CONTRIBUTIONS TO SUBSTANTIATING THE DECISION TO RELOCATE AN INDUSTRIAL BUSINESS

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Abstract: *The relocation of production by which a company partially transfers its production facilities, from one country to another, or from one city to another is a topical issue for industrial affairs. Also known as „offshoring" or „delocalization", it is one of the concrete and visible aspects of the globalization of the economy. Encouraging businesses, especially producers, to move between states, or between areas of a state, remains a popular policy of local or national economic development. Moving the company is a project that involves a great deal of responsibility, because of the many details that need to be solved.*

Typically, the decision to move facilities to certain locations or geographical areas is determined by a number of fundamental factors such as: production costs, complexity of markets, access to labor, finance and lending. Frequently it is considered that relocation is not just the answer to a single risk factor (climate, pollution), but a complex of decisions initiated and based on a number of social, economic, environmental and policy factors. In line with research on this topic, the strongest influence on the relocation of an enterprise is its expansion and the need to increase profits.

Theories on the relocation of industrial companies are a special case of the theory of location, which is focused on the geographic location of economic activity and the importance of location to support growth of the company. Another important reason for the decision to relocate is cost reduction, due to wage differences, economies of scale, energy prices and other economic and financial factors.

Even if it is a long-term decision, sustained by considerable financial support, the criteria of physical, economic, social or political nature with more or less predictable behavior, put managers in the position of always being careful, about the consequences of the emplacement on costs, to take account of a number of unidentified or incorrectly quantified situations and risks, requiring a reconsideration of the geographical situation of the undertaking. The article aims at identifying, grouping and eliminating overlaps, between the criteria considered in the literature at emplacement selection, in case of relocation of production. Optimizing the site selection decision means finding solutions or sets of solutions optimal relocation of production.

The solution to the optimization problem is the answer to the question: what is the optimal location option, so that all identified criteria are respected in different proportions? To substantiate the decision to relocate production, the problem of choosing the optimal site was approached as a multi-attribute type, for which those methods were selected and applied, that led to reliable results but at the same time constituting easy tools to be applied by an interested company.

Keywords: *relocation, criteria, decision, model, industrial business.*

1. INTRODUCTION - RESEARCH ORGANIZATION

The relocation of the businesses in one of the subjects of interest for the economic theory and practice and this is due to the spreading of this phenomenon, among the developed economies. This represents a decisional complex based on a series of social, economic, environmental and political factors and it can be described, as an action of moving into a new location, which in-

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volves a great responsibility, due to numerous aspects that have to be settled. It is well known the fact that, for a big size company, the most important aspects to be taken into consideration, when adopting a decision of relocation are: the costs for the transport, staff, utilities, reliability, legislation, natural environment, potential of innovation, the incentives granted by the local or central authorities and others. The settlement of the issue involves the passing over the following steps:

- the analyses of the literature of specialty for the identification of the criteria which determine the relocation of the industrial units;
- the configuration of some objective, determinant criteria, resulted from the study of other researches;
- the approaching of the issue of relocation, as a multiple-criteria decision.

2. THE IDENTIFICATION OF THE CRITERIA

2.1 Market. Any company providing commodities and services develops its activity in an environment, exerting a strong influence upon it, due to the multiple relations which are established. The nature and the object of these relations is diversified, their identification contributes to the efficient utilization of the production factors, to the achievement of the fundamental objective of the company [1]. The most important relations of the company are those related to the market, since in the competitive economy, both the manufacturer and the consumer, have the possibility to choose freely. The analysis of the market conditions presents importance, for the present and especially for the future of the company, the mechanism of the market being the barometer of the actual and future situation. The market validates the opportunity and the efficiency of the actions, connected to the orientation of the flux of commodities and services, from the manufacturer to the final consumer. The market is the place of testing the products, of new methods for the distribution and promoting of the products. In the same time, the market is the source of information concerning the actual and potential consumers, the structure and the characteristics of the distribution channels, competition, prices and tariffs, information necessary for the grounding of the decisions.

