

## MANAGEMENT VALUATION AS AN INTANGIBLE ASSET

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*În noua economie cunoștințele sunt principală sursă a valorii și a avantajului competițional. Ca urmare a impactului pe care îl au intangibilele asupra performanțelor organizațiilor managerii acestora au nevoie de modele pertinente care să îi ajute să măsoare eficiența investițiilor în active necorporeale întrucât decizile bazate pe datele tangibile tradiționale nu mai sunt viabile. În urma analizei critice a modelelor de evaluare a intangibilelor pe care literatura de specialitate le oferă, autorii lucrării de față evidențiază caracteristicile managementului ca activ intangibil – poate cel mai important – și de asemenea, propun un model original de evaluare (indicațiori și metodologie de calcul) și optimizare a efectelor asupra valorii companiilor, generate de modul în care sunt conduse organizațiile. Sistemul propus este în concordanță cu principiile promovate la nivel mondial, dar în același timp este adaptat realităților din organizațiile românești, aplicabilitatea lui fiind testată în cazul unei companii românești renumite.*

*Knowledge is the main source of value and competitive advantage in the new economy. Due to the impact of the intangible assets upon the performance of organizations, their managers need adequate models which can help them evaluate the efficiency of investing in non-corporeal assets because the decisions based on the traditional tangible data are not valid anymore. After a critical analysis of those methods of evaluating the intangible assets – methods which are provided by the specialized literature, the authors of the present paper emphasize the characteristics of management as an intangible asset – maybe the most important – and the authors also suggest an original model (indicators and calculus methodology) of evaluation and optimization of the effects upon the companies' value, generated by the way in which organizations are managed. The suggested system is in accordance with the international principles, but, at the same time, it is adapted to the Romanian organizations, its applicability having been tested on a famous Romanian company.*

**Keywords:** intangible assets; management as intangible; valuation methods

### 1. Actual approaches to the measurement and reporting of intangibles

Capital dematerialization is the current process of altering the capital structure by a significant increase of the non-corporeal capital importance. The

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significance of intangible assets for the whole economic system is unanimously accepted and recognized nowadays, as it is obvious that knowledge is both the expression of their value and a source of value for today's economies and companies.

Beyond the controversies regarding the definition and identification of intangible assets, a current problem of the specialized literature and practice of organizations is that of implementing a methodology and some indicators capable of measuring the effects that the intangibles produce upon companies.

Therefore, starting with the 90s, especially in Northern Europe, an increasing number of research institutes and companies started to thoroughly consider the problem of measuring, evaluating and expressing intangible assets, and these efforts have led in the past years to suggesting a lot of theories related to them, creating measuring methods which tend to be applied unitarily as reporting standards.

The most relevant examples are:

#### **Skandia Navigator**

The aim of the *Skandia Navigator* is not only to measure Intellectual Capital, but also to allow analysts to "navigate" among its components, consisting of five areas of interest (financial, customers, processes, human resources, innovation and development) affected by intellectual capital and their interaction over time. the *Skandia Navigator* is probably the most well known and analyzed Intellectual Capital measurement method in the literature to date. Because of its very innovative qualities, it represents a sort of archetype for the class of atomistic/analytical measurement methods.

One critical point of this model is that some of indexes and their values can have different meaning from one organization to another and, in the same time, they don't have a unique signification for all kinds of organizations. Another critical aspect is that the model uses some variables like the number of computers as value determinant, variables that are not relevant, and also the model uses approximate values and just a few monetary indexes. [1] (p. 167 – 173).

#### **The Intangible Assets Monitor**

The *Intangible Assets Monitor* is a diagram model showing a relatively high number of intangible asset indicators in a simplified format. In terms of intangible assets analysis, the model is based on three general areas of interest: innovation and growth; efficiency; stability.

The main weakness of the model is that it does not assign financial values to the intellectual capital. For this reason, Celemi Report add a *Value Added Statement* to the initial model, which includes: value added as a percent of revenues; value added / employee; profit rate etc. It stated that just those

companies which will follow the Celemi example will have success in valuating intellectual capital using this model [2].

