

## Expert assessment of socially responsible activities of enterprises using the goal tree method on the example of the printing industry

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**Abstract.** Socially responsible activities of enterprises are difficult to measure and, as a consequence, to diagnose. The most common method of evaluating socially responsible activities of an enterprise is expert evaluation. The disadvantage of this method is the high level of subjectivity and intuitiveness. The specified problem determined the purpose of the research – to develop an approach to evaluate the results of enterprises' activities in the aspect of social responsibility, which would allow to involve experts only at the stage of formalising social responsibility norms, and the actual level of fulfilment of these norms should be calculated not by expert means, but on the basis of objective data on the enterprise's activities. To fulfil the set aim, the work developed an approach to evaluate socially responsible activities of enterprises based on the application of the goal tree method. The paper proposes a procedure for building and quantitative analysis of a goal tree in the aspect of social responsibility, which involves taking into account: 1) expert assessments of social responsibility norms; 2) objective data on compliance with the norms of social responsibility at the analysed enterprise; 3) expert evaluations of the enterprise's capabilities to comply with these norms; 4) values of parameters of the external environment that affect these capabilities. The procedure for building and quantitative analysis of a goal tree in the aspect of social responsibility is demonstrated on the example of the printing industry. The proposed approach allows: to evaluate social results of the company's activity; to analyse problems and external limitations in the aspect of social responsibility; to formulate tasks of reducing external limitations on the enterprise's capability to fulfil the norms of social responsibility. This will contribute to increasing the efficiency of the decision-making process for managing results of the enterprise's socially responsible activities

**Keywords:** results; external limitations; tree method; analysis of capabilities

Article's History: Received: 01.09.2022; Revised: 16.11.2022; Accepted: 20.12.2022

### INTRODUCTION

One of the actual aspects of analysis of enterprise activities is the aspect of social responsibility. The complexity of this subject of the analysis lies in the fact that socially responsible activities of an enterprise (SRAE) are difficult to measure and, as a result, to diagnose. There are many reasons for this: duties of enterprises to the society are contradictory and change over time, and information about the performance of the duties is lacking. But it is difficult to improve what cannot be measured. Therefore, researchers have made efforts, which have resulted in an acceptable approach to the assessment of SRAE, which allows to take into account the systematisation of the phenomenon and the lack of objective information. According to this approach, the performance of enterprises in the aspect of social responsibility are described by a vector of characteristics that meet different objectives in this area; to obtain a generalised

estimate, the vector of characteristics is scalarised; to take into account the hierarchy of tasks in the field of social responsibility, the analytic hierarchy process is used [1; 2]. To reduce the number of characteristics describing SRAE factor analysis is used [3]. Assessments of characteristics of enterprises' performance in the aspect of social responsibility are mostly revealed through expert evaluation [4].

The most common methods of identifying the values of the performance of enterprises in the aspect of social responsibility are the follows:

- 1) questionnaires of external and internal stakeholders of the analysed enterprises ([5-7]);
- 2) content analysis of corporate reports, publications and interviews of managers (used, for example, in [5]).

The application of the method of content analysis for measuring SRAE is considered in detail in the study [8].

### Suggested Citation:

Potrashkova, L. (2022). Expert assessment of socially responsible activities of enterprises using the goal tree method on the example of the printing industry. *Development Management*, 20(4), 45-51. doi: 10.57111/devt.20(4).2022.45-51.

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The idea of the approach is to count the number of words, sentences or whole articles on the topic of social responsibility in the total volume of publications of the analysed organisation. The method is based on the hypothesis that the number of publications on the topic of social responsibility reflects the importance of this topic for the organisation [9]. The disadvantage of this approach is that the content analysis of corporate reports and publications allows us to draw conclusions only about the published information, and not about the actual activities of the enterprise.

