in the field of construction.

Table 2. Ranking of the impact of risk factors.

Risk factors	№	Description of the risk factor	Experts					∑ ranks	Factor weight
			1	2	3	4	5		
Financial factors	1	Low liquidity of the company contractor	16	14	13	12	13	68	0.047921
	2	Late transfer of funds by the customer to the contractor	11	12	10	10	14	57	0.040169
	3	Late payment of payments by the general contractor to subcontractors	15	17	12	16	15	75	0.052854
Technical factors	4	Non-compliance with norms and standards	9	11	9	8	12	49	0.034531
	5	Change of project documentation	14	13	15	13	16	71	0.050035
	6	Lack of local skilled labor	17	15	14	17	18	81	0.057082
	7	Lack of experience working with technical resources	10	8	11	9	7	45	0.031712
	8	Non-compliance with material storage standards	7	5	8	4	9	33	0.023256
	9	Delay in laboratory results	3	3	5	6	4	21	0.014799
	10	Lack of material resources	13	16	16	11	10	66	0.046512
Legal factors	11	Contractual disputes arising between the general contractor and subcontractors	8	9	10	7	11	45	0.031712
	12	Changing the terms of the contract by the customer	12	14	13	12	9	60	0.042283
	13	Lack of licenses and the difficulties that arise in obtaining them	10	10	8	13	12	53	0.03735
	14	The need to take into account local laws	3	5	2	6	4	20	0.014094
Economic factors	15	Currency exchange rate instability	11	13	9	10	13	56	0.039464
	16	Inflation	14	15	11	16	17	73	0.051445
	17	Instability of the market economy	6	7	5	9	8	35	0.024665
	18	Delayed arrival of shipments of materials to the local market	2	3	6	7	3	21	0.014799
	19	Difficulties with the delivery of materials to workplaces	9	8	12	8	9	46	0.032417
	20	Risks of bank transfers	12	12	8	11	10	53	0.03735
Management factors	21	Software difficulties	4	6	7	4	5	26	0.018323
	22	Weakness of the contractor's administrative staff	8	13	10	12	13	56	0.039464
	23	Lack of managerial experience	10	11	9	14	14	58	0.040874
	24	Inefficient planning	4	9	3	5	7	28	0.019732
	25	Slow decision-making mechanism by the customer	2	4	1	6	6	19	0.01339
	26	Low level of communication between contractor and customer, general contractor and subcontractors	7	10	12	10	11	50	0.035236
Natural factors	27	Sudden temperature fluctuations	13	9	13	15	12	62	0.043693
	28	Natural and geological disasters (earthquakes, floods, droughts)	15	16	14	16	12	73	0.051445

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29	Contamination of the work site	5	2	4	6	2	19	0.01339

Figure 1 shows the ranking of risk factors, taking into account their significance, depending on the weight measured for each of them, according to an expert survey.

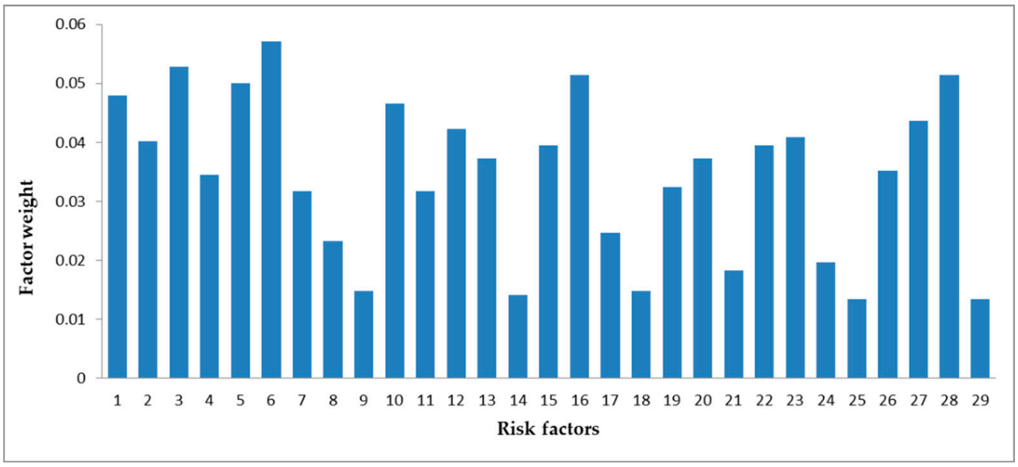

Figure 1. Ranking the significance of risk factors.

