

CASE STUDIES OF USING THE ANALYTIC HIERARCHY PROCESS METHOD IN CORPORATE SOCIAL RESPONSIBILITY AND ENVIRONMENTAL RISK MANAGEMENT

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Abstract

The paper deals with case studies of using the analytic hierarchy process method in the formulating the stakeholders' strategic goals within the CSR and simultaneously its utilization in minimization environmental risks.

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Key words

corporate social responsibility, environment risk management, method of analytic hierarchy process

Introduction

These days the need of making the right decision is indispensable in every field and every time. When we are talking about CSR company has to decide not only to make profit from their operations but also to take care about society and environment. The part of such system should be also managing the risks. In integration with the CSR we can use it in the field of environment risk management. In both mentioned fields we have to decide in some problems or questions. For simplification or objectification of the decision-making process we can use the Analytic Hierarchy Process. This method is a good tool for choosing the best choice or optimal alternative of defined goal/problem.

Corporate Social Responsibility

CSR is an abbreviation that stand for Corporate Social Responsibility that's a concept whereby companies decide voluntarily to contribute to a better society and a cleaner environment. A concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis [1].

These days more European and Slovak companies start to recognize the need of being socially responsible and they start to consider the responsibility as a part of company identity. It's recommended to involve the features of the social responsibility to the company goals and strategy.

Responsible business has following common features for each type of businesses [2]:

- *based on active cooperation with its stakeholders,*
- *universal for each type of business,*
- *emphasize the development not only the growth,*
- *is based on voluntarily basis,*
- *contributes to the development of the quality of life,*
- *mentions three key fields where the responsible business is wearing (triple-bottom-line).*

Over mention triple-bottom-line means the company is interested not only in economic growth but also concerns about the social and environmental impacts of its business.

The economic feature of CSR mostly deals with the business transparency, making good relations with its stakeholders who have an effect of business economic activity (mainly investors, shareholders, customers, suppliers, business partners, etc.).

The social feature can be divided into two parts, the internal and external one. Internal parts deals with the social policy of business and external one is interested in philanthropy, altruism and cooperation with the local community.

The environmental feature is a business approach where the business concentrates on minimizing the negative impact of its operating.

Business responsibility takes many advantages to business like [3]:

- *increased profit,*
- *reduced operating costs/increased operational efficiency,*
- *enhanced brand image and reputation,*
- *increased sales and customer loyalty,*
- *increased productivity and quality,*
- *increased ability to attract and retain employees,*
- *potentially, reduced regulatory oversight,*
- *"keeping up" with competitors and where the market is.*

Corporate Social Responsibility and Slovak republic

The ideas of CSR first appeared in Slovakia in the second half of the 1990 when the foreign investors and their business policy came to Slovakia and brought the principles of CSR with them. Since then the principles have been applied in Slovak businesses although their declaration is mostly the domain of large businesses. Mostly the businesses with foreign

share are identified with the CSR concept. However the truth is that the origin Slovak companies act responsibly because there is tradition of corporate social stewardship (principles of social involvement – charity and support of community projects). These principles are deeply rooted in Slovak businesses but are not acted under the title of CSR.

A lot of foundations, non-governmental organizations and civil associations are a proof that Slovak activity of civil society of one of the highest in Europe [4].

Between the key administrators supporting the CSR in Slovakia may include [4]:

- *business sector,*
- *non-governmental organizations (Pontis Foundation, INTEGRA Foundation, PANET, Donors Forum),*
- *group of firms (Business Leaders Forum –BLF, Club of Corporate Donors),*
- *media,*
- *governmental institutions,*
- *academic institutions.*

Stakeholders

Stakeholders represent a person, a group of people or organization that have a stake in a company and have an direct or indirect effect on the company, or its effected by its operations, policies or objectives.

