ENHANCEMENT OF ASSESSMENT OF THE INTANGIBLE ASSETS OF THE COMPANIES BY MEANS OF SUBTLE SETS

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Abstract: The reason for approaching this topic in our article starts from the fact that the value of goodwill (GW), which is an indicator that expresses the intangible value of the company, that is a factor with essential contribution to the company's market value, is determined through a method which we consider to be imprecise – respectively as difference between the price of sale of the asset and the value estimated by the evaluator. Or, the result obtained by this method is not accurate, and it does not answer the knowledge and information needs of the manager. In this article, we refer to the fact that managers also want to know, besides the GW, the factors that contributed to its achievement and factors that contributed to its achievement and in what percentage. The need appears more important in cases of the sale of companies when both the buyer and the seller are interested in establishing a fair price, based on the market value of the company in question. Starting from this practical requirement, the authors plan to elaborate econometric models based fuzzy set, by which they would determine the right level of the goodwill and to provide information in connection with the generating factors.

JEL Classification Number: G32; **DOI**: http://dx.doi.org/10.12955/cbup.v5.910

Key words: goodwill, fuzzy sets theory; subtle sets theory; movable assets; tangible assets

Motivation

The property that in economics takes the form of capital is subject to some specific processes such as privatization, sale, division, merger, liquidation, etc., processes that create a market of the companies. The accomplishment of any of these processes requires a complex assessment study of evaluation by which to determine an estimated value that will stay at the basis of establishing the asset's alienation price.

The evaluation represents the activity of estimation of the value of an asset, concretized in an evaluation report, performed in accordance with the standards specific to this activity and with the professional deontology, by a certified assessment evaluator. Concretely, by the evaluation of an asset, its market value is established, that is obtained by adding to the value of the tangible assets (tangibles), expressed by the net corrected asset (ANC), the value of intangible assets expressed by the goodwill. (Ioniță et al., 2004)

Stock-in-trade is made up of the aggregate movables and immovable assets, tangible and intangible, used by a trader for developing its activity. They are tangible assets (furniture, stocks, etc.) and intangible assets (company's trademark, goodwill, etc.). Thus, the goodwill in its aggregate is deemed an intangible asset of commercial nature that is however made up of the tangible assets and intangible assets. The intangible assets of the stock-in-trade are divided into groups:

- The assets that are accounted and may be evaluated distinctly. They are recorded individually in the balance sheet and are classified depending on their nature;

- Assets that are not individualized, but are reunited in an aggregate of assets referred to as **goodwill**, accounting notion that is recorded in the balance sheet and of which calculation represents the topic of our article.

The goodwill, according to the accounting provisions from Romania, represents the part of the goodwill that is not recorded within the other patrimony assets, but which competes in maintaining or developing the company's potential. The goodwill represents, in fact, the company's reputation in a certain area, reputation given by the management quality; by the fabrication mark, trade and services; by the company's customers, and by the commercial connections which it maintains in a certain geographic area, etc. The goodwill is an important factor in the processes of procurement or combination of some companies, as it influences favorably or unfavorably the company's purchase price and depending on the accuracy that it was established with. (Ioniță & Stoica, 2009)

If the accounting practice makes a difference between the stock-in-trade and the goodwill, the same is proceeded also in the process of assessment of the goods. The intangible assets are part of the company's patrimony of assets and must be included in the final value established by the evaluator. In

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the methodology used currently by evaluators, intangible assets of the goodwill are not subject to an evaluation and nor of a separate recording in the balance sheet, however, they contribute in maintaining and development the potential of the company's activities. In this context, we appreciate that a fair assessment of a company is only the one including in the final value established by the evaluator and surplus of value or of the goodwill which the goodwill generates and that is calculated with a high degree of accuracy. Also, in the evaluation, it must be taken into account the effect of the synergy of the goodwill, in the meaning that its value is bigger than the sum of the values of its assets taken separately.

