The Influence of the Conjunctural Factors toward the Reengineering of Organization

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Abstract. *The reengineering of the business processes, considered like a major change within the life of an organization, has a very important role for the success or failure of the said company where the change has occurred. Considered in many cases as a last solution to the major challenges of the market and socio-economic environment, the business reengineering has to follow two main directions: the fulfilment of the business goals and the evaluation of the external factors toward the processes of a company. The influence of each factor should be analysed in detail and projected separately for each organizational process in order to be included in the said process model. This paper presents a formalised approach of the interrelation between a process and the influence of an external factor toward the said process, as well as a case study that illustrates a practical application of this correlation.*

Key words: organizational reengineering; state variable, competitive position; strategic orientation, level of performance.

JEL Codes: D40, L22.
REL Codes: 7E, 17B.

1. Factors that influence the performance's level of an organization

The development of the processes within an organization or a company, as well as the performance's level fulfilled are affected by two types of factors: internal and external.

The main types of the internal factors that affect in a determinative way the condition and the evolution of an organization are:

- factors related to the human resource, including but not limited to: the human resources policy, the educational level of employees and their educational homogeneity, average age, assignment depending on the sex, etc.
- factors related to the quality of management, including but not limited to: method of management, the way of organizational structure, informational system, communication, the way of taking decisions and how they are applicable, etc.
- factors related to the quality assurance, including but not limited to: certifications, implementation of some high quality management systems, quality policy, etc.
- technological factors, including but not limited to: the technological level of equipment, products, IT and communication systems as well as any other similar factors.
- factors related to financial capabilities, including but not limited to: available financial resources, level of financial dues, etc.
- As regard the external factors, they may be classified in four main categories, such as: economic factors, social factors, factors depending on government, moral factors, etc.

In Figure 1 there are summarised the main categories of external factors and the main elements of each external factor that determines the evolution and the condition of the company.

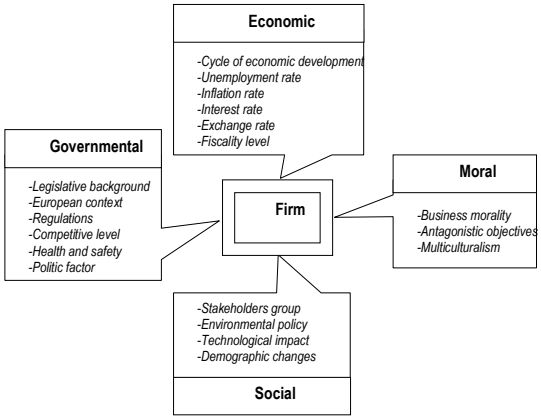

Figure 1. *The main categories of external factors affecting a firm*

A frequent used method to determine the influences of the external factors toward the processes developing within an organization or a firm is the Arthut D. Litte (ADL) method, that supposes to determine and represent based on some tables, a phase of the life's cycle relating to a certain field of the company's activity (see Table 1) as well as the firm's position on the market (see Table 2).

Evaluation of the phase from the life's cycle of each activity's sector of a company

Table 1

Indicator	Maturity phase of the activity's sector			
	Starting	Increase	Maturity	Decline
Increase rate		> 10 %	0 – 10 %	< 0 %
Number of competitors	Increasing	Maxim	Constant or decreasing	Minim or accentuated decreasing
Distribution of market quota	Fragmental	Is going to concentrate	Constant concentrated	Very concentrated or very fragmental
Stability of customers	Not constant	Stability increasing	Constant	Very constant
Stability of market quota	Not constant	Stability increasing	Constant enough	Very constant
Technology	Quick evolution	Changeable	Constant	Very constant

The competitive position of a firm on the products' market is evaluated from the point of view of the success key factors, showed in Table 2

Company's competitive position on the market

Table 2

Function	Production	Commercial	Financial	Organization
Success Key factors	Productive capacity Experience Technical skills Integration level Production cost	Market quota Sale price Sale level Distribution network Impression	Financial structure Financial independency Profitability	Flexibility

Depending on the fulfilment of the above mentioned factors requests a firm may be poisoned in one of the following competitive positions:

- dominant;
- strong;
- favourable;
- unfavourable;
- marginal.