2.2 The labour force. Among the ensemble of the production factors, the labour force represents the highest dynamic. The demographic environment of the target area or locality can be a key link, in choosing the layout of the company. The way of organizing of the different activities, specific for the industrial field, should take into consideration the issue of the employing and of the utilization of the labour force. The density of the population and the availability of the labour force, are aspects which the company must take into consideration. A labour force which is already qualified, can contribute to the increasing of the business in a short time. The information concerning the occupation, education, the incomes of the population, the distribution per age, styles of life, the way of spending the free time in a certain area, can suggest to a company the potential for increase and the opportunity of business in the respective environment. A special interest, from the labour force point of view, is represented by the areas having high secondary schools of specialty, universities and faculties specialized in the field of activity of the company or centers of research and development. These aspects are followed up by the companies, in the moment of adopting the decision to layout the headquarters, in an area or in another area, in a town or in another town, since the company can find specialized, qualified people and young people eager to assert.

2.3. Taxation. The role of the fiscal system is in close connection with exerting its functions, resides from them and it is manifested in financial, economic and social plan. The fiscal system appears as the main way of attracting the financial sources of the state, role who gains actually a

greater and greater importance. During the previous years, the financial resources available for the central and local authorities know a permanent growing. The fiscal system is highlighted as an important instrument of economic policy, used by the public authorities for influencing the economic processes and for the setting away the imbalances. The central or local authorities of different states of the world facilitate the industrial relocation by the achievement and maintaining of a positive business climate, the main actions being: fiscal facilities, favorable work legislation, networks of utilities financed by the state and others. The policies of regional and local economic growth are designed to attract the companies of the specific sectors. The decision of relocation is deeply influenced by the facilities of fiscal nature offered under different forms: exoneration of taxes and charges, diminishing the value of the VAT or of the tax upon profit, of local taxes, the granted subventions or payment terms not so restricted. The code of fiscal procedure and respectively the Fiscal Code are the most important regulations of the field of activity of the trade companies [2].

2.4. The legislative system. The aspects of legislative and judicial nature, out of which the company could not function, are taking into consideration to the relocation of a company. In order to perform a legal activity of a company, the legislation in force must be known concerning the functioning and the procedure of settlement of the trade companies. Each trade company which develops a production activity must be the subject of the provisions mentioned by the fiscal laws [4]. According to the laws in force, the employment of the staff at all the companies, will be performed based on individual labour contract, with the observance of the Labour Code and of the conditions concerning the social insurances.

2.5. The infrastructure. The infrastructure involves the means of transport, the equipment for the treatment of water and of the residual waters, telecommunications, generation, transmission and distribution of energy and others. An element of the same importance for the identification of the optimal outlay of production is represented by the road infrastructure, road nodes as well as the accessibility to the highways, to the national and international roads to be transited. The distance towards the main customers and suppliers is another element in choosing the layout of a production system. According to according to some authors, infrastructure was considered as a factor for localization of trade flows between regions [3]. Subsequently, concluded that because of the availability of data, the impact of infrastructure on regional development has become the basic criterion [6]. In 2013, other researchers argued that the effect of infrastructure on economic development varies between industrial groups and modes of transport [7].

2.6. The raw material. The raw material is a basic component out of which are manufactured the products, this is the reason why it represents an important element in choosing the layout of the production. The existence of the main raw materials necessary for production – especially when they are expensive or supplied by a small number of manufacturers – the distances of transport and their quality are the main followed up aspects.

2.7. Utilities. The issue of utilities is a basic element, analyzed by each investor and followed up during the whole period of running of the production activity. The community services of public utilities involve activities of utility and of public, general interest, developed at the level of the territory, which are under the management and the coordination of the public local authority. They have as aim the satisfaction of the local community requirements and consist in: supplying with water, sewerage and wastewater treatment, collection, drainage and evacuation of rainwater, production, transport, distribution and supplying of thermal energy in centralized system, sanitation, public illumination, administration in public and private field [5].

2.8. Research and innovation. Such activities form a process based on which the organizations generate ideas to be valued during the activity of production. New settlements allow the obtaining of some competitive advantages on the market. For the selection of the layout, the management of the company looks for aspects of innovative nature as: human resources qualified in research, an attractive system of research, an environment proper to the innovation, the financial support offered by the state, the existent investments in research, the internet network, the legislation concerning the rights of intellectual property.

2.9. The natural environment. The companies often choose for an economy which is disconnected from the surrounding natural environment. The accent falls upon the economic conditions and upon the environment in which the company can obtain a durable, competitive advantage. Such examples are found in the literature, which recognizes the fact that the companies can have a significant, negative impact upon the natural environment. The relocation of the companies can be an alternative for diminishing the pollution of the air in big towns and cities.