Interviews and questionnaires of external and internal stakeholders of the analysed enterprises were used, for example, in [5-7]. In [5] analysis of determinants of social performance of banks was based on the results of questionnaires and semi-structured interviews with managers of banking institutions. In [6] measuring of effectiveness of corporate social responsibility initiatives in the mining industry was carried out on the basis of surveys of households in mining communities. In [7] for analysing the value of corporate social responsibility for various stakeholders a survey of purchasing / sales representatives and managers was used (because these employees are the most credible to assess relationships with suppliers and customers).

Stakeholder questionnaires are the basis of the reputation index method [4]. The essence of the method is that competent observers (experts) make a rating of firms according to several criteria. For example, a Fortune rating is based on the results of a survey of a company's employees and an expert assessment of corporate culture policy and personnel policy.

The issue of forming methodological support for the questionnaire of internal stakeholders is considered in work [4]. The paper forms a list of characteristics according to which it is recommended to evaluate corporate socially responsible activities (according to the employees of the organisations that were interviewed). But the disadvantage of the study is that the proposed characteristics involve evaluation only with the help of expert judgments, and they allow for different interpretations. For example, the list contains the following characteristics: "The management of our company is primarily concerned with employees' needs and wants"; "The managerial decisions related with the employees are usually fair".

In general, the shortcomings of existing approach to assessing the socially responsible activities of an enterprise through a survey of stakeholders are: high level of intuitiveness and subjectivity; high level of experts' errors due to the complexity of the tasks (questions); high level of generalisation; insufficient validity of criteria of evaluation.

Based on the above, the purpose of this study was to improve the approach to assessing socially responsible activities of enterprises in such a way that the assessment is carried out on the basis of expert assessments of social responsibility requirements and objective data on fulfilment of these requirements at the analysed enterprise.

The purpose involved the following tasks: 1) to develop a procedure for quantitative analysis of the improved version of a goal tree of socially responsible activities of an enterprise, based on the formalisation of the requirements of social responsibility; 2) to take into account the existence of external restrictions on the ability of an enterprise to meet the requirements of social responsibility in the

developed procedure; 3) to demonstrate the procedure of quantitative analysis of the improved goal tree of socially responsible activities of an enterprise on the example of the printing industry.

## ● MATERIALS AND METHODS

This paper was based on the definition of socially responsible activities of an enterprise, proposed in [10]. According to this definition, socially responsible activities meet not only the requirements of the law, but also the norms of socially responsible behaviour of enterprises. So it is possible to distinguish socially responsible activity from activity which is not such, using the analysis of observance of social responsibility norms. In fact, compliance with social responsibility norms characterises only the external manifestation of socially responsible activities without taking into account the criteria for decision-making at the enterprise [10]. But in this study, the differences between external and internal manifestations of socially responsible activity were not considered.

Social responsibility norms are formed in each specific period of time under the influence of existing social problems, recommendations of public and expert organisations on measures to support sustainable development, existing agreements within the social partnership and leading business practices. Analysis of information sources showed that descriptions of tasks and norms of social responsibility in various industries could be found in the Environmental, Health, and Safety Guidelines, developed by the International Finance Corporation (IFC). The Guidelines contains examples of good international practice in the industries. In particular, the IFC Environmental, Health, and Safety Guidelines for Printing can be sources for social responsibility norms for printing companies [11]. In addition, tasks and norms of social responsibility can be found in non-financial reporting standards, the current analysis of which is given in [12].

The proposed approach is based on the improved procedure of quantitative analysis of the tree of enterprise's goals, which is supplemented by stages aimed at formalising the norms of social responsibility. In addition, the improved procedure provides for the assessment of existing external restrictions on the ability of enterprises to comply with these norms. The proposed approach is intended for use at the diagnostic stage of the decision-making process for managing results of enterprises' socially responsible activities. The use of the modified goal tree allows: to obtain a general assessment of the level of compliance with social responsibility norms at the enterprise, taking into account specifics of industries and separate enterprises; identify problems in the hierarchy of tasks of the enterprise in the field of social responsibility; identify external limitations on the enterprise's ability to fulfil social responsibility norms; formulate a set of measures aimed at increasing the level of using the enterprise's available opportunities in the field of social responsibility; formulate a set of measures to influence the enterprise's stakeholders in order to weaken external restrictions on the enterprise's capabilities in the field of social responsibility. The procedure for building and quantitative analysis of the modified goal tree is demonstrated on the example of a printing enterprise.