Based on the above mentioned information a matrix shall be made, named analyse matrix. The analyse Matrix issued by ADL is illustrated in Table 3.

ADL Matrix

Table 3

Maturity of activity's sector Competitive Position	Starting	Increase	Maturity	Decline
Dominant Strong Favourable Unfavourable Marginal	High profitability: high investments to maintain the position Medium profitability: high investments to improve the position Low profitability and high investments to improve the position		High profitability: Low investments Medium profitability Low profitability	

The strategic orientations that have been showed in the above presented analyse of model are those illustrated in Table 4.

Strategic orientations

Table 4

Maturity of activity's sector Competitive position	Starting	Increase	Maturity	Decline
Dominant Strong	Natural development			
Favourable			Development	
Unfavourable		Selective		
Marginal				Abandonment

The factors related to relation of company with the external environment are very important.

2. Evaluation the external factors' influence toward the activity of a firm

The technical-managerial evaluation of the influence of internal and external factors in the organizational reengineering process in principal assumes the identification of the external factors' groups that influence the processes developed within a company and determination of some state variables or of some indicators at the level of firm and further on at the level of the process to be able to evaluate the technical, economic and financial performance, as well as the

determination of some possible correlations between each factor or group of external factors including the indicators of stable performance (that means to get a business model such as *input – state –output* type).

These correlations, mathematical formalised or illustrated in differently other ways, generally are validated in time by the real evolution of the pair of *external factor – indicator value*, or they are object of some simulations, their goal being the identification of some scenario of evolution, based on some possible and probable values of the external factors. Based on the conclusions due to such simulations, it follows the reengineering of the organizational processes, such that the resulted processes to have an optimal behaviour within the simulated situations or in other situations that are similar to them.

Under these circumstances, there is determinant the identification of some indicators that have to quantify, for each factor or group of external factors, the impact which they have produced at the level of processes developed within a firm and at the same time should be monitorised the value's evolution of those indicators. In this case, finding of some correlations between the involved values and the identification of the variation tendencies of company's state variables, depending on the evolution's prognosis of some key factors, will be in the domain of applications and complex analyse informational systems and data mining.

This way of action presupposes, in order to be applicable, some complex stages, where there are analysed in detail all aspects related to the interaction of a firm and the external environment. The steps that should be followed to use with maximum efficiency the above stated method are:

▪ *Identification of the sensible zones of the company's activities,* taking into account their importance to get technical, economic and financial results in the company. In some circumstances, besides the main processes that are directly connected with the main field of activity of a firm, other support processes are taken into consideration, depending on the importance which the top management grant to them, such as the processes in relation with the data processing or those related to the managerial decision.

The activity of a company may be seen like a union of sub-activities and processes as it is showed in the following relation:

$$Pr = \bigcup_{i=1}^{n} Pr_i \qquad (1)$$

where:

Pr = the total process of transformation which is developing at the level of the firm;

n = the total number of organizational processes;

Pr_i = processes i under progress; i=1,2, …, n under progress processes.

The choice has in view those processes that contribute in a great extent to the creation of value and are going to make the object of a detailed study in order to identify their improvement solutions. In the opinion of some specialists, their choice may be realised based on the ratio between the estimated cost of the reengineering process and the prognosis of the results, while other ones consider that should selected with priority those processes with maximum increase potential.

▪ *Determination of the way to measure the level of performance* for each process and the state variables that characterise the running up and capacity of that process to fulfil its role within the company. Taking into account the fact that,

indifferently of the nature of organizational processes, they create the value for the customer, under the consumption circumstances depending on the kind of resources, in most cases, two kinds of indicators are taken into account: indicators of effort (or minimum effect), respectively (maximum effect).

It is important how those indicators shall combine each other from the process's level to the company's level as well as the contribution of each process to the final company's result, in other words, which is the contribution of each process to the final result of the firm's activity, under the circumstances of its new value.

In order to have a synthetically illustration of this affirmation, relations (2) and (3) may be used:

$$V = \{V_1, V_2, ..., V_m\} \quad (2)$$

where:

V = organization state;

m = number of significant state variables.

Therefore, each state variable of those which characterise the firm (V_j) is a function (f_j) of the states of all processes n that are developing within a company

$$V_j = f_j(V_{1j}, V_{2j}, \ldots, V_{nj}) \quad (3)$$

where:

V_j represents the state variable (indicator) j.