### Balanced Scorecard

The basic idea behind the *Balanced Scorecard* is to place alongside traditional financial variables several non-financial operating measures, which are likewise drivers of future financial performance. The traditional variables provide information on the company's past performance, while the non-financial variables can measure, for example, customer satisfaction, internal processes, innovative activities, and improvements made by the company. The combination of financial and operating measures allows managers to obtain a *balanced* view of the company's performance. The Balanced Scorecard is a diagram for measuring a company's performance from four perspectives: *Customer perspective; Internal perspective; Innovation and learning perspective; Financial perspective*.

The *weakness* of this model is referring to its higher rigidity. So, explaining the success through the four perspectives misses the reality that the performance of the company is multiple determined by factors with simultaneous action and also, the external medium can't be limited at customers only. Another problem is that the model requires the intervention of the top-management, fact that can have negative consequences for the decentralization process of the organization. [1] (p. 174 – 181).

### Lev's Knowledge Capital Formula

Lev developed the Knowledge Capital calculation method with the aim of measuring the financial statement impact of knowledge-related investments. The method implies three stages:

1. The first stage in Lev's method is to estimate annual normalized earnings based on "three years of historical year-end results and the conceptual breaking down of these into two distinct components, deriving from the following resource categories, respectively:

- tangible fixed assets and long-term financial assets (including equity investments);
- intangible assets.

2. The second stage in the Lev's method is to identify the portion of normalized annual earnings attributable to tangible assets and the portion attributable to long-term financial assets.

3. The earnings component deriving from intangible assets (the so-called Knowledge Capital Earnings – KCE), which is not shown in the financial statements, is calculated as a residual; in other words, as the result of the difference between total company earnings and the amount of earnings

attributable to tangible and long-term financial assets which was previously estimated.

This approach has several specific *weaknesses*. First of all, we observe that Lev's basic assumption is that earnings can be broken down into two distinct components, one portion attributable to tangible and long-term financial assets, on one hand, and a portion to intangible assets on the other. But earnings are in fact an aggregate, one and indivisible, in that they express the interaction of all the company's resources considered as a unit. A second criticism of Lev's proposed method is directed at the calculation method for the portion of earnings attributable to tangible and long-term financial assets and, as a consequence, for the portion attributable to intangible assets. In fact, there is no unanimous agreement on this calculation method since determining average earnings from tangible and long-term financial assets is highly subjective and so it is difficult to define technically. [1] (p. 165 – 167).

### **Tobin's Q**

Is a method which belongs to a wider category, this of the methods based on the hypothesis that the value of the intangible assets of a company can be calculated as a difference between market value (stock market capitalization) and the company's net book value. "Q" is the ratio between the company's market value and the replacement cost of its intangible assets. When Q is positive – that is, when the intangible assets replacement cost is less than the company's market value – the company enjoys monopoly profits or a higher-than-average return on investment. Obviously, then the higher the Q ratio, the higher the value of the company's Intellectual Capital since, as mentioned, the latter is determined by the difference between the company's market value and its tangible assets value.

*The critique* to this method refers to the volatility of courses on the stock market, aspect that is always out of the company's management control. Another weakness is the possibility that the value of the Q ratio be not determined by the value of intangible assets. For example, if a company uses old technologies it will have a big value of Q, but that is due to the accounting value of the technologies. [1] (p. 161 – 162).

### **IC – Index**

This model belongs to the category of valuating methods of intellectual capital which try to summarize many individual indexes in a single one and to correlate the others in assessing intellectual capital with the market changes. The authors of the model propose that indexes for calculation of *IC – Index* to be chosen in agreement with the strategy of the company and with the nature of its businesses and processes. Regarding the proportion of each index, this must be correlated with the importance of the each type of capital in the company

businesses. The authors appreciate that the company must settle two kinds of indexes: those which evaluate elements which determine the growing of the company value and those which evaluate the performance – the second category are the *key success factors* – KFS. Then, the information about the two categories is put together resulting an expression system of the intellectual capital.