## ● RESULTS AND DISCUSSION

As noted above, one of the shortcomings of existing approach to assessing corporate social responsibility through stakeholder surveys is the high level of expert error due to the complexity of the evaluation procedure. The procedure stipulates that experts must assess the level of compliance by the company with the requirements of social responsibility, although both the requirements and the results of their implementation at the company are poorly formalised. Moreover, experts may have significantly different ideas about the requirements themselves and their implementation at the enterprise.

In order to partially neutralise this problem, it is proposed to divide the process of evaluating the results of an enterprise to meet the requirements of social responsibility into two subprocesses:

- 1) assessment of the requirements of social responsibility (at the current stage of development of society, equipment and technology);
- 2) evaluation of the results of an enterprise to meet the identified requirements.

The first sub-process involves the use of expert evaluation.

The second subprocess involves the use of mostly objective data on the activities of the enterprise.

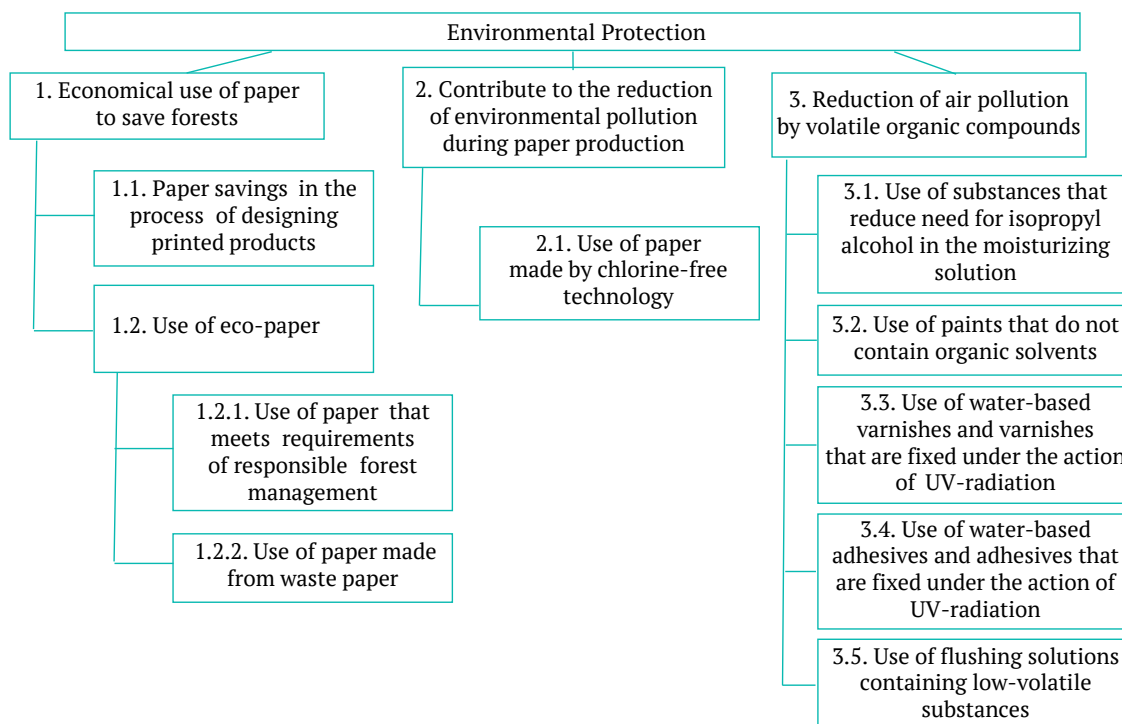
To calculate the generalised assessment of SRAE on the basis of expert assessments of social responsibility requirements and objective data on the results of the enterprise, it is proposed to use the method of a goal tree, which will take into account the hierarchy of SRAE tasks. The rules for building a tree of social responsibility goals are as follows:

1. The upper (first) level of the hierarchy corresponds to the general goal, which is to comply with the norms of socially responsible behaviour of an enterprise.