In detail, it could be said that the state of the organizational system is represented by the amount of states for all processes that is emphasized by relation (4), which is presented like a matrix of values of the main indicators for all processes existing in a firm:

$$V = \begin{pmatrix} V_{11} & V_{12} & \cdots & V_{1,n-1} & V_{1n} \\ V_{21} & V_{22} & \cdots & V_{2,n-1} & V_{2n} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ V_{m-1,1} & V_{m-1,2} & \cdots & V_{m-1,n-1} & V_{m-1,n} \\ V_{m,1} & V_{m,2} & \cdots & V_{m,n-1} & V_{m,n} \end{pmatrix} \quad (4)$$

There are situations where f_j function, which makes the connection between the value of a state variable at the organizational level and the values of the same variable recorded al the level of processes within the firm, is a formal cumulative one:

$$V_j = \sum_{k=1}^{n} V_{kj} \quad (5)$$

It's the situation of some indicators such as the total value created by a customer or stakeholders, or the registered costs at the company's level within a period of time. In other situation, such that related to the general technological level, the total indicator, at the firm's level, could be determined as a balanced average of the recorded values within the organizational processes, therefore:

$$V_j = \sum_{k=1}^{n} p_k V_{kj} \quad (6)$$

where p_k represents the share of process to determine the total value V_j ($\sum_{k=1}^{n} p_k = 1$).

In addition, there are situations where a j state variable is not influenced by the development of a process i. In this case, within "j" column of the defined matrix by relation (4), the positions corresponding to i process are null.

The level of performance is not always mathematical illustrated, under the form of some numerical values. There are many cases where the performance got by an organization, generally speaking and by its processes, particularly, are illustrated from qualitative point of view using the satisfactory excellence levels, competitive level, etc.

Determination of the factors that influence the evolution of an organization and, particularly, the values reached by the

variables identified in the previous stage. Those ones, both the internal and external ones, are classified in categories and it is determined the way and the rate where the categories and each individual factor influence each of processes and state indicators that illustrate particular process. Further on we shall detail the main categories of factors that could influence the processes of an organization.

Generally, we may suppose that there are a number of "k" groups of factors that determine the works and processes of an organization. Marking with F the multitude of those k groups of factors, then the multitude F of those factors shall be represented as follows:

$$F = \{F_1, F_2, ..., F_k\} \quad (7)$$

Each group of factors F_i have a number of x_i factors which, at the level of their group is presented as follows:

$$F_i = \{F_{i1}, F_{i2}, ..., F_{ix_i}\} \quad (8)$$

Marking with FP [lxn] the matrix that shows the influence of each factor toward a distinct process, this matrix will contain elements of 0 or 1, depending on the influence or the absence of influence of a factor toward the said process, under a *fuzzy* approach, this will contain values between 0 and 1, showing the range where one of the factor influences a certain process. The significance of matrix symbols is the following:

k = number of groups of the influence factors;

x_i = number of indicators (factors) of the group i;

l = the total number of the influence factors, ($l = \sum_{i=1}^{k} x_i$).

$FP_{i,j}$ will represent the influence level of factor i toward the process j, $FP_{ij} \in [0..1]$. In this way, an influence FV[lxm matrix of the factors toward the state variable may be obtained, determining the performance level of the firm that is expressed by the following relation:

$$FV = FP \times V \quad (9)$$

Having in mind that FV and V are known, the matrix FP will be determined by relation:

$$FP = FV \times V^{-1} \quad (10)$$

This relation will allow us to reconstitute the levels of influence of the factors toward the organizational processes, and these levels of influence may be useful in some circumstances, especially when the reengineering of some processes is required, starting from an estimated state of some factors.