Besides the main aspects detailed above there are also criteria of international, national, regional or local influence, which must not be neglected in an analysis of layout, these being: the political stability, the climate of the international relations, the restrictions, the cost of life, the attitude of the community and sometimes these cannot be quantified from the quantity point of view, the lists of control becoming instruments of utile evaluation.

3. THE SETTLEMENT OF THE ISSUE

The optimization of the decision of choosing the layout involves the finding of one or more optimal solutions for the relocation of the production. The solution of the optimization issue consists in the answer to the question: which is the optimal variant of layout so that to be observed the criteria previously identified, in different proportions? In order to reply to the question, it is necessary the utilization of some models of decision, in the presence of a multitude of criteria, named models of multiple-criteria decisions.

Table 1: Identified criterion

Symbol	***Criterion***
C1	Market
C2	Labour force
C3	Taxes
C4	Legislative system
C5	Infrastructure
C6	Raw material
C7	Utilities
C8	Research and Innovation
C9	Natural Environment

Such models are framed in two categories:

a) Multiple-attribute decisional model. Such a model consists in choosing the optimal variant from a finite multitude of variants, compared between them, reported to other criteria. Each variant is characterized depending all the criteria belonging to a finite multitude.
b) Multiple-objective decisional model. These are decisional situations in which the multitude of variants is finite. They generate models, which aims the maximization or the

minimization of functions having more variables, subject to a system of restrictions [8]. It is followed the establishing of the values of the variables, which check the system of restrictions and optimize every function separately.

The multiple-criteria optimization of the decision of relocation of production, will be approached as a multiple-attribute issue. For the simplifying of the calculus it was chosen a number of five variants, afferent to some countries or distinct geographic areas $V= \{V_1, V_2,...,V_5\}$ and a multitude of criteria previously identified $C= \{C_1, C_2,..., C_9\}$ (Table 1).

Table 2: The matrix of consequences

	C_1	C_2	…	C_9
V_1	a_{11}	a_{12}	…	a_{19}
V_2	a_{21}	a_{22}	…	a_{29}
…	…	…	…	…
V_5	a_{51}	a_{52}	…	a_{59}

For each criterion C_j, j= 1,...,9, to each variant V_i, i=1,...,5 it is associated a vector representing the result of the evaluation of that variant, depending on the criterion C_j. Established like this, the vectors will form the lines of a matrix of the consequences, presented in Table 2.

Table 3: The weighted matrix of the consequences

	C_1	C_2	…	C_9
V_1	a_{11}	a_{12}	…	a_{19}
V_2	a_{21}	a_{22}	…	a_{29}
…	…	…	…	…
V_5	a_{51}	a_{52}	…	a_{59}
X	x_1	x_2	…	x_5

The choosing of the layout is one of the situations in which not all the criteria have the same importance. As a consequence, it is proceeded to the establishing of the importance of the criteria previously presented, using some coefficients x_j , j= 1,...,5 which mentions the importance which the deciding person grants to each criterion separately, and together they form the vector x_j presented in Table 3.

For the establishing of the solution of the multiple-attribute issue were proposed more methods, depending on the data mentioned into the matrix of the consequences. The literature of specialty offers different methods of settlement, of the multiple-attribute issue and in this category, it is framed also, the optimization of the decision of choosing the layout (Table 4).

From the point of view of informational content, the methods can be:

a) Without information upon the preferences, if the decisional person hasn't information upon the fact that some criteria or variants are preferred in comparison with some others;
b) With information upon the criteria, which groups the problems according to the importance granted to each criterion, as follows:
   - in case of ordinal preferences, besides the matrix of the consequences it is known also a vector $V_0=\{a_{01}, a_{02},...,a_{05}\}$ of the standard levels afferent to the 9 criteria. These methods eliminate the variants to which are afferent lower values, in comparison with the standard levels;