This *method has been criticized* as not having a general applicability at the company level and being very dependant on the context in which the evaluation is made. The index value which is calculated for various companies or for the same company at different moments doesn't allow for comparisons. Another reproach is that the used indicators have approximate values, without measuring units, therefore emphasizing the evolution tendency of the intellectual capital, and not its value. As in the case of many other methods of measuring the intellectual capital, this one is also characterized by a high level of subjectivity concerning the choice of indicators, their weight in the final result and even supposing the fact that this intellectual capital is present or important for the company's activity. [3]

As it is mentioned, each method has its weaknesses and strengths, but it is not the objective of this paper to detail these, so the authors have chosen to conclude this review, with some observations which will sustain the opportunity of our work:

- the specialized literature and the practice provide a lot of models, each one with its strong or weak aspects, but some of the methods of evaluating the intellectual capital are built on the same principles and use the same indicators under different names, so we can say that although there are a lot of models no all of them offer a new perspective on the measuring of the intellectual capital;
- some researchers have developed their theories by analyzing the results of some case studies, others have elaborated certain indicators which they have applied in the practice (as in the *Skandia* case, for example) but without a prior testing of their validity, and others have elaborated sets of indicators which haven't been tested at all. For this reason, another challenge within the study of the intellectual capital is the necessity that the researchers base their conclusion on more empirical research;
- a common weakness for all the models is that they provide an image of the evolution of some indicators but don't create a relationship between the company's value – the main purpose of management - and the evolution of the intangible assets indicators;
- the evidences presented at various conferences prove that these indicators acquire a more and more practical significance, so they must be created to serve this purpose.

*The originality of the present model* consists in the solutions we found in order to reveal the correlation between the managerial performance (measured as the market value of the company) and the value of different indicators used to measure the intellectual capital. So, our model has a more practical importance, compared with the previous models, because it gives the opportunity to the managers to determine the exact contribution of the diverse intangible assets of the company on its performances and, on this basis to find the solutions to optimize them.

## 2. Function of management as an intangible asset

Reviewing the specialized literature, the model we propose has two components. Therefore, we intend in the followings to formulate these two parts pertinently to the case of the management's components optimization.

### a) Determining the objective function by means of a multiple regression

For this purpose, the correlation of the statistical values for the X and Y indicators is used. At first, the analytical methodology of the objective function expression is presented; it is a regression equation.

If we have a statistic selection of "n" volume

$$(Y_t, X_{1t}, X_{2t}, \dots, X_{kt}) \quad \text{with } (1 \leq t \leq n) \quad (1)$$

made upon the vector:

$$(Y, X_1, X_2, \dots, X_k) \quad (2)$$

where Y is the difference between the company's market value and the value of the shareholders' capital from the balance sheet and X – the set of indicators that express the company's objectives and the managerial strategies respectively, then we can write the regression equation for the corresponding hyper plane.

For the linear regression function, like the one which expresses the relationships between X and Y in the case of the management value maximization and the research of its components' optimal values, we'll use the least squares method by means of which we can determine the corresponding  $\theta_0$  and  $\theta_j$  coefficients ( $j = \overline{1, n}$ ) if the statistical selection is given.

We start from the regression hyper plane equation:

$$Y = \theta_0 + \theta_1 X_1 + \theta_2 X_2 + \dots + \theta_n X_n, \quad (1 \leq t \leq n) \quad (3)$$

related to which the  $\theta_0$  and  $\theta_j$  coefficients ( $j = \overline{1, n}$ ) have to be determined, with the help of the values from the statistical selection

The correlation degree is checked with the multiple correlation coefficient  $r$ , which is calculated by means of the following formula

$$r = \sqrt{1 - \frac{S_y^2 (k-n)}{\sigma_y^2 (n-1)}} \quad (k - \text{sample, } n - \text{variables}) \quad (4)$$

where  $S_y$  is the quadratic average variation of the  $Y$  values which were calculated with the adopted equation and  $\sigma_y$  is the quadratic average variation of the statistical values of the sample.

The real restrictions can and have to be different, in accordance with the requirements of the complex management process and with the company's particularities.

In order to formulate the system of necessary restrictions, it is recommended that the model's  $X$  variables be presented in advance. These are, in fact, objectives and strategies which are numerically materialized through the indicators of the company's functioning.

*b) Checking the functioning of the linear model which is used to optimize management as an intangible asset by LP*

The checking of the model which was presented at the end of the previous paragraph involves the following actions:

- A. The quantification of the objective function
- B. Solving the linear programming model intended to optimize the management components.

