

# A STUDY ON THE APPLICABILITY OF THE AHP METHOD FOR THE CHOICE OF THE KEY FACTORS OF REACHING SUCCESS IN CERTAIN SECTORS OF INDUSTRY

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## **Abstract**

*The present paper is designed to analyze the applicability of the AHP method in the process of identifying the key factors of success which are determinative of directing the choice and implementation of new technological solutions. The introductory thesis maintains that the AHP method allows achieving a higher accuracy of indicating the key factors of success than it might be possible by direct reliance on the opinion of experts. The enterprises of traditional branches were the mayor niveaus of the study made in the paper.*

## **1. INTRODUCTION**

The AHP method is one of the recent proposals made in the niveau of research that deals with the organization and management. The method has attracted the interest of Polish specialists in the recent years (Ormanty, 2002). Despite the fact that the method is still relatively little known in our country it, on the other hand, to be particularly interesting due to the dimension of its practical implementation. In view of this fact the present paper is designed to analyses the applicability of the AHP method in the process of identifying the key factors of success which are determinative of directing the choice and implementation of the new technological solutions. It is at this point that we may assume an introductory thesis of our discussion. This thesis maintains that the AHP method allows achieving a higher accuracy of indicating the key factors of success than it might be possible by direct reliance on the opinion of experts.

## **2. THE KEY FACTORS OF SUCCESS AND THEIR SIGNIFICANCE FOR THE CHOICE OF NEW TECHNOLOGICAL SOLUTIONS**

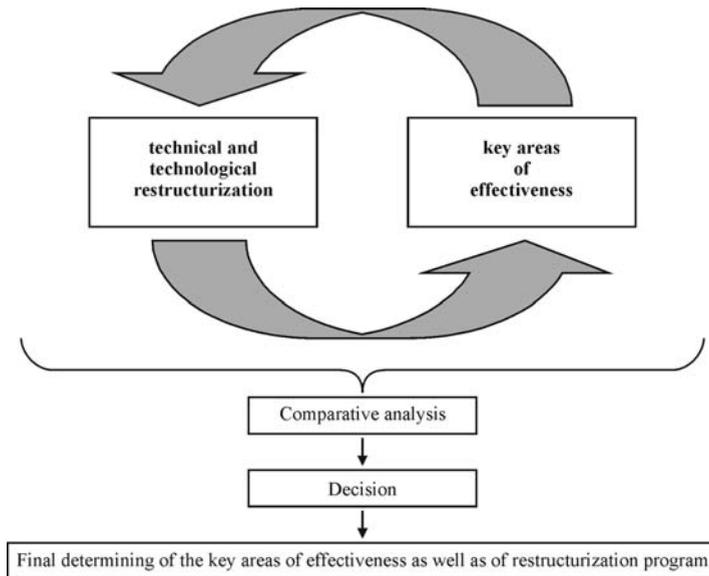
### **2.1. KEY FACTORS OF SUCCESS**

“The key areas of the enterprise effectiveness” is the notion that constitutes the starting point to the process of giving terminological explanations in this part of the paper (Baran, 2003). The “key areas” involve all these elements, as well as the processes linked therewith inside the system, which (in case of innovative solutions are likely to be introduced) have the potentially largest impact on the growth of the effectiveness of the whole (Porter, 1994). The tools that are designed to measure them are the aforementioned key factors of success. These are parameters as well as characteristics that describe the organization the attaining of which (on condition that the management mechanism functions effectively) guarantees the success. The effectiveness, in its turn, is: the advantage of maximalization of production and sale derived from the appropriate allocation of labour resources, means of production, the capital and the market goods as operating in the existing limitations of supply caused by the costs of production and sale as well as by the limitation of supply due to the proportion of buyer’s preferences (Sztucki, 1998). The impact of technical and technological restructurization on the key areas of effectiveness (which in fact determine the final direction of this restructurization) is made particularly visible at the initial phase of the process of “sanifying” the enterprise. In the other words, the impact is visible at the phrase at which the selection of one from among several possible alternative developmental paths (particularly if the latter are characterized by similar level of attractiveness) is made, the reciprocal influence, feedback of the two aforementioned factor, (which, in the decision-making process must be subject to joint analysis through juxtaposing the potential advantages and the possibility of their attainment) may be depicted in the way that is presented in **Figure 9.1**.