▪ *Determination of impact* of the group of factors F_i including each factor F_{ij}, toward a process or toward the general state of a company. Taking into consideration that each of those groups have a Pi share within the activity of a firm (considered as a relative importance of the group of factors F_i comparing with the other groups of factors) it may be assessed that the amount of all groups of factors to be equal with 1:

$$P_i \in (0,1), \sum_{i=1}^{k} Pi = 1 \quad (11)$$

Each of factors included in a group F_i has a relative importance (share) p_{ij}, j=1,..,x_i, such that:

$$p_j \in (0,1), \sum_{j=1}^{x_i} p_j = 1 \quad (12)$$

One should be mentioned that this approach, based on the theory of the vague multitudes, assumes that the influence of a

factor or a group of factor toward the state variables of the processes from a firm is constant, expressed through a share that may be assimilated and with the grade of belonging to a factor of the total results of the environment where the firm is acting. Another approach is that one where the share p_j is a function with a variable value in time:

$$p_j = \phi(t) \quad (13)$$

Reengineering of the organizational processes such that the evolution of the total company's performance to be the most favourable relating the prognosis values of the influence factors.

For each possible alternative of processes that are subject of the reengineering, based on some sets of values considered to be more probable for the influence factors it is simulated the level of performance reached at the level of process and at the level of firm, selecting that alternative that provide the total most favourable effect for the prognosis of period.

- *Simulation of the new processes' operation and the validation of their viability and efficiency or* depend on the case, their reengineering. The last two phases presented above represent the components of a repeated structure, that may also include, in case that a set of alternatives of the reengineered processes can not be identified to meet the effectiveness and efficiency requirements of the management, the previous stages.

It should be noticed that this approach requires a periodical process of managerial reengineering, such as to be taken into account both the level where the known factors determine the performance within the firm, and the possible evolution of the influence factors values.

3. The evaluation fuzzy method related to the evaluation of the external and internal factors toward the total qualitative and performance level. Case study

Further on we present, an evaluation case proposed by the Chinese specialists Jinying SUN, Youzhi HAO, Yong WU and Zhen DAI, using fuzzy techniques, relating the influence of the internal and external factors toward the total performance of the ecological buildings.

According to the authors, an ecological building is characterised by a heat system, water supply and canalization system, as well as effectiveness and efficient power supply system, rational use of used materials, creating an as much as possible ambient environment within the building and judicious use of the land.

These wishes may be considered like factors that provide the total level of performance and the quality of building, level that may be expressed by one, two, or three stars.

Therefore, the evaluation model assumes the following stages:

1. Determination of categories of the influence factors which are classified in multitude F $[F = \{F_1, F_2, F_3, F_4, F_5, F_6\}]$, where F1 is assimilated with the group of factors connected with judicious use of the built land and with the impact toward the external environment of the building, F2 represents the energetic effectiveness and efficiency, F3 refers to the use and saving of water, F4 refers to the use and saving of materials, F5 refers to the environmental quality inside the building, and F6 refers to the quality of the operational management.

Within each group of factors there are emphasized more individual factors as follows:

▪ F1 illustrates the rate of rational use of the built land and the impact toward the external environment of the building, and this group of factors includes:

- Share of underground parking from the total parking space. In the illustrated example, the share is about 60%.

- Rate of occupancy with buildings of the land. This is subject to some restrictions pursuant to PUZ (Zone Town-Plan).

- Architectonic design. This should provide the maximum use of solar light and energy as well as very good ventilation.

- Use of the new generation materials instead of those traditional.

- Saving of the built land. This refers to reduction of areas with public destination. (common spaces), using new technologies, techniques and materials.

- Construction of public utility spaces in the basement of building.

- Maximum utilization of the land in slope or less realisable for constructions.

▪ F2 illustrates the energetic effectiveness and efficiency and includes:

- Orientation of building, its architectural form, obfuscation of some recyclable energetic forms.

- External structure (walls, ceiling, windows), to provide a suitable thermal coefficient.

- Permanent control of temperature.

- Light system and its efficiency, providing some effectiveness and efficient means of lighting and use of some qualitative materials for the transparent and reflected areas.

▪ F3 illustrates the use and saving of water, taking into account:

- Use of used water.

- Use of pluvial water.

- Design of sanitary equipment such that due to capacity, technology and decreasing of losses those to be included in an upper and efficient class.

- Saving of water in public spaces, designing and judicious sizing of sanitary equipment, use of valves and by-pas valve with automatic cutting-off, etc.

- Use of natural water to irrigate the green zones.

▪ F4 illustrates the use and saving of materials, including:

- Use of recoverable energetic forms.

- Use of the new architectural and construction techniques. It is recommended to use at least three or four new methods.

- Use of some specific saving techniques of used materials in construction.