A. The quantification of the objective function

The objective function of the model starts from the multiple regression equation,

$$Y = \theta_0 + \theta_1 x_1 + \theta_2 x_2 + \theta_3 x_3 \quad (5)$$

where it is necessary to determine the coefficients:  $\theta_0, \theta_1, \theta_2$  and  $\theta_3$ .

As we have already shown, we need a set of statistical observations corresponding to the vector  $(Y, X_1, X_2, X_3)$ .

The correlation degree provided by the relationship is checked.

For this purpose, we should use the formula which provides the correlation coefficient:

$$r = \sqrt{1 - \frac{S_y^2 (k-n)}{\sigma_y^2 (n-1)}}, \quad (6)$$

$k$  – number of observations

$n$  – number of variables

where:

$$S_Y^2 = \frac{\sum_{t=1}^k (Y_t - \bar{Y}_t)^2}{k - n}, \quad \sigma_Y^2 = \frac{\sum_{t=1}^k (Y_t - \bar{Y}_t)^2}{n - 1}, \quad \bar{Y} = \frac{\sum Y_t}{k} \quad (7)$$

The  $r$  correlation coefficient is obtained.

If  $r > 0$ , we have to deal with a direct correlation between variables. The obtained value,  $r = 0.96$ , shows that the correlation degree is high, this meaning that the formula can be used for practical purposes

Providing the model linearity is of great importance in order to ensure its correct practical usage. Therefore, before launching the model into practice, it is necessary to test its linearity. We can apply the statistical method of checking the null hypothesis of the multiple regression coefficients of the model variables. In the case of the above mentioned problem, having 3 independent variables  $X_1$ ,  $X_2$  and  $X_3$ , with the  $r_{X_1}, r_{X_2}, r_{X_3}$  regression coefficients – the formula of checking the null hypothesis of the coefficients is expressed this way:

$$H_0 : r_{X_1} = r_{X_2} = r_{X_3} = 0 \quad (8)$$

If this formula proves right for all the coefficients, it means that the model doesn't fulfill the linearity conditions and, consequently, it cannot be used in practice.

The test checks the null hypothesis, by means of the error method  $\alpha$  which describes the  $P\alpha$  probability of accepting what needs to be rejected. In order to apply this method, we have to formulate an  $F$  indicator such as [4], (p. 474 – 546):

$$F = \frac{Y's \text{ variability explained by means of regression}}{Y's \text{ variability out of regression}} \quad (9)$$

#### B. Solving the linear programming model in the case of management optimization

The  $Y$  objective function is a function of correlation between the value which is added to the tangible capital of the company and its functioning indicators, namely:

$$Y = \theta_0 + \sum_j \theta_j X_j. \quad (j = \overline{1, n}) \quad (10)$$

where  $\theta_0$  is the general correlation coefficient,  $\theta_j$  – the partial correlation coefficients and  $X_j$  – the company's indicators' levels.

This relationship can be maximized by creating a problem (LP) where there is an objective function:

$$\max(Y - \theta_0) = \sum_j \theta_j X_j, \quad (j = \overline{1, n}) \quad (11)$$

which has to be maximized in the case of a system of restrictions such as:

$$\min X_j \leq X_j \leq \max X_j, \quad (j = \overline{1, n}) \quad (12)$$

and the non-negativity restrictions:

$$X_j \geq 0 \quad (13)$$

There can be two LP models for the optimization of the management components which are differentiated by the value of the  $Y=Y_1$  function that refers to the difference of the company's market value and the accounting value of the social capital, in the case of those companies which are quoted on stock exchange, and the  $Y=Y_2$  function – which refers to the cash-flow difference, between the updated cash-flow recorded at the end of the year and the cash-flow projected at the beginning of the year, in the case of those companies which are not quoted on stock exchange. There will also be different  $\theta_0$  and  $\theta_j$  coefficients for the two models. [5] (p. 17 – 79)

### 3. Case study S.C. Bucuresti S.A. Bucuresti

The present case study is based by the data supplied by the company S.C. BUCUREŞTI S.A. Bucureşti, a reference company in Romania in the field of oil and derivate products storage and transport. The subject company is quoted on the capital market, namely on Bucharest Stock Exchange, since 1999.

Evaluating management as an intangible company asset is achieved in agreement with the information that has been presented in the previous chapters where it was studied in detail on a simulated example.

