

THE DETERMINATION OF GOODWILL FACTORS CONTRIBUTION USING ECONOMETRIC MODELS BASED ON THE SUBTLE SETS THEORY

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In this paper, we proposed to demonstrate the possibility of correct determination of the goodwill size and the causing factors, through the use of econometric models based on the subtle sets theory.

This thematic approach motivation starts from the fact that this factor, essential for the value of an organization, is presently determined using a methodology which, according to its results, does not respond to the manager's needs for knowledge and information, whose will is not only understanding goodwill's value, but also its contributing factors and, if possible, their weight. The need is especially important for sales organizations where both the seller and the buyer expect to assess a correct price based on the market value of the organization. Starting from this practical requirement, the authors aim to develop and apply econometric models based on fuzzy and subtle sets, which determine the level of goodwill and provide information on the causing factors.

Keywords: *fuzzi sets theory; dynamic index; average index; subtle sets theory, goodwill*

1. Introduction

The goodwill, term with Anglo-Saxon origins adopted in most European countries, is the result of the additional profitability recorded by an organization and is generated by specific elements, particular conditions which it holds in addition to other economic agents in the field. In current Romanian accounting legislation it is being used the concept of commercial fund, which represents the fund trade not listed in the other elements of heritage, but which contributes to the maintenance or development of the organization, such as: the clientage, the commercial good custom, the commercial market, the reputation and other intangible assets. They are recorded in the accounts in a separate account for intangible assets (account 207 "Goodwill").

These intangible factors make an additional profit, higher than the mass interest that would result from investing an amount equivalent to the value of tangible assets. Excess profits, expressed in English language as *goodwill* and known as *survaleur* in French terms, is therefore the result of the additional yield compared with other agents in the field, which will benefit the owner organization. Understanding this excess profit and its causing factors continues to stand as a topic for research professionals. A solution for the correct issue of this problem is, as we mentioned before, the Econometric models based on the theory of subtle sets, which will be detailed in the following pages.

2. Econometric models, based on fuzzy and subtle sets, proposed for the determination of the main factors responsible for goodwill's practicability

To elucidate the role of fuzzy crowds in determining a more precise value of goodwill, we will examine some of the elements involved in obtaining the value of goodwill in a company.

2.1. The employees' loyalty towards the firm

To express the extent to which a worker of rank i , the employee of the company, is faithful to the company, it is introduced a status degree marked $\mu F(i)$ which shows the employee's ownership i to the D property to be true to the company. According to Zadeh's convention, $\mu F \in [0,1]$. This means that a scale was defined in which the highest degree of property membership to be true to the company is 1 and the worst is 0. The degree of belonging can be appreciated considering the worker's behaviour, as an employee of the firm, during all the period of the work contract. In the indefinite sets theory, a criterion easily measurable is being chosen and evaluated. Such a criterion could be the number of extra hours (h_s) performed by the worker from the first day of work up to the present moment of the analysis. In addition, the criterion of fidelity can be expressed by the seniority in the company, the quality of work, workplace discipline. The subtle sets make possible the analysis of all these criterion or a selection of them, whereas the fuzzy sets only accept one criterion analysis.

Turning to the criterion of the number of extra hours, a very simple method of calculating the degree of belonging $\mu F(i)$ based on this criterion could be:

$$\mu F(i) = \frac{h_s^i}{h_s^{\max}}$$

where: h_s^i - the amount of overtime incurred by the worker from time employment until now

h_s^{\max} - the maximum number of extra hours incurred by the worker as an employee of the firm

The fuzzy set AF of the company's loyal employees is the following:

$$AF = \left\{ \begin{array}{l} 1, 2, \dots, i, \dots, n \\ \mu F(1), \mu F(2), \dots, \mu F(i), \dots, \mu F(n) \end{array} \right\}$$

where: $\mu F(1) \geq \dots \geq \mu F(n)$,

$1, 2, \dots, i, \dots, n$ - the employees' rank

The fuzzy sets bring in two subjective elements:

- the choice of criterion that considers the feature analysis (in the given example, the criterion chosen for assessing the fidelity characteristic is the number of hours provided). Experts can change the criterion that allows the determination of the analyzed characteristic depending on the pursued objectives;
- the choice of membership function. Typically, the choice is made by experts.

In order to create a unified theory of fuzzy sets in the last decade of the XX century, the Romanian mathematician from Chisinau, Petre Osmătescu, discovered the subtle sets. A subtle set can be defined, in the simplest way, as a set of fuzzy sets, which define the same feature, but using two different criteria.