As the intangible assets bring additional profit in relation with other companies from the same category, but that don't benefit of the mentioned items and that, as we showed before, determines the goodwill, value of the company (V_0) should be established by adding GW to the value established for tangible assets, respectively ANC, according to the ratio (Ioniță, 2008)

$$V_0 = ANC + GW \quad (1)$$

The calculation of the company's value by this ration presents however a series of deficiencies deriving, as mentioned, from the modality of determining GW of which its dimension is established in the current methodology of assessment as the difference between the purchase price (or the value of contribution of the stock-in-trade) and the updated value of the asset items. The resulted difference is included in the value of the goods that make the purpose of the sale purchase agreement or that is recorded in the account of goodwill, without knowing the factors that determined it and the weight of participating of each of them. Or, such information is essential for the purchaser's information that always aims a clear image over the future profitability of the company. In our appraisal, this objective can be achieved by means of the econometric models based on fuzzy and subtle sets.

Specifications concerning the role of subtle sets and of the fuzzy sets in the company's assessment

In connection with the subtlety concept, we mention that it was treated even since the 16th century by the mathematician Gerolamo Cardano in his work "About subtlety" (Cardano, 1554) published in Latin. In the substantiation of the concept, the author specially emphasized the diagnostic and forecasting analysis, items that made such conception be presented also on the current medical practice.

The fuzzy sets although they were studied before by Lukaisievicz and by Moisil, were only defined in 1965 by Zadeh, so that further on they can be developed by many more authors (Zadeh, 1965). Although there are separated from the concept treated by Cardano, it may be asserted that by the conception treated in his book, Zadeh anticipates the concept of subtle space, putting the basis of a new way of thinking in the activities developed currently in the vital fields of the economic and social life. Thus, by their means, many applications were made in economics, in psychology, and in sociology. In our country, the model fuzzy sets are applied to the evaluation of the companies (Ioniță et al., 2004). In the economic field, in the case of our evaluation, a big interest for the application of the fuzzy sets is represented by the evaluation of the intangible assets. Although they hold an important weight, in the final value of the company, their evaluation is not made by a rigorous methodology, based on mathematic calculations that would assure us that the result is correct. On the contrary, the evaluation process, as it is developed presently, introduces a series of imprecision items that might be corrected by means of fuzzy sets. In order to clarify the role of fuzzy sets in determining with an acceptable accuracy the value of the intangible assets (generating goodwill), we will analyze the possibility of their application to the evaluation of one of the main factors participating in obtaining the goodwill value in a company. We, however, mention that the method proposed by us may be applied with good results also for modelling some activities from other fields of economics, especially those of management. (Mordeson & Davender, 2014)

Methods of evaluation of the inventive – innovative potential of the companies based on fuzzy sets

In accordance with national and international legislation from the field of industrial protection, innovations represents solutions that are applicable to an asset, process, etc. that lead to their perfection, while an invention signifies an original technical solution. The innovation expresses therefore only an improvement with the character of novelty applied to some original technical

solutions. From a legal point of view, the difference consists in rating the term of legal protection as it follows: 10 years for innovations and 20 years for inventions.

The main actions related to the evaluation of the inventive – innovative potential of the companies may classify as follows (Stoica et al., 2006):

- Actions that may be generated by the entire mass of employees of the company;

- Actions that are generated by the company's specialized services (research-development, designing, trials of prototypes, workshops, etc.);

- Actions generated by specialized institutions and experts from outside the company (consulting companies, universities, research-designing institutes, licensors, individuals, etc.), from the country and abroad.

These actions are followed by a series of technical and economic indicators of goodwill that will be evaluated in a positive way and others of bad will that will be negatively valuated. The indicators represent *potential results of effective results.* Obviously, for potential results, smaller degrees of trust will be granted than the effective ones (obtained as a result of determinations from the real economic system and not from the simulated system).

Further on, we disclose the method of evaluation of these results for various stages and compartments.