### **2.2. THE ENTERPRISES OF TRADITIONAL BRANCHES AND THEIR PROBLEMS IN THE 1990’S**

Enterprises of traditional branches should be understood the collectivity of the units of the following lines of industry: mining, metallurgic, mechanical, food-producing, electricity-and-heat producing as well as other lines having a long-time market tradition. The units under discussion are those that generally operate in the phase of marketing maturity and usually face considerable problems that are due to the necessity of reducing their costs (the units have to cope with the hyperemployment, bad structure of property and scale of potential investments).

In Polish conditions, the metallurgic and mining branches are illustrative of the nature and the proportion of difficulties that are run into by the units that belong to the aforementioned collectivity. It is for these two sectors that the central administration has, for many years, been trying to create sanifying programs a yet up to the present time these efforts, made by the central administration, have not been successful.



**Figure 9.1:** The Feedback Between the Key Areas of Effectiveness and the Activities Undertaken within the Framework of Technical and Technological Restructurization

### 2.2.1 THE RESTRUCTURIZATION OF POLISH METALLURGY

The causes of creating the Polish metallurgy restructurization programs may be divided into those which are due to the influence of internal factors and those which are the result of various external pressures (Knop, 1999). The first group of causes may be defined on the basis of weaker and stronger aspects of the discussed sector. The second group of causes includes in particular those that are economy-, law-, as well as policy-conditioned. Such variety of causes is, in its turn, a requisite of the necessity to resort (on occasion of choosing the direction of sanifying activities in investments of technological sphere) to the method that objectivizes the process of analysis of alternatives and of ultimate choice.

In the Canadian study there were described the deficiencies observed with regard to the entire branch. Likewise, there were presented the prognosis of market development and, last but not least, there were defined the activities indispensable to sanify the situation. The study gave attention to the bad structure of production, technological underdevelopment, excessive employment and other defects responsible for the weakening of competitiveness of the metallurgic sector. Eventually, as a result of markets in the countries of the sudden loss of the markets in the countries of the former Council for Mutual Economic Aid and other factors such as more demanding receives or the acceptance of certain norms specified in international contracts, there have been accepted a sanification program. The program was viewed as a direction-forming strategy with respect to Polish metallurgy. At this point, it is advisable to emphasise again that

the dominant factor conducive of the drawing up of the aforementioned document was the weakening competitiveness of the sector in both the internal as well as the global markets. In addition, some grass-roots pressure exerted by the enterprises themselves, as the entities that were subject to the process of changes, could be observed.

The emergence of the Verified Program which was the continuation of the Canadian study was due to the improvement of effects in the discussed branch. The lack of satisfying progress in the implementation of the central plan of improvement was another cause. What was particularly recommended was the reliance on smaller programs which, while constituting a coherent whole, might successfully correspond to the realia that were specific for the respective groups of enterprises. What was important was also the fact that the work over the document was, to a large extent, commenced due to the “centrifugal” pressures coming from the inside of sector (significance of the influence exerted by the external factors being still essential).

The awareness that there was no chance to complete the restructurization of the sector in 2002 laid the functions for the elaborating of a New Program. What contributed to the latter was also the dynamics of changes in international situation: globalization and negotiations referring to the accession Poland to the European Union. Thus, like in the case of Canadian Study, also this time the external circumstances were essentially stimulative of drafting the elaboration that would meet the needs of the branch.

### **2.2.2. RESTRUCTURIZATION OF THE POLISH MINERY (SKOWRON, 2000)**

In case of minery, the complexity of decision making process is similar to that found in case of metallurgy. Hence, also in the branch of minery, we can find the tendency to seek effective methods that might be helpful in identifying the factors responsible for success. The AHP method tries to come up to these expectations at the moment when, for many years, there have been made ineffective attempts to sanify the activities of the enterprises of this sector. In 1993 which was “the first stage of the restructurization program” it was found impossible to achieve the goal that was planned and that was tantamount to the prevention of the growth of indebtedness of the branch and securing the circumstances that might guarantee the financial success of the mines.