2. The second level of the hierarchy contains the objectives that correspond to the main aspects of social responsibility defined in ISO 26000 [13]: human rights; labour practices; environment; fair operating practices; consumer issues; community involvement and development.

3. The third and subsequent levels of the hierarchy contain the tasks that must be performed to achieve the goals of the second level.

4. For lower-level tasks, experts set social responsibility norms, formulated as descriptions of good practices that have become widespread in the country and in the world. An example of a fragment of a goal tree for compliance with social responsibility norms of the printing company is shown in Figure 1.



**Figure 1.** A fragment of a goal tree for compliance with social responsibility in the printing industry

**Source:** developed by the author based on [11]

The main component of the process of evaluating the socially responsible activities of an enterprise with the help of a goal tree is the procedure of quantitative analysis of the constructed tree. Based on the purpose of the study, it is proposed to supplement the existing procedure of quantitative analysis with steps aimed at formalising social responsibility norms. Then the proposed procedure for quantitative analysis of a goal tree for compliance with social responsibility norms will contain the following steps:

*1. Stage of formation of goals and tasks in the aspect of social responsibility.*

1.1. For all goals, tasks and norms located in the hierarchy of the goal tree, experts assign coefficients of relative weight  $V_i \in [0, 1]$ ,  $i \in I$ . The sum of weighting coefficients for all elements of the goal tree, which are subordinate to one element of a higher level, should be equal to one.

1.2. For each social responsibility norm on the goal tree, experts should formalise the rule of calculating the

level of implementation of this norm on the basis of indicators of the enterprise performance that can be measured.

A typical formula for calculating the level of fulfilment of the norm is the following (for stimulant indicators):

$$D_i = \frac{F_i}{N_i}, i \in I^N, \tag{1}$$

where  $D_i$  – the level of fulfilment of the social responsibility norm  $i$ ;  $N_i$  – normative value of the indicator, which, accord-

ing to experts, characterises the activities of the enterprise in the aspect of fulfilment of the social responsibility norm  $i$ ;  $F_i$  – the actual value of this indicator;  $I^N$  a subset of the goal tree elements, which describe social responsibility norms.

Examples of rules for calculating the level of fulfilment of social responsibility norms in the printing industry are given in Table. 1. Note that the rules for calculating the level of compliance can be built on the use of linguistic variables and fuzzy inference.

**Table 1.** Examples of the rules for calculating the implementation of social responsibility norms in the printing industry

Norms of socially responsible behaviour (from the goal tree shown in Figure 1)	Relevant indicators of the enterprise's performance	Rules for calculating the actual level of compliance with norms
1.1. Paper savings in the process of designing printed products	$F_{11}$ – percentage of printed products with economic design	$D_{11} = F_{11}/N_{11}$ , where $N_{11}$ – normative percentage of printed products with economic design
1.2.1. Use of paper that meets requirements of responsible forest management	$F_{121}$ – percentage of paper with the certificate of responsible forest management in the total amount of used paper from primary raw materials	$D_{121} = F_{121}/N_{121}$ , where $N_{121}$ – normative percentage of paper with the certificate of responsible forest management
1.2.2. Use of paper made from waste paper	$F_{122}$ – percentage of paper made from waste paper in the total amount of paper used	$D_{122} = F_{122}/N_{122}$ , where $N_{122}$ – normative percentage of paper made from waste paper

**Source:** developed by the author

1.3. Experts set normative values  $N_i, i \in I^N$  for all social responsibility norms contained in the goal tree. These values describe the requirements that society imposes on enterprises at the current stage of development of the industry.