- The used proportion of recyclable materials.

▪ F5 illustrates the quality of the environment inside the building related to:

- Natural light and ventilation of building, as well as assurance of the green zones inside the building.

- Phonic isolation and reduction of noise, by the structure and the composition of the walls, ceiling and windows.

- Existence of a rational ratio between the glass-window areas and the other areas, the windows areas reported to the area of walls.

- Use of internal and external obfuscation and prevention of direct solar radiation toward the doors, windows and wall during the winter time.

▪ F6 defines the operational management and includes:

- Management of waste, collecting selective and recycling the waste.

- Utilization of automatic equipment both in monitorised zone of operational parameters of the building, and assurance of security.

- General management style.

Under the context of this model, it follows to be determined the shares of groups of factors and distinctly for each factor. For the illustrated example, those shares, are showed in Table 5.

Further are there are determined three distinct levels of building's performance, namely with one, two and, respectively, three stars, as well as the belonging coefficient of each factor (influence) for each level, the total evaluation using fuzzy technology being illustrated in Table 5.

The total evaluation using fuzzy techniques

Table 5

Group of factors	Group share	Factors	Share of factor	Fuzzy evaluation matrix		
				O star	Two stars	Three stars
Judicious utilization of the built land and the impact toward the external environment of building	0.1	Prop. Underground parking	0.2	0.15	0.25	0.6
		Level of land occupancy	0.125	0.2	0.3	0.5
		Architectural design	0.175	0.2	0.3	0.5
		Materials of new generation	0.2	0.15	0.25	0.6
		Saving of land	0.125	0.1	0.3	0.6
		Level of basemen location	0.125	0.1	0.3	0.6
		Utilisation of land	0.05	0.1	0.4	0.5
Energetic effectiveness and efficiency	0.5	Orientation of building	0.35	0.1	0.2	0.7
		External structure	0.35	0.1	0.2	0.7
		Control of temperature	0.2	0.15	0.25	0.6
		Light system	0.1	0.1	0.25	0.65
Use and saving of water	0.2	Utilisation of used water	0.3	0.3	0.3	0.4
		Utilisation of pluvial water	0.15	0.2	0.4	0.4
		Sanitary equipment	0.3	0.1	0.2	0.7
		Public spaces	0.15	0.25	0.35	0.4
		Utilisation of natural water	0.1	0.15	0.3	0.55
Utilisation and saving of materials	0.1	Utilisation of recoverable energy	0.15	0.35	0.25	0.4
		New architectural techniques	0.5	0.2	0.3	0.5
		Saving techniques	0.1	0.3	0.1	0.6
		Recoverable materials	0.25	0.15	0.35	0.5
Environmental quality inside the building	0.05	Natural light and ventilation	0.3	0.3	0.2	0.5
		Phonic isolation	0.2	0.3	0.2	0.5
		Strained – glass window area	0.3	0.25	0.35	0.4
		Utilisation of shadow	0.2	0.2	0.3	0.5
Operational management	0.05	Management of waste	0.3	0.2	0.25	0.55
		Automation	0.4	0.2	0.3	0.5
		General style of management	0.4	0.2	0.3	0.5

Based on the above mentioned stated, the matrix of shares of groups of factors is the following:

P = (0.1 0.5 0.2 0.1 0.05 0.05)

Shares for each factor are:

P(1) = (0.2 0.125 0.175 0.2 0.125 0.125 0.05)

P(2) = (0.35 0.35 0.2 0.1)

P(3) = (0.3 0.15 0.3 0.15 0.1)

P(4) = (0.15 0.5 0.1 0.25)

P(5) = (0.3 0.2 0.3 0.2)

P(6) = (0.3 0.4 0.4)

Fuzzy matrixes of secondary evaluation are those matrixes R, obtained according to the below relation:

$$B = A \times R = A \times \begin{pmatrix} R_1 \\ R_2 \\ R_3 \\ R_4 \\ R_5 \\ R_6 \end{pmatrix} = \begin{pmatrix} r_{11} & r_{12} & \dots & r_{1n} \\ r_{21} & r_{22} & \dots & r_{2n} \\ \dots & \dots & \dots & \dots \\ r_{61} & r_{62} & \dots & r_{6n} \end{pmatrix} \quad (14)$$

where r_{ij} represents, conform to fuzzy multitude theory, the level of belonging of the factor I of the performance's level j.