The consistency of the results of the expert survey is checked using the concordance coefficient (W), as in formula (1):

$$W = \frac{12\times 42166.5}{(5)^2.(29^3-29)-5\times 53} = 0.84$$

Since W > 0.5, the consistency of expert opinions exists. The coefficient value is 0.84, which indicates a high degree of consistency of expert opinions.

The degree of consistency is also estimated by calculating the Pearson correlation coefficient using the equation below:

$$X_p^2 = w \times m \times (n-1) = 0.84 \times 5 \times (29-1) = 117.6$$

The calculated Pearson coefficient is compared with the tabular value for the number of degrees of freedom n - 1 = 28, at a given significance level $\alpha = 0.05$.

Since X_p^2 is calculated – 117.6 > tabular – 41.3, then W = 0.84 is not a random value, and therefore the results obtained by their degree of significance make sense and can be used in further research.

Risk factor management strategies.

The risk factors of construction projects are diverse in nature and causes of occurrence. However, in theory, four main strategies for managing them have been developed, which are often followed in practice [29–31]:

- Avoidance (exclusion) of the occurrence of risk factors.
- Transfer of risk factors.
- Reduction (reduction) of the influence of risk factors.
- Acceptance of the occurrence of risk factors.

After identifying and assessing risk factors, construction industry specialists can take the necessary decisions and possible administrative and technological measures. These procedures are designed to contain risk factors by reducing the likelihood of occurrence or minimizing their impact [32,33].

TOPSIS technology allows evaluating the effectiveness of construction companies depending on their chosen risk management strategies. The strategies listed above serve as criteria for reducing or

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limiting the impact of risk factors of construction companies. The sub-criteria that are taken for this assessment are identified in the process of analyzing data from various studies, interviews with specialists of construction companies. Using the results of the assessment, those who manage risk factors in the company can choose the most preferable solution from several alternatives [34–37], as shown in Figure 2.

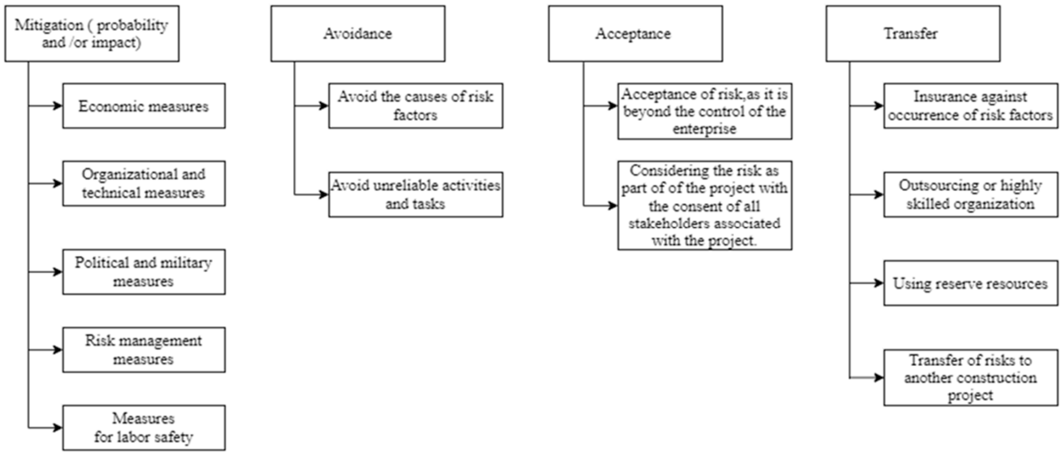

Figure 2. Measures to reduce or limit the impact of risk factors in construction companies [31].

The basic principle of the TOPSIS method is that the alternative should have the shortest distance from the positive ideal solution and the furthest distance from the negative ideal solution [38,39].

The study assessed the sustainability of the functioning of three construction companies depending on the application of different strategies for managing risk factors. To facilitate calculations, the first company was designated C1, the second – C2, the third – C3; criteria (applied measures) were designated as K1, K2, ..., Kp. Table 3 presents the results of the evaluation of each alternative for companies by criteria (applied measures) on a scale from 1 to 10, in accordance with the results of the expert survey[40,41].

Table 3. Matrix of solutions for evaluation of criteria.

AAA	AA	A	BBB	BB	B	CCC	CC	C	D
10	9	8	7	6	5	4	3	2	1

Where AAA - is the highest rating for the criteria, which is 10 and so for the rest of the symbols.