In general stakeholders are divided into two groups: the internal and external ones. The internal stakeholders are represented by shareholders, managers, staff, etc. On the other way the subjects who impact on the company from the external surrounding are for example: suppliers, customers, creditors, community, government, environment, etc.

Business goals are created as a compromise between individual stakeholders. Every one of stakeholders has a special relation to a business and follows its own targets.

Stakeholders expect from business mainly [5]:

- *transparency,*
- *ethic behaviour,*
- *good governance with strong processes of government and control,*
- *reactions on requirements and opinions of its stakeholders,*
- *responsibility in its actions, attitudes and values,*
- *credibility.*

A business ought to [5]:

- *appreciate a value of stakeholders involvement to doing activities within the corporate social responsibility,*
- *utilize the stakeholders involvement to solve conflicts about its interests, stakeholders' and community interests,*
- *be responsive to its stakeholders,*
- *be conscious and ought to respect interests and requirements of its stakeholders.*

Stakeholders' involvement to CSR brings following benefits [6]:

- *setting up the goals and monitoring the achievements (setting the meaningful goals and assessment of real achievements),*
- *environment innovation (predicting new trends helps to understand the complicated business environment),*

- *risk management (communication with external members may indicate possible risks in time),*
- *information value (good and strong relations with stakeholders represent the source of valuable information for business).*

Risk

According to the ISO/IEC (2002) Guide 73, risk is defined as a “combination of the probability of an event and its consequences” and a “combination of the extent to which an occurrence of a particular set of circumstances is likely to occur and its outcome.” Risk is the potential that a given threat will exploit vulnerabilities to cause loss or damage to an asset or group of assets, and directly or indirectly affect the organization. The security risk level is determined from the combination of the asset values and assessed levels of related threats and associated vulnerabilities [7].

Risk management

To be most effective, an organization’s risk management should adhere to the following principles [8]:

- a) *Risk management creates value.*
- b) *Risk management is an integral part of organizational processes.*
- c) *Risk management is part of decision making. Risk management helps decision makers make informed choices. Risk management can help prioritize actions and distinguish among alternative courses of action. Ultimately, risk management can help with decisions on whether a risk is unacceptable and whether risk treatment will be adequate and effective.*
- d) *Risk management explicitly addresses uncertainty.*
- e) *Risk management is systematic, structured and timely.*
- f) *Risk management is based on the best available information.*
- g) *Risk management is tailored.*
- h) *Risk management takes human and cultural factors into account.*
- i) *Risk management is transparent and inclusive.*
- j) *Risk management is dynamic, iterative and responsive to change.*
- k) *Risk management facilitates continual improvement and enhancement of the organization.*

Environmental Risk Management

Environmental risk management seeks to minimize the impact of natural catastrophes, based on a detailed analysis of the risk assessment results. This helps in effective planning of the remedial steps, prioritizing of the action items, and early decision-making. This also helps in the quick enforcement of suitable policy or regulatory mechanisms. Today, environmental risk management is practiced by a wide range of industry segments, such as general and life insurance, real estate and construction, government and development funding organizations, agriculture, and utilities sectors [9].

Analytic Hierarchy Process method

The AHP is based on the experience gained by its developer, T.L. Saaty, while directing research projects in the US Arms Control and Disarmament Agency. It was developed as a reaction to the finding that there is a miserable lack of common, easily understood and easy-to-implement methodology to enable the taking of complex decisions [10].

The AHP provides a means of decomposing the problem into a hierarchy of subproblems which can more easily be comprehended and subjectively evaluated. The subjective evaluations are converted into numerical values and processed to rank each alternative on a numerical scale. **The methodology of the AHP can be explained in following steps [10]:**

Step 1: The problem is decomposed into a hierarchy of goal, criteria, sub-criteria and alternatives.

Step 2: Data are collected from experts or decision-makers corresponding to the hierarchic structure, in the pairwise comparison of alternatives on a qualitative scale as described below. Experts can rate the comparison as equal, marginally strong, strong, very strong, and extremely strong.