We obtain, in above illustrated example the following matrixes:

$$R_1 = \begin{pmatrix} 0.15 & 0.25 & 0.6 \\ 0.2 & 0.3 & 0.5 \\ 0.2 & 0.3 & 0.5 \\ 0.15 & 0.25 & 0.6 \\ 0.25 & 0.3 & 0.55 \\ 0.1 & 0.3 & 0.6 \\ 0.1 & 0.4 & 0.5 \end{pmatrix}, \quad R_2 = \begin{pmatrix} 0.1 & 0.2 & 0.7 \\ 0.1 & 0.2 & 0.7 \\ 0.15 & 0.25 & 0.6 \\ 0.1 & 0.25 & 0.65 \end{pmatrix}, \quad R_3 = \begin{pmatrix} 0.3 & 0.3 & 0.4 \\ 0.2 & 0.4 & 0.4 \\ 0.1 & 0.2 & 0.7 \\ 0.25 & 0.35 & 0.4 \\ 0.15 & 0.3 & 0.55 \end{pmatrix}$$

$$R_4 = \begin{pmatrix} 0.35 & 0.25 & 0.4 \\ 0.2 & 0.3 & 0.5 \\ 0.3 & 0.1 & 0.6 \\ 0.15 & 0.35 & 0.5 \end{pmatrix}, \quad R_5 = \begin{pmatrix} 0.3 & 0.2 & 0.5 \\ 0.3 & 0.2 & 0.5 \\ 0.25 & 0.35 & 0.4 \\ 0.2 & 0.3 & 0.5 \end{pmatrix}, \quad R_6 = \begin{pmatrix} 0.1 & 0.3 & 0.6 \\ 0.2 & 0.25 & 0.55 \\ 0.2 & 0.3 & 0.5 \end{pmatrix}$$

Using relation (10), $B_i = A_i \times R_i$, it is passed from the secondary evaluation vectors to the primary one as follows:

B_1 = (0.16875 0.285 0.54625)
B_2 = (0.11 0.215 0.675)
B_3 = (0.2025 0.2925 0.505)
B_4 = (0.22 0.285 0.495)
B_5 = (0.235 0.265 0.4)
B_6 = (0.17 0.255 0.545)

It is obtained the total matrix of evaluation:

$$R = \begin{pmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \\ B_5 \\ B_6 \end{pmatrix} = \begin{pmatrix} 0.16875 & 0.285 & 0.54625 \\ 0.11 & 0.215 & 0.675 \\ 0.2025 & 0.2925 & 0.505 \\ 0.22 & 0.285 & 0.495 \\ 0.235 & 0.265 & 0.4 \\ 0.17 & 0.255 & 0.545 \end{pmatrix}$$

The evaluation result based on the primary indicators is the following:

$$B = A \times R = (0.154625 \quad 0.249 \quad 0.596375)$$

Assuming that the performance's levels are V = (1 2 3), we shall determine the total evaluation value according to the relation:

$$T = V \times B^{-1} \qquad (15)$$

Obtaining a value of 2.44175.

Generally, a note (total evaluation) between 1 and 1.7 classifies the ecological building in the class "one star", with a value between 1.7 and 2.4 in class "two stars", while a note between 2.4 and 3 shall be classified in "three stars". Therefore, the ecologic building of our example is classified at "three stars" category.

References

Ciobanu, I., Ciulu, R. (2005). *Strategiile competitive ale firmei*, Editura Polirom, București

Dima, I.C., Man, M. (1999). *Managementul producției industriale*, Editura AGIR, Editura Academiei Române, București

Drucker, P.F. (2004). *Managementul viitorului*, Editura ASAB, București

Leroy, F. (2004). *Les strategies de l'entreprise,* Editura Dunod, Paris

Macmillan, H., Tampoe, M. (2000). *Strategic management*, Oxford University Press

Sun, J., Wu, Y., Hao, Y., Dai Z. (2006). *Fuzzy Comprehensive Evaluation Model and Influence Factors Analysis on Comprehensive Performance of Green Buildings*, Renewable Energy Resources and a Greener Future Vol.VIII-4-2, Bejing