Started from the data provided by the analyzed company, according to the presented calculus relationships, we obtain a table of indicators similar to that one from the “Intangible Assets Monitor” suggested by Erik Sveiby. In accordance with this model, the indicators which could be calculated with the data provided by the company have been classified into three categories:

- *external structure indicators*: income increase; clients who contribute to the improvement of the company's image; income/client; clients' satisfaction index; number of repeated orders; the five most important clients.

- *internal structure indicators*: income from new products; C&D/Income; administrative staff ratio; income/administrative staff; administrative staff rotation; administrative staff length of service; beginners ratio.

- *indicators related to competence*: average professional experience; clients who contribute to the increase of competence; increase of professional competence; specialists with a training of tertiary degree; added value/specialist; marginal added value; employees' satisfaction index; experts rotation; experts length of service; average employees' age.

According to the IAM (Intangible Assets Monitor) model, these indicators have been grouped into types of indicators: increase/renewal indicators; efficiency indicators; stability indicators.

The *algorithm of the process*

### Step 1: Making objectives plans using morphological analysis<sup>3</sup>

We used morphological analysis in order to create some combinations of indexes in such a way that in every combination an index is present from every category and from every group, resulting in 27 combinations, which will be further analyzed.

For simplification, indexes have been marked with letters as: A, B, C – for the external structure indexes; D, E, F – for the internal structure indexes; G, H, I – for the competence indexes. The results were the 27 combinations as in table 1.

Table 1  
The combinations of analyzed indicators

Nr. crt.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
E.S.	A	A	A	A	A	A	A	A	A	B	B	B	B	B
I.S.	D	D	D	E	E	E	F	F	F	D	D	D	E	E
C.	G	H	I	G	H	I	G	H	I	G	H	I	G	H

  

Nr. crt.	15	16	17	18	19	20	21	22	23	24	25	26	27
E.S.	B	B	B	B	C	C	C	C	C	C	C	C	C
I.S.	E	F	F	F	D	D	D	E	E	E	F	F	F
C.	I	G	H	I	G	H	I	G	H	I	G	H	I

E. S. – indicators of external structure;

I. S. - indicators of internal structure;

C - indicators of competence.

### Step 2. Calculation of multiple regressive functions $\hat{Y}_f (f=1,2,\dots,C_n)$ , where

$n=27$

After making the convenient combinations for the indexes on step 1, the regression analysis for determining the objective functions is applied. For every regressive function the following data is entered:

**Input Y** – the index of the management market value, obtained by stock exchange capitalization;

<sup>3</sup> Morphological analysis does allow for reduction, not by reducing the number of variables involved, but by reducing the number of possible solutions through the elimination of the illogical solution combinations in a grid box.

**Output X** – the matrix of independent variables representing the chosen indexes.

In the table 1 was made a primary selection of regressive functions from the point of view of the multiple correlation coefficients R and of significance test F. The regressive functions which have the multiple correlation coefficient equal or more than 0,95 are representative, the error of the prediction being less than 5%.

Thus, from 27 combinations only 4 remained in the optimization and post-optimization calculation, namely the combinations numbered 4, 5, 19 and 25, presented in the table 2:

Table 2

Useful combinations			
Combinations' numbers	Indicators		
4	A	E	G
5	A	E	H
19	C	D	G
25	C	F	G

The indexes closest link with the dependent variable describing the management value is:

- from the external structure category: A – increase of the company's revenues (%), C – customers' contentment index (marks)
- from the internal structure category D – Costs C&D/Revenues (%); E – Revenues per management personnel (million ROL), F – Rotation of the management personnel (%)
- from the personnel competence category: G – Medium professional experience (years); H – Marginal value added (%)

### Step 3: Modelling LP f and resulting max $\hat{Y}_f$

The system modelling by means of the linear programming has in view to optimizing the objective function resulted from the 4 combinations with admissible correlations.

The modelling was done starting from the regressive function coefficients, thus transformed in the objective function coefficients.

The restrictions were limited by the company's management to obtaining at least the indexes' limits from the previous years; the restriction concerning the resources refers to the limitation of the total investments by the amount of 150 billions ROL (about 4.2 million EURO)

The solution needed must maximize the objective function  $\max(Y + 20,450,342.90)$ , expressed in million ROL.