Step 3: The pairwise comparisons of various criteria generated at step 2 are organised into a square matrix.

Step 4: The principal eigenvalue and the corresponding normalised right eigenvector of the comparison matrix give the relative importance of the various criteria being compared.

Step 5: The consistency of the matrix of order n is evaluated.

Step 6: The rating of each alternative is multiplied by the weights of the sub-criteria and aggregated to get local ratings with respect to each criterion.

Case Study of Using the AHP Method in Stakeholders' Strategic Goal Formulation

The AHP method aforementioned is designed to deal with such decision-making situations where the relationships between elements are expressed quantitatively. This method, inter alia, can be used in formulating of the stakeholders' strategic goals in CSR too.

In dealing with this method, we used the software program Expert Choice, whose output is a wide range of materials for an explicit reasoning of the best alternatives choice. Expert Choice is a software tool that supports decision making in the selection of alternatives that are characterized by hierarchical layout of criterions and priorities for selection

Decision making process relating to formulation of stakeholders' strategic goals is one of the most serious topics that company solves within the strategic planning.

In the decision making process were selected the following goals from the other alternative goals:

- *realization of ergonomic audit in the manufacturing process,*
- *eco-effective project implementation,*
- *do nothing.*

We carried out the decision making process in a company where it was necessary to determine which of the proposed alternatives - the CSR goals, would be the most useful for the stakeholders. A group of experts were considered to be shareholders, managers and employees (internal stakeholders). There were assigned three criterions to each expert, which have an impact on decision making in selecting the best alternatives.

The goal was to find a through strategic stakeholders' goal within the CSR. We proceed as follows, at first we set the main objective solution (to find a trough strategic goal), then we set various alternatives (strategic goals) and created the hierarchic structure see Fig. 2 (4 levels – the goal, the experts, criterions and alternatives). We identified the importance of experts and their criterions by the pair comparison, after that we decided about the alternative importance according to rated criterions by the pair comparison too.

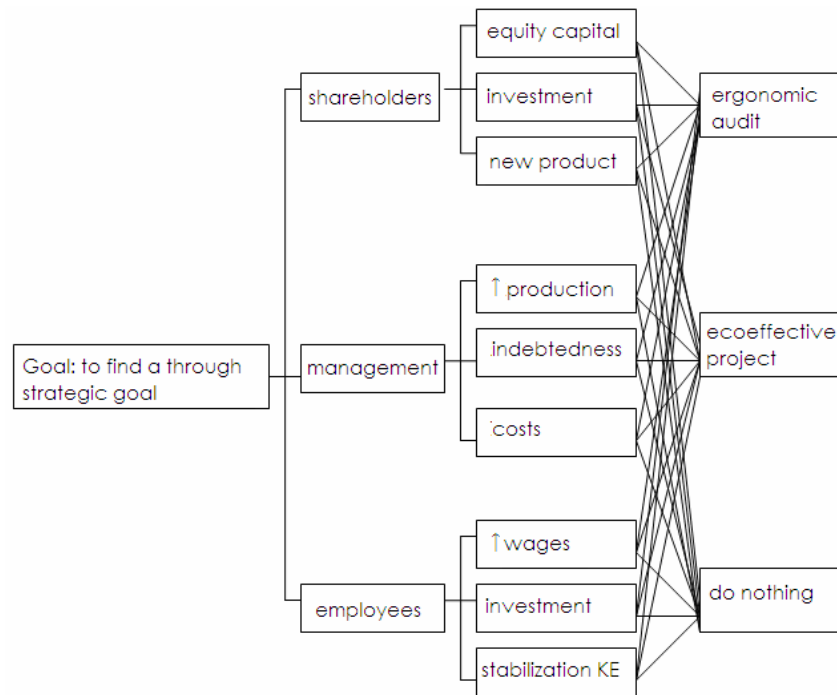


Fig. 1 Hierarchical structure of decision-making process

After the creating a hierarchical structure, we continued in the decision making process and its most important part of the paired comparisons. First, using an analytical form, we found out the experts importance in finding a strategic goal. According to the matrix that was compiled (Table 1) on base of the form it can determined that shareholders are 4 times more important than the managers and employees and managers that are 2 times more important than employees. Based on the matrix software Expert Choice assessed that the most important word in deciding takes the shareholders with more than 66%, followed by management with nearly 21% and the smallest word have employees with 13%.