The growing need to work out the rescue program led to the acceptance, in spring 1994, of the next document: “The restructurization of minery program for the second stage: 1994–1995”. The program could be boiled down to the following postulates: financial liability of the state for the liquidation of non-profitable mines and liquidation of the subject allocations. What was additionally planned were: the obligatory conclusion of the long-term contracts between the mining companies and the coal exporters, introduction of free prices below the import parity within internal market and, continuing export in the economically justified proportion. In addition, there was planned the privatization of the soil surface objects of the mines and the improvement of the social shield system. The program was the first to represent the logic of the systemic activities. Unfortunately, the branch in question recorded the growing loss and indebtedness which were, to a large extent, due to too weak discipline of undertaken activities, inconsistency and the lack of factual engagement.

The third stage of the restructurization of minery that was designed to take place in the years 1996–1997 was based on the governmental program labeled: The adjustment of Polish minery to the circumstances of market economy and international competition. and on the program: The hard coal minery: policy of the State and that of the sectors over the years 1996–2000 (this program was approved of by the council of Ministry on the 30<sup>th</sup> of April 1996). Likewise, it was based on the statute of 27 August 1997 on the financial restructurization of minery. At this stage the reduction of the coal outpout and the limitations of employment as well as the increase in efficiency were the major objectives designed to be reached by the restructurization. Additionally, there were planned: the decrease in pollution emission, the introducing of order and improving the spatial and property management as well as clearing the mines of their debts. The positive evaluation of the implementation of this program is not possible since, contrary to what was planned, the production potential of the mines was gradually increased in the course of time.

The endeavours to cope with the problems of this branch of industry led to the creation of the Fourth stage of the restructurization of mines. This stage tried to arrive at two kinds of goals: the general and the partial ones. Among the general ones there should be emphasized the postulate demanding that the enterprises of this branch be turned into the units capable of independent activities in the circumstances of market economy. The partial goals, in their turn, were exponential of the agenda foreseeing the arrival at the parameters that were significant from the point of view of the success of reform and characteristic of the processes taking place in the branch. Unfortunately, also this time the implementation of the program fell short of the expectations.

### **3. THE POSSIBILITY OF APPLYING THE AHP METHOD IN THE PROCESS OF IDENTIFYING THE KEY FACTORS OF SUCCESS**

#### **3.1. THE POSSIBILITIES AND LIMITATIONS OF THE AHP METHOD WHEN VIEWED IN THE CONTEXT OF THE DISCUSSED TOPIC (ADAMUS & SZARA, 2000)**

The AHP method allows making a keen and complex analysis of the attractiveness of the decision alternatives that are picked up from among their strictly defined set. The fundamental trump of the AHP method is the fact that it enables to compare varying factors that are both of quantitative and qualitative character. The discussed method is suitable for making tests that allow evaluating the level of satisfaction based on the selection of different strategies. At the same time the AHP method ensures the verification of the logical coherence of the judgments made by the respondents (with the admission of certain degree of irrationality and emotional tint in the opinions that are uttered. What is a strong side of the discussed method is the simplicity of its construction and its application. The simplicity of interpretation of the obtained results should also be emphasized. The AHP method has a strong theoretical support based on the

achievements of such branches of the world of learning as sociology, psychology, mathematics and statistics.

Among the most essential limitations of the AHP method one may list the subjectivity of the choice of elements (that is the indirect aims, attributes, alternatives) which make up the basic structure presenting the problem, and consequently analyzing it later. What we deal with in this case is the necessity to make certain authoritatively introduced assumptions. One must be aware, therefore, that the potentially best solution may in fact exist beyond the outlined search zone. This makes it necessary to thoroughly detect all the factors that have an impact on the satisfaction arising from the decision that has been taken. The opinions of the respondents are formulated exclusively on the basis of the consciously reported preferences. The latter do not always need to correspond to the factual (although such that one does not realize) convictions. At the same time we are confronted with the lack of justification or information on why the respondent makes this and not the other choice. The procedure that is applied does not tend toward a reflection but toward a certain kind of “automatism” in giving answers.

Despite all these shortcomings it is undeniable that the strong aspects of the discussed research tool decidedly dominate its weak sides. Further analysis will show that the AHP method allows to substantially improve the quality of the research results in such issues like the identifying of the key factors of success as applied in the strategy of the enterprises that are active in the ripe and thoroughly studied branches of industry.