Evaluation of the innovating potential

An elementary indicator that must be evaluated is the total number of innovators NT_{iv} of which: N_{iv1} represents the number of innovators with a single innovation approved; N_{iv2} – number of innovators with two innovations approved, etc. It is awarded a score for the number of innovators with a single innovation approved P_{iv1}, a score P_{iv2} for the number of innovators with two innovations approves and so on. The total score PT_{iv} for the number of innovators is:

$$PT_{iv} = N_{iv1} \times P_{iv1} + N_{iv2} \times P_{iv2} + \ldots\ldots + N_{ivn} \times P_{ivn} \quad (2)$$

For the proposals of innovations endorsed N_{iv}^{AF} it is awarded a number of points P_{iv}^{AF}, and the total number of points is obtained with the following ratio:

$$PT_{iv}^{AF} = N_{iv}^{AF} \times P_{iv}^{AF} \quad (3)$$

Some of the innovations endorsed affirmatively may enter among those applied immediately N_{iv}^{AI}, and others enter in experimenting N_{iv}^{Aex}. It results that the restriction (4) must be satisfied as a part of the innovations cannot be experimented due to the impossibility of bearing of the experimenting cost by the company:

$$N_{iv}^{AI} + N_{iv}^{Aex} \le N_{iv}^{AF}, \quad (4)$$

Further on, the innovations accepted after experimenting, noted by N_{ivp}^{Aex}, will be applied in the production process, and the others, that prove unfeasible in technical terms or inefficient in economic terms, will be rejected (N_{ivn}^{Aex}). Therefore, the relations expressed in the following ratios will be observed:

$$N_{ivp}^{Aex} \le N_{iv}^{Aex} \text{ and } \quad N_{ivn}^{Aex} = N_{iv}^{Aex} - N_{ivp}^{Aex} \quad (5)$$

Of course, the scores increase as the innovations reach a stage closer to the current production. If we note with P_{iv}^{AI} the score awarded to innovations that may be applied immediately in production with P_{iv}^{Aex} the score awarded to innovations that needs to be experimented and with P_{ivp}^{Aex} the score awarded to innovations that were experimented with success and are applied already to production, then we will have the following restrictions:

$$P_{iv}^{Aex} \le P_{iv}^{AI} \quad and \quad P_{iv}^{Aex} \le P_{ivp}^{Aex} \quad (6)$$

And the total score for experimenting and production will be determined with the ratio:

$$PT_{\exp} = N_{iv}^{AI} \times P_{iv}^{AI} + N_{iv}^{Aex} \times P_{iv}^{Aex} + N_{ivp}^{Aex} \times P_{ivp}^{Aex} \quad (7)$$

There may be also introduced bad-will items for rejected innovations, like:

$$PT_{BW} = -(N_{iv}^{Aexr} \times P_{iv}^{Aexr} + N_{ivrp}^{Aex} \times P_{ivrp}^{Aex}) \quad (8)$$

In which:

N_{iv}^{Aexr} – number of innovations rejected following the experimenting;

P_{iv}^{Aexr} – number of points of penalization for the innovation rejection after experimenting;

N_{ivrp}^{Aex} – number of innovations accepted as feasible after experimenting, but that proved to be inefficient on the basis of the results effectively obtained after application in production;

P_{ivrp}^{Aex} – number of penalizing points for the innovation rejected after application in production;

PT_{BW} – total number of penalizing points for rejected innovations.

Obviously, the restriction will be made up:

$$P_{ivrp}^{Aex} >> P_{iv}^{Aexr} \quad (9)$$

Finally, the score for innovations, totalizing each stage carried out from the scheme and diminished with the badwill is:

$$PT = PT_{iv} + PT_{iv}^{AF} + PT_{exp} - PT_{BW} \quad (10)$$

These scores are added with the technical and economic results obtained following the effective application. A global result might be the profit increase obtained by the company following the application of all these innovations. Be it ΔP of this profit. Then it may be calculated of form- profit indicator obtained on point awarded for innovations, as it follows:

$$\Pi_I = \frac{\Delta P}{PT} \quad (11)$$

For Π_1 it is awarded a score $P_{\Pi 1}$, where: $P_{\Pi 1} > P_{iv}^{AI}$

To the effective profit ΔP, it is granted a degree of trust bigger than the total PT score. It might however, raise the issue of also considering other criteria than the profit, such as for example, ecological, ergonomic, psychological criteria, etc.