The four systems of the linear programming are:

➤ *Combination 4*

It includes: income increase ( $x_1$  [%]); income per administrative person ( $x_2$  [ROL millions]); average professional experience ( $x_3$  [years]).

Objective function:

$$[\max](Y + 20,450,342.90) = -178,699.91x_1 - 87.07x_2 + 755,388.33x_3$$

System of restrictions:

$$x_1 \geq 0.15; x_1 \leq 0.25; x_2 \geq 2,713.2; x_2 \leq 3,500.0; x_3 \geq 27.5; x_3 \leq 30.0;$$

$$5,000x_1 + 50x_2 + 100x_3 \leq 150,000; x_1, x_2, x_3 \geq 0$$

The solution of this model needs to be determined by means of linear programming.

The solution should maximize the objective function  $\max(Y + 20,450,342.90)$ , expressed in ROL millions.

➤ *Combination 5*

It includes: income increase ( $x_1$  [%]); income per administrative person ( $x_2$  [ROL millions]); marginal added value ( $x_3$  [%]).

Objective function:

$$[\max](Y + 115,540.23) = -536,350.29x_1 + 502.92x_2 - 7,707,693.91x_3$$

$$\text{System of restrictions: } x_1 \geq 0.15; x_1 \leq 0.25; x_2 \geq 2,713.2; x_2 \leq 3,500; x_3 \geq 0.15;$$

$$x_3 \leq 0.25; 5,000x_1 + 50x_2 + 1,000x_3 \leq 150,000; x_1, x_2, x_3 \geq 0.$$

The solution should maximize the objective function  $\max(Y + 115,540.23)$ , expressed in ROL millions.

➤ *Combination 19*

It includes: index of clients' satisfaction ( $x_1$  [mark]); C&D/Income ( $x_2$  [%]); average professional experience ( $x_3$  [years]).

Objective function:

$$[\max](Y + 20,248,997.13) = -207,782.70x_1 - 1,131,748.34x_2 + 768,951.87x_3$$

$$\text{System of restrictions: } x_1 \geq 4; x_1 \leq 5; x_2 \geq 4; x_2 \leq 10; x_3 \geq 27.5; x_3 \leq 30.0;$$

$$1,000x_1 + 12,738x_2 + 100x_3 \leq 150,000; x_1, x_2, x_3 \geq 0.$$

The solution should maximize the objective function  $\max(Y + 20,248,997.13)$ , expressed in ROL millions.

➤ *Combination 25*

It includes: index of clients' satisfaction ( $x_1$  [mark]); administrative staff rotation ( $x_2$  [%]); average professional experience ( $x_3$  [years]).

Objective function:

$$[\max] (Y + 22,187,184.96) = -408,166.04x_1 - 19,442,498.59x_2 + 875,015.18x_3$$

System of restrictions:  $x_1 \geq 4$ ;  $x_1 \leq 5$ ;  $x_2 \geq 1$ ;  $x_2 \leq 2$ ;  $x_3 \geq 27.5$ ;  $x_3 \leq 30.0$ ;

$$1,000x_1 + 50x_2 + 100x_3 \leq 150,000; x_1, x_2, x_3 \geq 0$$

The solution should maximize the objective function  $\max(Y + 22,187,184.96)$ , expressed in ROL millions. (12).

#### Step 4: Solving LP f and resulting $\max \hat{Y}_f$

The solutions resulted by solving the LP problem, as well as its post-optimization, are obtained by means of the EXCEL 10 function, Data Analysis Package included by request. The solving reports are presented in three ways: the first presents the LP solutions, the second the sensitivity analysis and the third the variation limits report. The reports for the 4 combinations selected are shown in the table 3.