2. The stage of determining the actual level of achievement of goals.

2.1. Accounting of objective data  $\{F_i | i \in I^N\}$  is carried out, and on this basis the level of performance of each norm of social responsibility is calculated according to the formula (1).

2.2. The degree of achievement of each element of the goal tree is calculated on the basis of the values of weighting coefficients  $\{V_i | i \in I\}$  and estimates of the level of compliance with social responsibility norms  $\{D_i | i \in I^N\}$ :

$$D_i = \sum_{j \in J^i} V_j \cdot D_j, i \in I^N, \tag{2}$$

where  $J^i$  – the set of numbers of the goal tree elements, which are subordinate to the element  $i$ .

3. Stage of analysis of external constraints.

An important task of the analysis of socially responsible activities of an enterprise is to assess the opportunities of the enterprise to comply with various norms of social responsibility. Such opportunities are partly determined by external conditions and are associated with certain decisions by different groups of external stakeholders. For example, a necessary condition for reducing the use of isopropyl alcohol in the printing process is the availability of substitutes for this substance in the market of printing expendable materials. And the amount of recycled paper used in the printing process depends on the corresponding demand from consumers. Therefore, for each norm of social responsibility, experts must assess the maximum possible level of implementation of this norm under existing external constraints.

Thus, for each social responsibility norm contained in the built goal tree experts need to do the following:

a) to identify a set of parameters of external environment that affect the ability of the enterprise to implement the analysed norm;

b) to build a function of the dependence of the level of the analysed norm implementation on the value of the identified parameters of external environment:

$$D_i^m = f(Z_i), i \in I^N, \tag{3}$$

where  $D_i^m$  – the maximum possible level of compliance by the enterprise with the norm  $i$ , subject to existing external constraints;  $Z_i$  – vector of parameters of external environment that affect the ability of the enterprise to comply with norm  $i$ ;

c) to assess the factual values of the identified parameters of external environment  $Z_i$ ;

d) calculate the maximum possible level of implementation of the analysed norm for the available values of parameters of external environment.

On the basis of the performed calculations the maximum possible level of achievement of the general goal of the enterprise in the aspect of social responsibility on condition of available values of parameters of external environment can be defined.

The analysis will allow to adjust the enterprise's goals in the aspect of social responsibility by coordinating them with the available opportunities. It will also allow to formulate tasks on the impact on the external environment of the enterprise in order to reduce its negative impact on the ability of the enterprise in the field of social responsibility.

Examples of functions of dependence of the level of compliance with social responsibility norms on the parameters of the external environment in the printing industry are given in Table 2.

**Table 2.** Examples of functions of dependence of the level of implementation of social responsibility norms on the parameters of the external environment in the printing industry

Norms of socially responsible behaviour (from the goal tree shown in Figure 1)	External condition	Rules for calculating the maximum possible level of compliance with the norm depending on parameters of the external environment
1.1. Paper savings in the process of designing printed products	Consent of customers of printed products for eco-design	$D_{11}^m = Z_{11} / N_{11}$ , where $D_{11}^m$ – the maximum possible level of compliance with the analysed norm on condition of existing attitude of printed products customers to eco-design; $Z_{11}$ – expert assessment of the percentage of printed products with eco-design, to which customers may agree
1.2.1. Use of paper that meets requirements of responsible forest management	Consent of printed products customers to the use of paper with a certificate of responsible forest management	$D_{121}^m = Z_{121} / N_{121}$ , where $D_{121}^m$ – the maximum possible level of compliance with the analysed norm on condition of existing attitude of printed products customers to the use of paper with a certificate of responsible forest management; where $Z_{121}$ – expert assessment of the percentage of paper with the certificate of responsible forest management in the total amount of used paper from primary raw materials, to which customers may agree
1.2.2. Use of paper made from waste paper	Consent of printed products customers to the use of paper made from waste paper	$D_{122}^m = Z_{122} / N_{122}$ , where $D_{122}^m$ – the maximum possible level of compliance with the analysed norm on condition of existing attitude of printed products customers to the use of paper made from waste paper; where $Z_{122}$ – expert assessment of the percentage of paper made from waste paper in the total amount of used paper, to which customers may agree