In addition, in the case of employees' fidelity towards the firm, it can be observed that other criteria can be taken into consideration to define the same characteristic, of which we mention:

- 1- the seniority in the firm (v);
- 2- the percentage of wage increase offered by another firm, which would cause the employee to leave the current firm for the new company(sp);
- 3- the work discipline showed during the work time (v);
- 4- the degree of cooperation with colleagues, superiors and subordinates (gc).

The four criteria being analyzed it can be concluded that the first two are fuzzy sets and the latter are subtle sets. Therefore, to comply with the definition given, we decompose the criteria 3 and 4 into other small criteria that will lead to the fuzzy sub-set. As an example, the 3rd criterion "work discipline" could be divided into:

- a) the number of unexcused absences (N_a^i);
- b) the number of excused absences (N_i);
- c) scraps, penalties for delayed handing over of papers, imputations and other prejudice brought to the firm (N_p).

For the N number of employees it can be set the maximum number of unexcused absences (N_a^{\max}), the maximum number of excused absences (N_i^{\max}) and the maximum accepted prejudices. For the 4th criterion "cooperation degree" it may be taken a survey among work colleagues, supervisors and subordinates, if necessary. Work colleagues rank j will answer questions of the form: how many years of collaborating? (t_{ij}); if the employee has fulfilled the requested tasks? (p_{sj}^{is}); if the employee helps colleagues in difficulty (D_{ij}); if they had disputes with worker i (L_{ij}); if a further cooperation with the worker I would be willable (C_{ij}). Responses falling into grades corresponding question (e.g. poor, good, very good and small, medium, large, etc.) receive a number of points (+,-). Admitting that 8 workers are being investigated, for each worker is valid the following:

$$NPC_i = \frac{1}{v_i} \sum_{j=1}^n (P_{sji} + D_{ij} + N_{ij} + C_{ij}) t_{ij}$$

By analogy, calculating the number of points allotted to the employee by the superior (NPS_i) and, where applicable, the number of points allotted by the subordinate ($NPSB_i$). It is afterwards calculated the total number of points allotted to the employee, as follows:

$$NPT_i = k_1 \times NPC_i + k_2 \times NPS_i + k_3 \times NPSB_i$$

where $i = (1, 2, \dots, n)$, with k_1, k_2, k_3 are factors of importance given to colleagues, superiors and subordinates ($k_2 > k_1 > k_3$). For employees' set it can determine which is the maximum score NPT_{\max} .

Based on these determinations there can be calculated the degrees of membership for each fuzzy set and subset. Thus, for the work seniority is obtained:

$$\mu_1(i) = \frac{v_i}{v_{\max}}$$

where v_{\max} – the highest work seniority of all company employees.

For the percentage increase S_p^i which determine the employee's decision of requesting the transfer the following is valid:

$$\mu_2(i) = \frac{S_p^i}{S_p^{\max}}$$

where v_{\max} – the percentage that determine even the most faithful employee to transfer.

Furthermore, the employees' degree of belonging depending on the discipline at work that they have proved (based on the a, b, c subsets) is determined. It acknowledges that the compensation

law is multipliable, i.e.:

$$\mu_3(i) = \frac{Na^{\wedge}}{N_s^{\max}} \times \frac{N_i^{\wedge}}{N_i^{\max}} \times \frac{P_b^{\wedge}}{P_b^{\max}}$$

For the degree of cooperation with other persons of the firm three sub-sets were considered (colleagues, superiors and possibly subordinates). In turn, these sub-sets were more analytically divided into five components. A points system was established, which was weighted by age collaboration and a first score was obtained on employees' class. By summing up the scores on employees' class a total score $NPCT_i$ and a maximum total score $NPCT_{\max}$ were obtained. As a result it becomes possible to calculate the degree of cooperation of the employee, as follows:

$$\mu_4(i) = \frac{NPT_i}{NPT_{\max}}$$

The last problem to be solved is the composition of the five levels of membership: $\mu_F(i)$ calculated for the criterion of overtime, which was completed with the grades of membership for the four new criteria (the work seniority in the company, the wage growth that could cause the transfer of employee, discipline at work and the degree of cooperation), which are $\mu_1(i)$, $\mu_2(i)$, $\mu_3(i)$, $\mu_4(i)$. Addressing this issue properly can be done after a long time by creating a system in which many processes take place, which will be listed below.