### **3.2. THE AHP METHOD AS AN EXPERT-SUGGESTED KEY FACTORS CHOICE ALTERNATIVE**

In his research made at the end of 1990's the author of the present paper dealt *inter alia* with the question of the choice of key factors determinative of success in the following branches of industry: mining, metallurgic, food-producing, chemical, power-producing and machine-building. As a result of the questionnaire interviews made with the representatives of the top management of plants in the respective branches the author drew up the list of the following factors:

(1) Extractive industry:

- high degree of output concentration;
- improvement of the coal quality (purity);

(2) Food-producing industry:

- over-average quality of products;
- nutritive and gustatory attractiveness;

(3) Metallurgic industry:

- possibility of applying the diversifying strategy (with due regard to the necessity of simultaneous arrival at the scale advantages with the process of meeting the demand connected with the selected market niche);
- production that meets the ecology standards;

(4) Chemical industry:

- possibility of the synthesis of the compound, hardly “attainable” substances;
- stability of parameters of the production process;

## (5) Machine-building industry:

- very good utility parameters of the product (including the comfort of operating the production system);
- ability to systematically reduce the cost of production (or applying the low costs strategy) while simultaneously securing the right level of the flexibility of reaction to the needs of the market;

## (6) Power industry:

- reliability (continuity) of the services that are rendered;
- possibility of flexibility in adjusting the offer to the need of an individual customer.

It can be easily seen that the key factors of success listed in the context of the respective branches vary considerably. It is not impossible that, in view of the subjectivism of the respondents' opinions, the choice was made far from being the optimum one. What is noteworthy at the same time is the enormous significance (in terms of social, financial and political dimension) of the decision taken on the basis of the analysis of the branch in question. In traditional branches, the investment activities are usually bound with the outlays whose proportion reaches hundreds million (if not milliard) zlotys. This demonstrates the scale of the problem which is tantamount to the necessity of accurately identifying the key factors of success.

**Table 9.1:** The Characteristics of the Methods: 1. AHP, 2. Questionnaire Survey, 3. Delphi Method, the Methods Being Viewed in Terms of the Effectiveness of Identifying the Key Factors of Success

	AHP	Questionnaire survey	Delphi technique
1. The preservation of consistency in answers given by the respondents	+++	+	++
2. Complexity of the analysis of collected data	+++	+	++
3. Simplicity of procedure, implementation of the method	++	+++	+
4. Simplicity of formulating final conclusions	+++	+	++
5. Accuracy of the ordering of the elements that are subject to assessment	+++	+	++ / +++
6. Promptitude with which the entire procedure may be followed	++	+++	+

The methods which are subject to the present discussion show a limited suitability in the phase of the collection of the elements that aspire at being the key factors of success. On the other hand the making of comparison of the discussed instruments is justified when viewed through the prism of: 1. the quality of the analysis of the collected data and 2. the formulation of the decision prerequisites. It is exactly at that point that the attractiveness of the AHP method is visible since this is the method which – thanks to the fact that it limits the choice to the selection of one element from the pair of elements – allows to preserve consistency and the logic of the ordering of

elements that are being assessed therewith. This, in its turn, forms a straight line towards pointing to those amongst these elements that may be defined as the key ones. The table that is found above contains the list of the characteristics that distinguish the following methods: 1. AHP, 2. that of questionnaire investigation, and 3. the Delphic method. These methods are viewed in terms of several most essential criteria.

#### 4. CONCLUDING REMARKS

It is exactly the AHP method that tries to meet the demands that the decisions referring to the key factors of success, be of the optimum nature. The positive aspects of the method allow to state that (when compared with what can be obtained while relying only on the indications of experts) the method guarantees the carrying out of more reliable verification of the actual attractiveness of the respective propositions. Thanks to the AHP method the identification of key factors of success is made in a more prompt and more effective manner, the quality of obtained results being simultaneously more correct. This consequently leads to the considerable increase of the quality of final decisions.

While summing up, we can arrive at a conclusion that the AHP method is the method that fully deserves recommendation as an alternative *vis-à-vis* the hitherto universally applied methods whose objective is the identification of the key factors of success. The author of the present paper intends to continue his research on the application of the AHP method to the detection of the most significant types of factors that condition the success of economic organizations when cross-sectional viewed.

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