If we assume that there is a solution to a multi-criteria problem with (m) alternatives and (n) criteria, then the matrix of solutions (mij) = m × n will have the following form:

$$\begin{array}{cc} & \begin{array}{ccc} k_1 & k_2 & k_3 \end{array} \\ M= \begin{array}{c} C_1 \\ C_2 \\ \dots \\ C_m \end{array} & \begin{bmatrix} К_{11} & К_{12} & К_{13} \\ К_{21} & К_{22} & К_{23} \\ \dots & \dots & \dots \\ К_{m1} & К_{m2} & К_{mn} \end{bmatrix}, \end{array} \quad (4)$$

The assessment of the effectiveness of the functioning of companies from the point of view of risk factors management is carried out using the TOPSIS method and consists of the following stages:

1. After summarizing the results of the survey of experts in accordance with Table 2 the importance of the criteria is calculated as follows:

$$B_{ij}=\frac{К_{ij}}{\sum_{i=1}^{m} К_{ij}} \quad , \quad (5)$$

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where Bij is the relative importance of each criterion.

After that, the entropy value of each criterion is calculated using the following formula:

$$e_j = \frac{-1}{\ln m} \sum_{i=1}^{m} Bij \ln Bij, \quad (6)$$

where ej is the entropy value of each criterion from 0 to 1.
m is the number of alternatives.
Then the weights w1, w2, ..., wn for the evaluated criterion are calculated using the following formula:

$$W_j = \frac{1-e_j}{\sum_{i=1}^{n}(1-e_j)} , \quad (7)$$

2. The matrix of normalization solutions for criteria (Measures to reduce or limit the impact of risk factors) is calculated:

$$R_{ij} = \frac{\kappa_{ij}}{\sqrt{\sum_{i=1}^{m} \kappa_{ij}^2}} , \quad (8)$$

where Rij is a matrix of normalization solutions for criteria;
i – 1, 2, ..., m;
j – 1, 2, ..., n.

Then the weighted matrix of normalization solutions for the criteria is calculated as follows:

$$V_{ij} = w_j * R_{ij} , \quad (9)$$

where (wj) is the weight of the criterion, and the sum of the weights of the criteria is 1 according to the following formula:

$$\sum_{i=1}^{n} w_j = 1, \quad (10)$$

3. Positive and negative ideal solutions are determined:

$$A^+ = maxv_{ij}, j = 1,2, \dots \dots, n , \quad (11)$$

$$A^- = minv_{ij}, j = 1,2, \dots \dots, n , \quad (12)$$

4. The distance of the alternative from the positive ideal solution is determined:

$$= \left(V_{ij} - v^+ j\right)^2, \quad (13)$$

5. The distance of the alternative from the negative ideal solution is determined:

$$= \left(V_{ij} - v^- j\right)^2, \quad (14)$$

6. The distance scale (Oi+) is calculated using the Euclidean distance (n). The distance for each alternative of a positive ideal solution is determined by the following formula:

$$Oi^+ = \sqrt{\left\{\sum_{i=1}^{n}\left(V_{ij} - v^+ j\right)^2\right\}} , \quad (15)$$

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7. The distance scale (Oi-) is calculated using the Euclidean distance (n). The distance for each alternative of a negative ideal solution is determined by the following formula:

$$Oi^{-} = \sqrt{\left\{\sum_{i=1}^{n}\left(V_{ij} - v^{-}j\right)^{2}\right\}}\ , \tag{16}$$

8. The relative proximity to the positive ideal solution is calculated using the following formula:

$$C_i = \frac{Oi^{-}}{Oi^{-}+Oi^{+}}\ , \tag{17}$$

9. The evaluation of tof the sustainable of the functioning of the studied companies from the point of view of risk factors management is carried out, depending on the value of the proximity coefficient (Ci) on the scale presented in Table 4 [42–44].

Table 4. Gradation of the Harrington desirability scale.

№	Gradation of the Harrington scale	Desired rating
1	1.00 – 0.81	Very good
2	0.80 – 0.64	good
3	0.63 – 0.38	Satisfactorly
4	0.37 – 0.21	Bad
5	0.20 – 0.00	Very bad

3. Results

The results of the survey conducted among experts of construction companies were analyzed in accordance with Table 5.

Table 5. Decision matrix for criteria (applied measures).