- methods which settle the issue of relocation using the matrix of consequences and of some information upon the criteria, using the vector $X=(x_0, x_1,...,x_5)$ where $(x_0, x_1,..., x_5)$ is a permutation of the set of numbers {1,2,...,5}. The component x_i mentions the place where is found the criterion C_i depending on the preference;
- methods which allot certain cardinal preferences to the criteria. This means that the importance of the criteria, is given by the vector $X = (x_0, x_1,...,x_5)$, where $0 \leq x \leq 1$;
- methods which bring the initial model to another form in which are taken into consideration only independent criteria [9][10][11]. From the multitude of the methods presented in Table 4, the issue of choosing the layout is framed into the group of methods, with information upon the criteria. These methods can be applied for finding an optimal variant, or for the ranking of the found variants. It was done a selection for the exemplification of the methods of scoring, which imposes the passing through the subsequent steps (Table 5):
- it is formed a matrix, in which are mentioned all the criteria of choosing the layout in each line and column;
- each criterion receives points of importance, taking into consideration that the score 2 is given for the most important criteria, score 1 is for those having the same importance and score 0 for the less important ones;
- the criteria are compared between them, two by two, taking into consideration the scoring mentioned above;
- on the diagonal of the matrix it is one point, since each criterion is compared with itself;
- it is calculated the total per column for each criterion obtaining the result n_i of the evaluation and the score is calculated in percentage $P(n_i)$.

Table 4: Methods for solving multi-attribute problems

Type of information	**Complexity of information**	**Classes of methods**
Without information		Method of dominance Maxi-min method Maxi-max method
With information upon the criteria	Standard level	Conjunctive method Disjunctive method
	Ordinal preferences	Lexical-graphic method Method of elimination based on aspects Permuting method
	Cardinal preferences	Linear attribution method Simple additive weighted method Hierarchical additive weighted method The method of diameters Onicescu method Electre method Topsis method Method of minimizing the deviation Saphier-Rusu method Scoring method
	Dependent criteria	The method of hierarchical combinations

Table 5: Matrix of the interactions

Criterion	C1	C2	C3	C4	C5	C6	C7	C8	C9	Total
C1	1	1	0	0	1	1	1	0	1	
C2	1	1	0	0	1	1	0	0	1	
C3	2	2	1	1	2	0	1	1	1	
C4	2	2	1	1	2	2	1	1	0	
C5	1	1	0	0	1	2	1	2	1	
C6	1	1	2	0	0	1	1	1	0	
C7	1	2	1	1	1	1	1	0	0	
C8	2	2	1	1	0	1	2	1	1	
C9	1	1	1	2	1	2	2	1	1	
n_i	12	13	7	6	9	11	10	7	6	81
$P(n_i)$ (%)	14.8	16.0	8.6	7.4	11.2	13.7	12.3	8.6	7.4	100.0

From the matrix of the interactions it is emphasized the second criterion as having an importance of 16%. Based on this result, the deciding person has the possibility to select the variant of layout, depending on the location which maximize the advantages of human resources. Such a method has negative aspects, determined by the fact that the decision will be adopted depending on the dominant criterion and involves a certain dose of subjectivism connected to the comparison of the criteria. For a more conclusive result, it can be chosen another method of Table 4. The approach is based on the appreciation of each criterion, by a parameter existent in the specialty literature, or configured by the decisional factor. For the understanding of the model were established the parameters and the intervals of variation in Table 6. For the settlement of the issue the following steps are passed:

a) It is measured the level of the parameter for each variant of layout;
b) The values are normalized if are used quantitative and qualitative criteria. The operation is performed based on correspondence between the set of the values of the criteria and another set using the procedure named scaling;
c) The application of a method of Table 4 which leads to the selection of the variant of layout, depending on all the identified criteria.

Table 6: Parameters associated with the criteria

Symbol	Criterion	Parameter	Domain of variation
C1	Market	The distance up to the main customers (km.)	0-500
C2	Labour force	The availability of the labour force (%)	0-60
C3	Taxes	Fiscal deduction (%)	0-100
C4	Legislative system	Stability of the legislative system	0-10
C5	Infrastructure	The level of covering with utilities (%)	0-100
C6	Raw material	Expenses with raw materials (% of production cost)	0-80
C7	Utilities	The degree of covering with utilities (%)	0-100
C8	Research and Innovation	The degree of research and innovation (%)	0-20
C9	Natural environment	The level of pollution of the natural environment	0-10

CONCLUSION

The problem of relocation of a company is approached in the literature of specialty, in close connection with a determinant criterion. Unlike this direction of research, the article presents, in a synthetic form, a decisional model which takes into consideration several objective criteria. The identified problem was treated as a multiple-attribute decision, having the advantage that

it offers a solution using a small consumption of resources. The main difficulty with whom the presented models of multiple-criteria decisions are facing, consists in the fact that they can lead to different solutions, for one and the same problem. Due to this fact in the final of the article, were enumerated the stages to be passed for the elimination of this drawback.

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