Consequently, it might be likely to be calculated a global utility of innovations U_I, by an interdisciplinary team of economists, technicians, psychologists, sociologists, physicians, biologists, etc. In the end, an efficiency indicator $\mathbf{u_I}$ can be calculated that would express the utility of the awarded point, like:

$$u_I = \frac{U_I}{PT} \quad (12)$$

Evaluation of the potential for investments

In an analogical way with those presented for innovations, the total number of inventors among the employees will be established NT_{INV} where:

N_{INV}^1 - number of inventors with a single patented invention;

N^2_{INV} - number of inventors with two patented inventions, etc.

A score P_{INV}^1 is awarded for inventors with a single patent, a score P_{INV}^2 for inventors with two inventions, etc. The total number of points for inventions made by the employees may be determined with the ratio:

$$PT_{INV}^A = N_{INV}^1 \times P_{INV}^1 + N_{INV}^2 \times P_{INV}^2 + ... \quad (13)$$

Further on, it is considered the number of proposals of inventions endorsed affirmatively N_{INV}^{AF} as well as the score awarded for an invention endorsed affirmatively P_{INV}^{AF}, which allows establishing the total score for this category of inventions, as follows:

$$PT_{INV}^{AF} = N_{INV}^{AF} \times P_{INV}^{AF} \quad (14)$$

A part of the inventions endorsed affirmatively may be directly applied (without experimentations) in production; obviously, at the beginning, with an experimental character and then in definitive terms. We will note this category of inventions with N_{INV}^{AI}. Another part, which we note by N_{INV}^{Aex}, require

experimentations for which the company has funds for bearing the costs of prototypes, trials, etc. It still remains a part, noted with N_{INV}^{Anex} of inventions that must be experimented, but for which the company does not have the funds necessary to execute prototypes, trials etc. they will be returned to the authors for finding a financing source or, with their consent, a stock S_{INV}^{Anex} of the uncompleted inventions is made up. Therefore, the following restriction must be checked:

$$N_{INV}^{AI} + N_{INV}^{Aex} + N_{INV}^{Anex} = N_{INV}^{AF} \quad (15)$$

The total score PT_{INV} awarded for these inventions is:

$$PT_{INV} = N_{INV}^{AI} \times P_{INV}^{AI} + N_{INV}^{Aex} \times P_{INV}^{Aex} + N_{INV}^{Anex} \times P_{INV}^{Anex} \quad (16)$$

where: P_{INV}^{AI}, P_{INV}^{Anex}, P_{INV}^{Anex} represents the score awarded for inventions from the appropriate category.

It may be considered $P_{INV}^{Anex} \cong 0,$ taking into account that these inventions were already scored in the ratio that expresses the total number of points awarded to employees, and if the authors will find funds for experimenting and of they will prove as efficient, they will be scored in the ratio that expresses the total number of points awarded for the endorsed inventions.

On the basis of the inventions presented by the employees and experimented by means of the company N_{INV}^{Aex}, a number of prototypes $NPE_1,$ are made, that can be calculated by the ratio:

$$NPE_1 = c_1 \times N_{INV}^{Aex} \quad (17)$$

where: c_1 = average number of prototypes necessary to experiment an invention of the employees.

In an analogical way, NPE_2 is determined, which represents the number of prototypes necessary for experimenting the inventions proposed by the company's research and designing service, by using the ratio:

$$NPE_2 = c_2 \times N_{INV}^{CP}, \quad (18)$$

In which: c_2 = average number of prototypes necessary to experiment an invention made by the company's research and designing service.

After the endorsement and technical and economic analysis of the results of the experimenting, it is obtained a number of prototypes with positive results NPE^{FAV} and another number NPE^{nf} with unfavourable results. For inventions with favourable results $N_{INV1}^{FAV},$ respectively N_{INV2}^{FAV} (of the employees and those of the company's research and designing service) patenting files are drawn out, that are submitted to the competent authorities spending the taxes T_{x1}, respectively T_{x2}. In parallel with patenting, experimental implementation may be started. A technical and economic analysis of the results of the experimental implementation is made and if the results are not favourable, redesigning occurs, and if it is then favourable, final implementation is started.