Construction companies	Criteria			
	Avoiding (excluding) the occurrence of RF	Transfer of RF	Acceptance of the occurrence of RF	Reduction (reduction) of the influence of RF
C1	6.5	6.3	8.1	7.7
C2	8.9	8.5	7.6	6.9
C3	8.1	7.2	6.4	5.4
$\sum_{i=1}^{m} \text{м}_{ij}$	23.5	22	22.1	20

The importance of the criteria (applied measures) is calculated using formulas (5), (6) and (7) in accordance with Tables 6, 7, 8 and 9.

Table 6. Calculations of the importance of criteria (applied measures), stage 1- ($B_{ij}=\frac{\kappa_{ij}}{\sum_{i=1}^{m}\kappa_{ij}}$).

Constructio n	Criteria			
	Avoiding (excluding) the occurrence of RF	Transfer of RF	Acceptance of the occurrence of RF	Reduction of the influence of RF

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C1	0.277	0.286	0.367	0.385
C2	0.379	0.386	0.344	0.345
C3	0.345	0.327	0.290	0.270

Table 7. Calculations of the importance of criteria (applied measures), stage 2- ($Bij \ln Bij$).

Construction companies	Criteria			
	Avoiding (excluding) the occurrence of RF	Transfer of RF	Acceptance of the occurrence of RF	Reduction of the influence of RF
C1	-0.355	-0.358	-0.368	-0.367
C2	-0.368	-0.367	-0.367	-0.367
C3	-0.367	-0.366	-0.359	-0.354

Table 8. Calculations of the importance of criteria (applied measures), stage 3- ($e_j = \frac{-1}{\ln m}\sum_{i=1}^{m} Bij \ln Bij$), m=3 (number of companies studied).

	Criteria				
	Avoiding (excluding) the occurrence of RF	Transfer of RF	Acceptance of the occurrence of RF	Reduction of the influence of RF	
e_j	0.992	0.993	0.996	0.990	
$1 - e_j$	0.008	0.007	0.004	0.01	$\sum 1 - e_i = 0.029$

Table 9. Calculations of the importance of criteria (applied measures), stage 3- ($W_j = \frac{1-e_j}{\sum_{i=1}^{n}(1-e_j)}$).

	Criteria			
	Avoiding (excluding) the occurrence of RF	Transfer of RF	Acceptance of the occurrence of RF	Reduction of the influence of RF
Wj	0.276	0.241	0.138	0.345

Using data obtained at the stages of application of the TOPSIS method and formulas (8), (9), (10), (11), (12) and (13) a matrix of normalization solutions was calculated for the criteria (applied measures) to reduce or limit the influence of risk factors (Tables 10, 11).

Table 10. Matrix of normalization solutions for criteria (applied measures), stage 1.

Construction companies	Criteria			
	Avoiding (excluding) the occurrence of RF	Transfer of RF	Acceptance of the occurrence of RF	Reduction of the influence of RF
C1	6.5	6.3	8.1	7.7
C2	8.9	8.5	7.6	6.9
C3	8.1	7.2	6.4	5.4
$\sum_{i=1}^{m} \kappa_{ij}^2$	187.07	163.78	164.33	136.06
$\sqrt{\sum_{i=1}^{m} k_{ij}^2}$	13.68	12.8	12.82	11.66

Table 11. Matrix of normalization solutions for criteria (applied measures), stage 2 - ($R_{ij} = \frac{\kappa_{ij}}{\sqrt{\sum_{i=1}^{m} \kappa_{ij}^2}}$).

Construction companies	Criteria			
	Avoiding	Transfer of RF	Acceptance of the occurrence	Reduction

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	(excluding) the occurrence of RF		of RF	of the influence of RF
C1	0.475	0.492	0.632	0.660
C2	0.651	0.664	0.593	0.592
C3	0.592	0.563	0.499	0.463

Using the obtained values (Wj) (see Table. 9) and (Rij) (see Table. 11) a weighted matrix of normalization solutions is calculated for the criteria (applied measures) (see Table 12).

Table 12. Weighted matrix of normalization solutions for criteria (applied measures),($V_{ij} = w_j * R_{ij}$).

Construction companies	Criteria			
	Avoiding (excluding) the occurrence of RF	Transfer of RF	Acceptance of the occurrence of RF	Reduction of the influence of RF
C1	0.131	0.119	0.087	0.228
C2	0.179	0.160	0.082	0.204
C3	0.163	0.136	0.069	0.159

Thus, we obtain the values of the positive ideal solution and the negative ideal solution:

$$A^{+} = 0.179, 0.160, 0087, 0.228,$$

$$A^{-} = 0.131, 0.119, 0.069, 0.159.$$

Then, the distance of the alternative from the positive ideal solution and the negative ideal solution is calculated (see Table. 13, 14, 15, 16).