Firstly, the independence of the considered criteria should be verified (for example - the number of extra hours, the length of employment, the wage growth that could cause the transfer of staff, discipline in work and the degree of cooperation with other employees of the company). To prove this independence 25 coefficients of correlation γ_{ij} , should be calculated taking into account the five criteria. In the first stage, no statistical data needed, it can be done assuming that $\gamma_{ij} = 0$, $(\forall) i \neq j$, $i, j \in \{1, 2, 3, 4, 5\}$ and that for any parameter i the thread is not correlated with any difference.¹ In fact it could be considered a multiplicative type law of composition, according to Cobb - Douglass, i.e.

$$\mu_c(i) = \prod_{i=1}^5 x_i \alpha_i$$

where α_i - exponents which are statistically determined. Before accurately determining these exponents it can be considered that $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 1$.

In the second stage the first estimates of the coefficients of correlation are being performed. If $\gamma_{ij} \neq 0$ significantly, then the variable x_j is replaced with $x_j^1 = x_j^{\gamma_{ij} \cdot \alpha_{ij}}$ because at the initial time $\gamma_{ij}^0 = 1$ $(\forall) i \neq j \Rightarrow \gamma_{ij}^i \neq 0$, $\alpha_j^{(1)} = (1 - \gamma_{ij}^i) \alpha_j$.

Furthermore, by calculating the weight coefficient of correlation in the total amount of these factors, it is estimated the relevance of the criterion. It is calculated $\max \mu_G(i) = \mu_G^{\max}$, $i \in \{1, 2, \dots, n\}$ and $\min \mu_G^{\min}$.

The interval $[\mu_{Gmin}, \mu_{Gmax}]$ is divided into a number of parts, for example, five parts (approximately equal or approximately of geometric progression). When granted a pay rise for loyalty, then it is advisable to apply an incentive system for employees, such as its size being dependent on the degree of global belonging $\mu_G(i)$ associated to person i .

Based on these increases "prices" of loyalty can be calculated, reporting the increase to

¹ If there is an auto-correlation with $\gamma_{ij} \neq 0$, then the number of correlation coefficients is less than 25

the degree of belonging $\mu_G(i)$, but applying a degree of confidence $g(i)$ calculated according to the recommendations above.

The results thus obtained will increase the value obtained by the method ANC property bearing the same name.

2.2. The creative and innovation ability of the organization staff

The existence of such a capacity at the personnel of the organization leads to profit increase by default, and, therefore, to the acquisition of goodwill.

A correct evaluation of the goodwill/ bad will factors of influence in an organization can be made using the method GERT (Graphical Evaluation and Research Techniques) assisted by subtle sets², in which the scores method is applied. For each invention / innovation can be established both the profit increase ΔP obtained from its implementation and the total score PT given by the experts. The result is a statistical indicator of economic efficiency of the organization with rank i and form:

$$\Pi_i^e = \Delta P / PT$$

Similar to this, the organization efficiency of rank I can be assessed taking into account other global criteria such as environmental, ergonomic, psychological, etc.

In the case of multidisciplinary/ interdisciplinary teams of economists, technicians, ecologists, biologists, sociologists, psychologists etc., it can be established the growth of innovation / invention utility applied in the organization of rank i and noted ΔU_i . This way of expressing efficiency will be noted $\alpha_{i,t}^e$, $\alpha_{i,t}^{ec}$, $\alpha_{i,t}^{erg}$, $\alpha_{i,t}^{ps}$ etc. for global environmental, ergonomic, psychological, etc. criteria assessing the rank i organization's activity.

If these criteria are followed in the interdisciplinary dynamics team, efficiency indicators are obtained: $\alpha_{i,t}^e$, $\alpha_{i,t}^{ec}$, $\alpha_{i,t}^{erg}$, $\alpha_{i,t}^{ps}$ etc. where $t \in 1, 2, \dots, T$, and T = the forecast horizon considered by experts. In this case, it is acquired only a partial development of not only global but also analytical performance of all disciplines who have formed interdisciplinary team. Following all developments of partial interdisciplinary teams in the world, it can be obtained a qualitative prediction "close" to the total one, case in which the interdisciplinary team tends towards what philosophers call trans-disciplinarily (cooperation of technical, economic, biological disciplines, etc. leads to positive developments of each of those participating) and exploit the ideas of several scholars of Romanian origin who had significant contributions to the development of world science, such as: Stefan Odoobleja, Petre Osmatescu.

3. Conclusions

The analysis of goodwill calculating possibilities and the determining of causing factors should constitute a research topic of great interest to specialists in the field. In this respect, we consider important to establish and analyze the goodwill generating factors because they provide favorable conditions for the organization to achieve a profit that makes further compete with other companies. To this may be used, as shown in paper, econometric models based on fuzzy and subtle sets theory. By applying these models can be removed the main deficiency of current methods that do not provide information about goodwill generating factors.

² I. Ionita, C. S. Banescu and M. Stoica "Organizational assessment", pag: 173 – 202.

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