On the basis of the financial accounting situations, the profit effectively obtained due to the implementation of the inventions P_{INV}^{EF1}, P_{INV}^{EF2} of the employees may be assessed, respectively of the company's research and designing service. The total score of made prototypes PT_{PROT} can be calculated by means of the ratio:

$$PT_{PROT} = NPE_1 \times P_{PROT}^1 + NPE_2 \times P_{PROT}^2 + (NPE^r{}_1 \times P_n^1 + NPE_2^r \times P_n^2), \quad (19)$$

where: P_{PROT}^1, P_{PROT}^2 – the score attached to the experimented prototypes made by employees, respectively by the company's research and designing service;

NPE_1^r, NPE_2^r – number off prototypes that require certain corrections;

P_n^1, P_n^2 – negative score awarded to prototypes that require certain corrections.

The score awarded for successful development of the experimental production of the prototypes PT_{INV}^{PEX} will be determined by the ratio:

$$PT_{INV}^{PEX} = N_{INV1}^{FAV} \times P_{EXP}^{1} + N_{INV2}^{FAV} \times P_{EXP}^{2}, \quad (20)$$

where: $N_{INV1}^{FAV}, N_{INV2}^{FAV}$ – number of prototypes that behave positively (of the employees, respectively of the company's research and designing service);

P_{EXP}^{1}, P_{EXP}^{2} - the score awarded to abovementioned prototypes.

Also, a score P_{PREM} is awarded for each of the N_{INV}^{PREM} inventions that were prized. Finally, the total score generated by inventions PTG_{INV} is:

$$PTG_{INV} = PT_{INV}^{A} + PT_{INV}^{AF} + PT_{INV} + PT_{PROT} + PT_{INV}^{PEX} + (N_{INV}^{PREM} \times P_{PREM} + S_{INV}^{Anex} \times P_{S}), \quad (21)$$

where: P_S the score for the stock of unused inventions (very close to zero).

Another number of points is awarded for the studies drawn out with own forces, of which a part endorsed affirmatively and for the studies paid to consulting companies (only if they are endorsed affirmatively). This score is noted by P_{STUD} and is given by the ratio:

$$P_{STUD} = N_{STUD}^{FP} \times P_{STUD}^{Rf} + N_{STUD}^{AF} \times P_{STUD}^{AF} + N_{STUD}^{CONS} \times P_{STUD}^{CONS} \quad (22)$$

where:

$N_{STUD}^{FP} =$ number of studies made by own forces;

$P_{STUD}^{Rf} =$ the score for the studies made inside the company;

$N_{STUD}^{AF} =$ number of studies endorsed affirmatively;

$P_{STUD}^{AF} =$ the score awarded to studies endorsed affirmatively;

$N_{STUD}^{CONS} =$ number of studies achieved by consulting (paid only if they are endorsed affirmatively);

$N_{STUD}^{FP} =$ the score awarded to studies achieved by consulting.

For the technical and material basis of the technology transfer, the score PB_{TM}, is awarded, that is calculated by the ratio:

$$PB_{TM} = NLC \times PLC + NP \times PP + NPP \times PPP + NAÎP \times PAÎP \quad (23)$$

where: NLC - number of research laboratories;
NP - number of the staff occupied in research-design activities;
NPP - number of prototype projects;
NAÎP - number of prototype trial laboratories.
The patents will be scored as follows:

- For the patents of the inventors among employees (NB_A), that were supported by the company with the payment of taxes T_{x1}, the score (PB_A) is awarded;
- For the patents of the inventors among employees NB_A^S that undertook the tax T_{x1}, the score PB_A^S is granted;
- For the patents obtained on behalf of the company, NB_F and for which it paid the tax T_{x2}, the score PB_F is awarded. The total score for patents PT_B is calculated with the ratio:

$$PT_B = NB_A \times PB_A + NB_A^S \times PB_A^S + NB_F \times PB_F \quad (24)$$

For licenses, a score PT_L is awarded, given by the ratio:

$$PT_L = N_{Lf}^{A} \times P_{Lf}^{A} + N_{Lf}^{S} \times P_{Lf}^{S} + N_{Ln}^{A} \times P_{Ln}^{A} + N_{Ln}^{S} \times P_{Ln}^{S} \quad (25)$$

where: N_{Lf}^{A} = number of autochthon licenses used in the production process;