Table 3

Results after LP optimization

Comb.	Variables		Variables value after LP optimization	Objective function value after LP optimizaion
	symbol	name	specification	ROL
4	$x_1$	income increase	0.15	1,948,256.25
	$x_2$	income per administrative person	2,713.20	
	$x_3$	average professional experience	30.00	
5	$x_1$	The growth of incomes, (%)	0.15	147,551.87
	$x_2$	Incomes/ administrative personnel (mil. ROL)	2982.00	
	$x_3$	Marginal added value (%)	0.15	
19	$x_1$	Customer satisfaction index, (marks)	4.00	1,943,158.18
	$x_2$	Proportion of R&D expenses from incomes (%)	0.04	
	$x_3$	Professional experience average (years)	30.00	
25	$x_1$	customer satisfaction index (marks)	4.00	486,356.54
	$x_2$	turnover of administrative personnel (%)	0.10	
	$x_3$	professional experience average (years)	30.00	

**Step 5: Calculating  $\Delta\hat{Y}_f = \max\hat{Y}_f - \hat{Y}_f$  and the efficiency of management value optimization  $\varepsilon_{\min}$  and  $\varepsilon_{\max}$**

The problem of determining the efficiency of the optimized solution in regard to the non-optimized solution was approached only for the versions that comply to the conditions imposed by the correlation of the regressive function.

**Step 6: Post-optimizing the “optimum solution” by applying the dual linear model**

The post-optimization is an additional advantage of using the models in the management process. Although the optimum is in the superlative, one can notice that there are yet actions of improving the business performance to be done, even after putting into effect the optimization models. In this instance at least three post-optimization directions can be noted, namely:

1. The post-optimization by the management objectives’ combinatorics,
2. The post-optimization by applying the dual linear model, and
3. The post-optimization by sensitivity analysis of the primary model’s elements.

After modelling the PL problem, it had to be solved. In the sensitivity report created by the SOLVER command from the EXCEL software are shown both the shadow prices and the variation limits for the objective function coefficients, as well as the free terms of the restrictions (RH Side).

**Results of the model implementation**

In the 4<sup>th</sup> combination can be noticed that  $x_1$  – increase of revenues, and  $x_2$  – revenues per management personnel are standing to the inferior restriction limit, while  $x_3$  – medium professional experience is standing to the superior restriction limit.

The difference between the optimized Y according to the PL (1,948,256.25 ROL) and the non-optimized Y (403,572.12 ROL) was calculated to  $\Delta Y = 1,544,684.13$  million ROL to an optimum of resources consumption of 139,410.00 million ROL, which leads to an efficiency between 10.81 and 11.35, meaning that a consumption of 1 ROL brings an increase of management value more than 10 times, with a 95% probability.

In the 5<sup>th</sup> combination can be noticed that  $x_1$  – increase of revenues and  $x_2$  – marginal value added are standing to the inferior restriction limit, while  $x_3$  – revenues per management personnel is standing to a medium value of the restriction limit.

The difference between the optimized and the non-optimized Y was calculated to  $\Delta Y = 403,149.70$  million ROL to an optimum of resources

consumption of 150,000.00 million ROL, which leads to an efficiency between 2.45 and 2.93, meaning that a consumption of 1 ROL brings an increase of management value nearly more than 3 times.

In the 19<sup>th</sup> combination can be noticed that  $x_1$  – customers' contentment index and  $x_2$  – the level of costs C&D in revenues are standing to the inferior restriction limit, while  $x_3$  – medium professional experience is standing to a minimal value of the restriction limit.

The difference between the optimized Y according to the PL and the unoptimized Y is  $\Delta Y = 1,687,065.02$  million ROL to an optimum of resources consumption of 7,509.52 million ROL, which leads to an efficiency between 219.87 and 229.44, meaning that a consumption of 1 ROL brings an increase of management value more than 220 times.

In the 25<sup>th</sup> combination can be noticed that  $x_1$  – customers' contentment index and  $x_2$  – rotation of management personnel are standing to the inferior restriction limit, while  $x_3$  – medium professional experience is standing to a maximal value of the restriction limit.

The difference between the optimized Y according to the LP and the unoptimized Y is  $\Delta Y = 39,027.27$  million ROL to an optimum of resources consumption of 7,005.00 million ROL, which leads to an efficiency between 0.47 and 10.67, meaning that a consumption of 1 ROL brings an increase of management value more than 10 times, if there are maximal chances. The company will not regain the money invested only if there are minimal chances ( $\varepsilon = 0.47$ ).