Source: developed by the author

Let's compare the approach proposed in this work with other approaches to the evaluation of SRAE. In approaches for SRAE evaluation the following features differ: a list of social responsibility tasks that are taken into account; a list of characteristics that describe the results of these tasks [14]; objectivity of the values of the characteristics (objective data or expert opinions); methods of converting a vector of results into a scalar complex indicator (according to [15], one of the main obstacles in constructing a generalised scalar indicator is the problem of weighing partial results).

Let's make a comparison according to the specified characteristics:

1. Comparison of social responsibility tasks that are taken into account.

Tasks of social responsibility, which are taken into account when evaluating SRAE, characterise the responsibility of business to different groups of stakeholders (to one group or several). The set of tasks is mostly formed by researchers themselves. Thus, in [16], the image of corporate social responsibility is measured from the point of view of customers, in [17] – from the point of view of employees. In [18] corporate social responsibility practices are evaluated in a large number of directions, namely: from the perspective of shareholders, customers, employees, suppliers, other stakeholders, as well as from the perspective of ethics, environment, jurisprudence, human rights and society. In the developed approach, it is proposed to use tasks that correspond to the main topics and problems of social responsibility, which are given in the ISO 26000 Standard [13] and determined as a result of the work of experts from more than 90 countries and 40 international and regional organisations.

2. Comparison of methods of calculating the integral assessment of the SRAE.

In the proposed approach, the integrated assessment of SRAE is calculated on the bases of hierarchy of tasks, taking into account the assessment of the importance of each task. Coefficients of importance of the tasks located on the goal tree can be calculated using the Analytic Hierarchy Process, which involves a pairwise comparison of the hierarchy elements. The Analytic Hierarchy Process is a common method of determining importance coefficients for criteria for evaluating alternatives. This method is used to calculate the integrated assessment of SRAE, for example, in [19; 20]. The difference between the calculation of the integrated assessment of the SRAE using the modified goal tree is that the calculation is based on a comparison of the actual state of affairs at the enterprise with the norms of social responsibility.

3. Comparison by objectivity of the values of the used characteristics.

In many works the evaluation of SRAE is carried out on the basis of a questionnaire method, which is used to identify the judgments of external and internal stakeholders. So, for example, in studies [4; 17], the assessment of socially responsible activities of enterprises and organisations reflects the perception of SRAE by employees of the analysed enterprises and organisations. The approach proposed in this article involves assessing the level of compliance with social responsibility norms based on objective data on the results of enterprise activity. Expert judgments are used at the stage of formalisation of social responsibility norms, as well as at the stage of formalisation of the dependence of the enterprise's capability to fulfil these norms on the parameters of the external and internal environment.

The advantage of the proposed approach is that it allows to take into account:

1. The hierarchy of tasks of the enterprise in the field of social responsibility and the relative importance of each task. This allows not only to obtain a general assessment of SRAE, but also to evaluate the results of separate areas of social responsibility implementation at the enterprise. The detailing of tasks allows to take into account specifics of industries and separate enterprises.

2. Expert assessments of norms of social responsibility. Taking into account the norms of social responsibility allows to compare social results of the enterprise's activity with the actual requirements that society places on business.

3. Expert assessments of the enterprise's capabilities to fulfil the norms of social responsibility under existing restrictions imposed by the external environment. Taking into account the enterprise's capabilities to fulfil the norms of social responsibility is important for correct setting the social goals of the enterprise's activities. Identifying constraints imposed by the external environment allows to set tasks for eliminating these constraints (in particular, to plan the impact on stakeholders whose decisions limit the enterprise's ability to fulfil the norms of social responsibility).