Table 13. The distance of the alternative from the positive ideal solution, stage 1- $(V_{ij} - v^{+}j)$.

Construction companies	Criteria			
	Avoiding (excluding) the occurrence of RF	Transfer of RF	Acceptance of the occurrence of RF	Reduction of the influence of RF
C1	-0.048	-0.041	0.000	0.000
C2	0.000	0.000	-0.005	-0.024
C3	-0.016	-0.024	-0.018	-0.069

Table 14. The distance of the alternative from the positive ideal solution, stage 2- $(V_{ij} - v^{+}j)^{2}$.

Construction companies	Criteria				Total	$O_i^{+} = \sqrt{\text{Total}}$
	Avoiding (excluding) the occurrence of RF	Transfer of RF	Acceptance of the occurrence of RF	Reduction of the influence of RF		
C1	0.0023	0.0017	0.0000	0.0000	0.004	0.063
C2	0.0000	0.0000	0.000025	0.00058	0.0006	0.024
C3	0.00026	0.00058	0.00032	0.0048	0.006	0.077

Table 15. Distancing the alternative from the positive ideal solution, stage 3- $(V_{ij} - v^{-}j)$.

Construction companies	Criteria			
	Avoiding (excluding) the occurrence of RF	Transfer of RF	Acceptance of the occurrence of RF	Reduction of the influence of RF
C1	0.0000	0.0000	0.018	0.069
C2	0.048	0.041	0.013	0.045
C3	0.032	0.017	0.000	0.000

Table 16. The distance of the alternative from the positive ideal solution, stage 4- $(V_{ij} - v^{-}j)^2$.

Construction companies	Criteria				Total	$O_i^- = \sqrt{\text{Total}}$
	Avoiding (excluding) the occurrence of RF	Transfer of RF	Acceptance of the occurrence of RF	Reduction of the influence of RF		
C1	0.0000	0.0000	0.00032	0.0048	0.0051	0.071
C2	0.0023	0.0017	0.00017	0.002	0.0062	0.079
C3	0.001	0.0003	0.0000	0.0000	0.0013	0.036

The coefficient of relative proximity to the optimal solution is calculated in accordance with Table 4 as follows:

Ci(company$_1$)= 0.071/ (0.071+0.063)= 0.53 (Satisfactorily);

Ci(company$_2$)= 0.079/ (0.079+0.024)= 0.77 (good);

Ci(company$_3$)= 0.036/ (0.036+0.077)= 0.32 (Bad).

4. Conclusions

Experts have assessed a large number of factors that can affect the sustainable functioning of a construction company. The results of the survey showed that financial, technical, legal, economic, managerial and natural factors have the greatest impact. When developing a risk management strategy, construction companies are recommended to take into account the significance of the identified factors.

The information obtained can be used by persons responsible for the sustainable functioning of the construction company in the development and planning of measures to counteract risk factors. This will ensure the timely adoption of balanced, well-thought-out decisions; identify specific responses aimed at resolving risky situations.

The sustainable functioning of a construction company is ensured by its ability to withstand risks and achieve the final goals of construction, in this regard, the heads of construction companies now often face the difficult task of choosing optimal solutions in the field of risk management. In such cases, it is necessary to resort to the use of special methods of multi-criteria analysis of decision-making, such as the TOPSIS method. With the help of this method, the stability of functioning was assessed depending on the application of different strategies for managing risk factors of three construction companies.

The study showed that the risk factor management programs developed in the analyzed construction companies do not take into account the influence of some significant factors and modern scientific data about them. Consequently, the measures provided for in such programs to minimize risks are not relevant and cannot lead to highly effective results in preserving such an important property of construction companies as sustainability.

It is recommended to include several important aspects in the plans for managing risk factors in a construction company:

1. Conducting advanced training courses that teach participants of an investment and construction project the skills of managing risk factors at all stages of the project.
2. Optimization of administrative and legal work related to obtaining licenses for construction activities (development of relevant instructions, regulations).
3. Checking the quality of building materials and their compliance with specifications at each stage of the project.
4. Study and application of ways to improve the effectiveness of the use of technical resources.

The development of an effective decision-making mechanism aimed at preventing or reducing the impact of risk factors significantly increases the stability of the functioning of construction companies, allowing them to respond in a timely manner to undesirable deviations from the normal course of implementation of investment and construction projects.

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