From the point of view of the shadow prices one can conclude that in any situation, except the 5<sup>th</sup> combination, the increase of the professional experience with 1 year brings an increase of the objective function value between 875,015.18 million ROL (the 25<sup>th</sup> combination), with the optimization maximal efficiency, 768,951.87 million ROL (the 19<sup>th</sup> combination), and 755,388.33 million ROL (4<sup>th</sup> combination).

We can also notice that in three out of the four combinations, namely 4, 19 and 25, the indicator which is maximized in order to obtain the optimum is the average professional experience.

Practically, we can see in three out of four cases that the increase of the company's value is determined by the permanent increase of the employees' professional experience. The conclusions of this study confirm the fact that the most profitable investment is in human resources. They are loyal to the company, they don't come and go very frequently; the average professional experience in the company increases if they are better paid, protected from various kinds of danger and respected.

### **The originality of the model**

The method of the management valuation as an intangible asset and optimization of the management components is described in this form for the first time in the present paper.

Starting from the drawbacks of the methods used internationally to estimate the intangible assets, modelling the problem in the form presented in this paper can eliminate the disadvantages, encouraging the optimization of management components as an intangible asset.

The regressive function hereby proposed in the form of the objective function can be used not only in a static way, as a factor by which the management takes part in a given moment to the new value creation, together with the employees and the shareholders, but also for previsioning the performance for the future, in relation with the planning of new objectives.

An important contribution of this work is that it creates the linear programming model, which attaches to the regressive function a set of restrictions linked by possibilities and resources, which can work for optimizing the management performance.

The research made in this dissertation considers the management not only as a valuable component of the company's assets, which must be taken into account to its market capitalization, but also as an operational instrument for conducting the company's activity.

After the research done within this paper, management is considered to be not only a value component of the company's assets which has to be taken into consideration when the company is revaluated on the market, but also an operational instrument used to manage the company's activity. The well-known "Management by Objectives" method (MBO) acquires, after this research, the form of a coherent mathematical model by means of which one can operate optimizations and post-optimizations in managing business. Combined with the evaluation of the economical efficiency of the optimization efforts, this model represents an important way of improving the economical results and diminishing risks.

The model itself can admit as many variables as possible. A model with a higher number of variables has the advantage to offer a wider range of managerial objectives, which allows for a facilitation of formulating the company's tasks and, consequently, a definite, detailed supervision of their putting into practice. At the same time, this makes the planning activity difficult and stiffens the human action by an exaggerated rigidity due to deadlines and responsibilities. Therefore, in order to obtain a rational formulation of the model, the authors recommend the limitation to a lower number of indicators which have been designated as independent variables in the model, by choosing the most significant ones out of the 32 which have been used by the companies experienced in this field. For

demonstrative purposes, this paper use the model with 3-4 independent variables (objectives), while for the practical projects the models can reach 10-12 objectives.

### **Limitations**

The limits of the model we described derive from three directions:

- 1) The period for which we made our study is 7 years, since the company was quoted on the capital market. That is why we had to limit the variables in the regression function. For a longer period it can be used more variables which can change the results but does not affect the model.
- 2) The results also can be affected by the conjuncturel market factors like international economic trends, political, social factors and so on, which are not taken into account by the model because they are very different from one case to another and cannot be generalized.
- 3) The model was applied just for the one kind of industry and for one company. To make a generalization it is necessary to observe how the model works in different kind of industries (services, public administration, commerce, education), of companies and also different kind of economies.

The limits presented are a start point for the authors and for other researchers to continue the work in this field, because the model can be very useful as a managerial instrument to identify the factors which have an major contribution to the company's value and to optimize them.

### **4. Conclusions**

Unlike the option of other researchers from abroad, who framed the instruments of study for this problem and thus limited to the synoptical charts of indexes for intangibles, from which the "Intangible Assets Monitor" is determinant, this work prefers the calculation method, which evaluates the company's value added by a single cipher, made by the difference between the market value and the assets (re-evaluated). This can be dynamically studied by means of the regressive function which links the management, as an intangible asset, and the company's activity indexes.

Practically, it is acknowledged that in three cases from four the increase of the company's value is made by the increase of the professional experience of the employees. Thus, the conclusions of this study acknowledge that the most profitable investment of the companies is in people. Therefore it is essential, especially taking into consideration the UE admission, for Romanian companies to make all the efforts possible to keep experienced personnel by means of the appropriate remuneration measures.

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