P_{Lf}^{A} = the score associated to these licenses;

N_{Lf}^{S} = number of foreign licenses used in production;

P_{Lf}^{S} = the score associated to these licenses;

N_{Ln}^{A} = number of unused autochthon licenses;

P_{Ln}^{A} = the score associated to these licenses ($P_{Ln}^{A} \to 0$ or even $P_{Ln}^{A} < 0$).

N_{Ln}^{S} = number of foreign unused licenses;

P_{Ln}^{S} = the score associated to these licenses (usually $P_{Ln}^{S} < 0$).

The total score total for preparing the workforce PTP_{FM} is given by the ratio:

$$PTP_{FM} = NPS_L \times PS_L + NPS_{FP} \times PS_{FP} + hc \times P_{cs} - hg \times Pg, \quad (26)$$

where: NPS_L – number of persons specialized by the licensor;

PS_L - the score awarded for a person specialized by the licensor;

NPS_{FP} - number of persons specialized by own forces;

PS_{FP} - the score awarded for a person specialized by their own forces.

hc - number of hours for conferences achieved by the organization for convincing employees that the technology transfer will be a benefit for employees;

P_{cs} - the score awarded for the conferences organized for convincing employees about the advantages of the technology transfer;

hg - number of strike hours organized by workers as a protest against the technology transfer;

P_g - the negative score for the strikes of protest against the technology transfer.

The profit is forecasted according to the feasibility studies for certain technology transfer projects, that promote inventions or that use purchased licenses. Be it P_p such a profit. The follow-up stage is started during which the effective achieved profit P_r is established. If PT_e represents the total number of points awarded for the technology transfer achieved by the considered feasibility study, then the forecasted profit is calculated on points awarded with the ratio:

$$\Pi_p = \frac{P_p}{PT_e} \quad (27)$$

Or the profit achieved on awarded points:

$$\Pi_r = \frac{P_r}{PT_e} \quad (28)$$

If: $\left|\Pi_p - \Pi_r\right| \le \varepsilon_2$ (where ε = maximum accepted limit as lag between the forecasted level and the one effectively achieved), then for the general score of know-how, a number of points TP_r is added. If, on the contrary, such limit is exceeded, a number of TP_{PEN} points awarded as penalty for non-fulfilment of the provisions from the feasibility study are deducted. The number of these points is established by specialists.

Totalizing all mentioned points gives us a number that estimates the vastness of know-how and with which the patrimonial value of the company will be corrected.

Conclusions

In the current practice, establishing the value of an asset is achieved by using evaluation methods based on tangible and intangible assets. The first one leads to the determination of ANC, and the last ones to the determining the super profit or of the goodwill. The price proposed by the seller is made up by adding to the value of ANC the goodwill value. If the determination of ANC, for which the necessary information is collected from accounting, does not raise special problems, when the accounting is well drawn out, determination of GW complicates the evaluation process, as the

necessary information are not found in the accounting. Such information originates from the subjective assessment of some intangible assets such as the management quality, the good custom, clients' fidelity, etc.

The profit surplus, expressed by the term "goodwill," is, therefore, the result of an additional profitability in relation with the other agents from the field, of which will benefit the owner of the company. As a result, the final value of a company, established by the evaluator, must include the correctly calculated dimension of the goodwill.

In the development of some market economic specific processes, such as the privatization, sale, division, merger, etc. their partners are interested in also knowing the items that generate goodwill, including the weight that they participate. That is why, the analysis of the possibilities of calculation of the goodwill and establishing the factors which they determine, remain a large interest research topic for specialists in the field. There may be use for econometric models based on the theory of subtle sets and of fuzzy sets, as presented in the article. By the application of these models, the main deficiency of the current methods may be eliminated, which on the one hand, does not provide information related to the goodwill generating factors, but on the other hand provides very useful information both for the company's buyer and for its seller.

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