4. Objective data on the results of the enterprise's activities. The use of objective data makes it possible to reduce the level of subjectivity of the obtained evaluation of the SRAE.

The disadvantage of the proposed approach is that the tasks set before experts remain complex and require experts to have in-depth knowledge in the field of production technologies and modern social responsibility practices in the analysed sectors of material and non-material production.

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## ● CONCLUSION

The paper proposes an approach to expert evaluation of socially responsible activities of enterprises by applying a modified goal tree, which contains expert evaluations of norms of social responsibility and objective data on compliance with these norms at the analysed enterprise. Compared to traditional approaches the proposed approach simplifies the task offered to experts. Experts do not estimate the level of socially responsible activities of the enterprise, but formalise the existing norms of socially responsible behaviour. Such a simplification will help increase the accuracy of assessing the level of implementation of social responsibility at enterprises.

Assessment of the level of fulfilment of social responsibility norms in the study was carried out using the goal tree method, which is the basis of the analytic hierarchy process. A goal tree is a structured set of goals of the organisation, built on a hierarchical principle. Quantitative analysis of a goal tree is aimed at assessing the level of achievement of the overall goal and the goals of each level. In order to make the goal tree method suitable for assessing socially responsible activities of an enterprise, its modification was carried out. The modified goal tree allows to take into account: norms of social responsibility; the level of implementation of these norms at the enterprise; external restrictions on the enterprise's capability to comply with these norms. Thus, with the help of the proposed approach, it is possible not only to assess the level of implementation of social responsibility at the enterprise, but also to carry out an analysis of internal problems and external restrictions in the sphere of socially responsible activities.

The developed approach is demonstrated on the example of the printing industry. But the considered example is fragmentary. The construction and quantitative analysis of a complete goal tree of socially responsible activities of an enterprise needs to be considered in further research.

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## Експертне оцінювання соціально відповідальної діяльності підприємств за допомогою метода дерева цілей на прикладі поліграфічної галузі

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**Анотація.** Соціально відповідальна діяльність підприємства погано піддається вимірюванню і, як наслідок, діагностиці. Основним методом оцінювання результатів діяльності підприємств в аспекті соціальної відповідальності є експертне оцінювання. Недоліком цього методу є високий рівень суб'єктивності та інтуїтивності. Зазначена актуальна проблема визначила мету дослідження – розробити такий підхід до оцінювання результатів діяльності підприємств в аспекті соціальної відповідальності, який би дозволив залучати експертів тільки на стадії формалізації норм соціальної відповідальності, а фактичний рівень виконання цих норм розраховувати не експертним шляхом, а на основі об'єктивних даних про діяльність підприємства. Для виконання поставленої мети у роботі розроблено підхід до оцінювання соціально відповідальної діяльності підприємства на основі застосування метода дерева цілей. Запропоновано процедуру побудови та кількісного аналізу дерева цілей соціальної відповідальності, яка передбачає врахування: 1) експертних оцінок норм соціальної відповідальності; 2) об'єктивних даних щодо дотримання норм соціальної відповідальності на аналізованому підприємстві; 3) експертних оцінок спроможностей підприємства щодо виконання цих норм; 4) значень параметрів зовнішнього середовища, які впливають на ці спроможності. Процедuru побудови та кількісного аналізу дерева цілей соціальної відповідальності продемонстровано на прикладі поліграфічної галузі. Запропонований підхід дозволяє оцінити соціальні результати діяльності підприємства, здійснити аналіз «вузьких місць» і зовнішніх обмежень в аспекті соціальної відповідальності, а також сформулювати завдання щодо послаблення зовнішніх обмежень на спроможності підприємства щодо виконання норм соціальної відповідальності. Це сприятиме підвищенню ефективності процесу прийняття рішень з управління результатами соціально відповідальної діяльності підприємства

**Ключові слова:** результати; зовнішні обмеження; дерево цілей; аналіз спроможностей