MATRIX OF PAIRWISE EXPERT COMPARISON

Table 1

	shareholders	management	employees
shareholders	1	4	4
management	1/4	1	2
employees	1/4	1/2	1

We continued in the criterion evaluation (by alternatives) by the same way as the previous, it was necessary to draw 3 matrixes, the result was following:

- **Shareholders** - the most important criterion for them seems to be the equity capital with 66 %, followed by investments with more than 18% and finally the implementation of a new product with almost 16% importance.
- **Management** - for them is essential to ensure the growth of labor productivity with 55 %, followed by the cost of claims with 24 % and the remaining 21 % is company's indebtedness.
- **Employees** – they prefer the wage increase with 61 %, then require investment to the working environment with nearly 27% and only 12 % is to the key personnel stabilization.

Finally, it was necessary to evaluate the alternatives according to individual criterions and the 9 matrixes were created (because there are 9 criterions) of the size 3x3 (alternatives were compared between), that were compiled on a base of the evaluated analytical forms. Because of too many matrixes, we decided to show at least 1, that shows a comparison of alternatives according to criteria of equity capital (Tab. 2). When evaluating alternatives, we counted with local and global weight of individual criterions too.

COMPARISON OF ALTERNATIVES ACCORDING TO THE CRITERION –
– EQUITY CAPITAL

Table 2

Criterion equity capital	Ergon. audit	Ecoeffective project	Do nothing
Ergonomic audit	1	4	2
Eco effective project	1/4	1	1/5
Do nothing	1/2	5	1

The result of the decision making process was to determine the alternative with the highest priority. **Software Expert Choice determined the order according to the calculations follows:**

1. *realization of ergonomic audit in manufacturing process,*
2. *nothing to do – do not realize any project with priority 29,4 %,*
3. *implementation of eco- effective project with 25,5 % priority.*

The output of decision making process is that was found a through stakeholders' strategic goal within the CSR strategy – the realization of ergonomic audit in manufacturing process. The whole process of deciding was verified by mathematical calculation.

Case Study of Using the AHP Method in Environmental Risks Minimization

We tried to build the application of AHP method for environment risk management on the company orientated in the environmental protection and safety and occupational health. The reason of this orientation is that this company where we did the verification produces electric energy. Next, we describe the procedure for resolving this method step by step as it was implemented.

In the first step we had to define the goal or problem solution. This was in connection with the examination of environment risk management defined as follows: "Minimization of environmental risks". The goal is specifically bound to the problem, we have identified in the company and to the need or intend to minimize or eliminate the use of hydrazine substances. The substance is highly toxic, carcinogenic and also has a toxic effect to aquatic organisms. Effective solution of the problem should therefore results in effective elimination of environmental risks and risks associated with protection and safety and occupational health of employees who are exposed to effect of the substance.

The second step was to design alternatives. Although the suggestion of alternatives was on the last level of the hierarchical structure of AHP we made it in the second step. It is an important part of the result by the reason that alternatives must be realistic and feasible to use them. They also must be designed by experts because of efficiency of the resulting alternatives in terms of goal applications.

In this case we used following alternatives:

- *A1- volume changes in purchasing and handling of hydrazine,*
- *A2- hydrazine replacement or technology change,*
- *A3- to do nothing.*

The role of the suggested alternatives was to cover the full range of options to solve this problem. We considered the keeping the substance in the company in the first alternative, but with some changes we tried to minimize or eliminate its potential risks. The second one is when we wanted to completely remove the substance from company and the last option was designed to examine what would happen if we did nothing.

In the third step we suggested the criteria that are restrictions for the alternatives. So they limited the outputs of problem solving or goal. There are criteria that were designed for our application in the last table Tab.4.

The calculations of standardized scale and tests of consistency and following finding the optimal alternative or the most important criterion are in the next steps. This can be done both manually and with the use of the software tool for AHP method solving – Expert Choice 11.5.

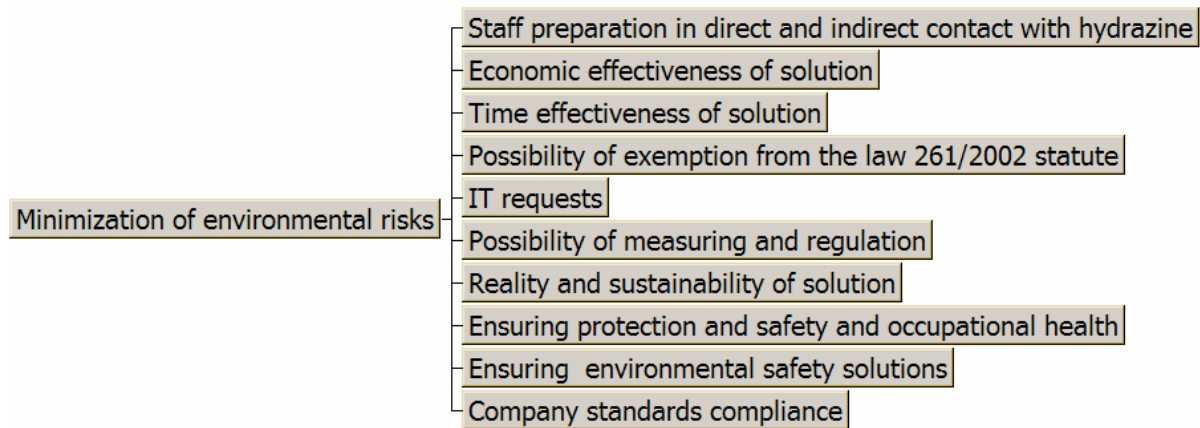


Fig. 2 Hierarchical structure of the solution (Goal and Criteria) – Expert Choice 11.5

In the fourth step we compared criteria by pairwise comparison (Tab. 3) of criteria using Saaty assessment matrix which compared all the criteria among themselves.

CRITERIONS PAIRWISE COMPARISON MATRIX

Table 3

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1	1	1/3	3	1/7	3	1/4	1/7	1/9	1/8	1/2
C2	3	1	3	1/4	3	1/3	1/5	1/8	1/8	1/2
C3	1/3	1/3	1	1/3	2	1/3	1/5	1/9	1/8	1/4
C4	7	4	3	1	7	4	1/3	1/9	1/8	1/2
C5	1/3	1/3	1/2	1/7	1	1	1/7	1/9	1/8	1/6
C6	4	3	3	1/4	1	1	1/5	1/5	1/4	1/4
C7	7	5	5	3	7	5	1	1/2	1	2
C8	9	8	9	9	9	5	2	1	2	2
C9	8	8	8	8	8	4	1	1/2	1	2
C10	2	2	4	2	6	4	1/2	1/2	1/2	1

The result of the comparison was finding the order of the criterions importance. **The three most important criterions were the following:**

1. *ensuring protection and safety and occupational health,*
2. *ensuring environmental safety solutions,*
3. *reality and sustainability of solution.*

We equivalently compared the alternatives each based on any other criterion in the final fifth step. The result of the comparison was to find optimal solution to the defined goal. There's a final assessment and finding optimal solution in the Tab. 4.

ALTERNATIVE FINAL ASSESSMENT

Table 4

Criterion	Weight	Weight in %	A1	A2	A3
Ensuring protection and safety and occupational health	0,270	27,05	0,03	0,21	0,03
Ensuring environmental safety solutions	0,204	20,39	0,051	0,102	0,051
Reality and sustainability of solution	0,166	16,57	0,1123	0,032	0,0217
Company standards compliance	0,103	10,25	0,054	0,0146	0,0344
Possibility of exemption from the law 261/2002 statute	0,089	8,9	0,0209	0,0612	0,0069
Possibility of measuring and regulation	0,051	5,07	0,0053	0,0325	0,0132
Economic effectiveness of solution	0,042	4,18	0,0089	0,0056	0,0275
Staff preparation in direct and indirect contact with hydrazine	0,033	3,27	0,0024	0,0053	0,0252
Time effectiveness of solution	0,023	2,33	0,0034	0,0016	0,0181
IT requests	0,020	1,99	0,0040	0,0013	0,0147
Total:	1	100%	0,292	0,466	0,243

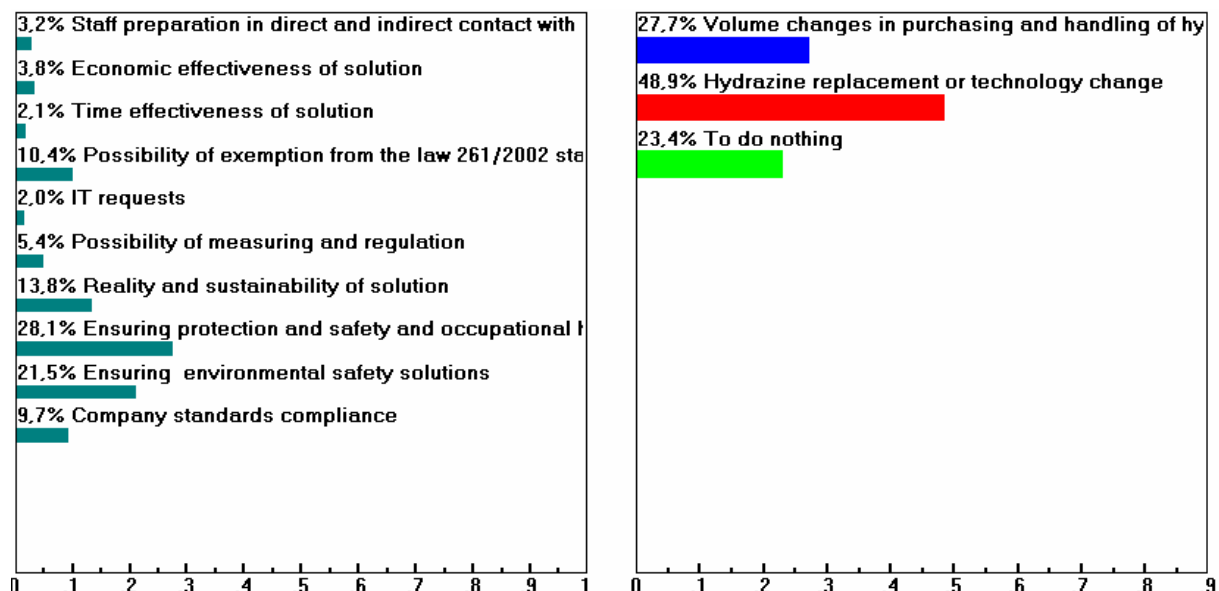


Fig. 3 Dynamic sensitivity graph – Expert Choice 11.5

There is an optimal alternative for the defined goal – to minimize environment risks – optimal is the alternative A2 - **hydrazine replacement or technology change** in the Tab. 4 and Fig. 3.

Conclusion

In this article we tried to refer for the topic of making the right decisions in the area of corporate social business and the subsystem environment risk management. This is necessary because of sustainable development not only in Slovak companies.

The analytic hierarchy process can be used in each business area where decisions are required.

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