

**DESIGN OF AN ECONOMETRIC MODEL FOR EVALUATION O GOODWILL
FOR COMPANIES LISTED ON REGULATED MARKETS****Veronica GROSU***Stefan cel Mare University of Suceava, 720229, Romania
veronica.grosu@usm.ro***Tabita CÎRDEI***Stefan cel Mare University of Suceava, 720229, Romania***Abstract**

Goodwill is one of the most complex and unclear concepts in financial accounting. It is uncertain what it represents as an asset, it is recognized only in the situation of business combinations and it is subject of depreciation. The aim of this paper is to analyze the causes that determined the significant increase in the importance of intangible assets and especially goodwill in the success of a business and in increasing its global value. The objectives of the research are focused on: highlighting the difference between internally generated goodwill and purchased goodwill; on determining the reasons behind the existence of such controversial opinions regarding the recognition and valuation of goodwill; identifying how goodwill contributes to the deepening of the quantitative difference between the market value and the book value of a company; determining the impact of not presenting goodwill in financial reporting. The obtained results consist in establishing the dependency relationship between goodwill and Insider Holdings, R&D, Capitalized R&D as % of Invested Capital and EV/EBITDA.

Keywords: *book value; goodwill; intangible assets; research and development; the market value of the enterprise*

JEL Classification: *M41*

I. INTRODUCTION

As an economic value, goodwill plays a significant role in determining the value of an entity and has thus become a much-debated issue in recent years that the economic community has tried to delineate in terms of content and structure, separate from other intangible assets. There are companies on the market that have the same production factors but are evaluated and considered at different values due to the influence of these intangible values. The purpose of this paper is to identify a dependency between goodwill and other factors whose variation would have an impact on the change in the value of goodwill.

The most common components of goodwill are: company brands, brand names (as physical brand components), publishing titles, investments in human resource capital (employee knowledge and experience), customer loyalty, company market share, its relations with customers, etc. From this derives the primary objective of the current study, namely to identify a set of factors that influence the variation of goodwill, with the help of which to build a valid econometric model.

The secondary objectives of the research are the following:

- Emphasizing the difference between internally generated goodwill and purchased goodwill;
- Determining the reasons underlying the existence of such controversial opinions regarding the recognition and valuation of goodwill;
- Identifying how goodwill contributes to the deepening of the quantitative difference between the market value and the accounting value of a company;
- Determining the impact of not presenting goodwill in financial reporting.

These objectives were achieved through the three chapters of the present work.

The actuality and importance of the topic is represented by the evolution of the economy and the increase in the importance of intangible assets in a company. The development of technology has significantly contributed to changing the structure of a company's assets. If at first they paid almost exclusive attention to fixed assets, we can see that for some time intangible assets, especially the unidentifiable ones that enter the structure of goodwill, are increasingly of interest to companies.

The fact that two companies possessing the same resources can achieve different results, the market value is in most cases higher than the book value, a company can be acquired at a price far above the book value of its assets, all these are current problems that stand at the basis for supporting the topicality of the theme.

The motivation underlying the choice of goodwill as a research topic was influenced by the significant increase in the importance of intangible assets and especially goodwill in the success of a business and in

increasing its overall value, but also by the fact that we wanted to find answers to a series of questions that we identified, among which we mention:

- What is the impact of goodwill ownership on a company's market value?
- Why would companies try to value an asset that has no position in the financial statements?
- Is it possible to create a new model for assessing the value of internally generated goodwill in such a way as to allow its recognition in the balance sheet, thus eliminating the discrimination between entities that internally produce such intangible assets and those that acquire them?

The motivation for choosing the theme actually represents finding the answers to these questions. Under the methodological report, the scientific approach was carried out in two stages. The first stage is represented by the documentation, necessary to achieve the theoretical approach. In this sense, specialized works were analyzed including the opinions of various scholars related to the evaluation and recognition of goodwill, the impact of its non-presentation in financial reporting and the difference between the market value and the book value and the connection of this difference with the concept of goodwill.

In the fourth section of the work, an applied research is developed, consisting in the modeling of the relationship between goodwill and a series of relevant financial indicators in ensuring the sustainability of the business. In this sense, a database was created in which the values were calculated as the average of each industry with the help of the Excel program offered by the Microsoft suite. Later we entered the data into the statistical program and interpreted the tables with the help of which we were able to identify the dependency relationship between the dependent variable goodwill and the other chosen independent variables.

In order to achieve the aim and objectives of the work, we used research methods, among which we mention:

- the method of non-participatory observation, by illustrating the concepts from the first two chapters from a theoretical point of view;
- the typological method, useful for constructing certain classifications of notions and their characteristics;
- the longitudinal and transversal method, assuming research in time and space.

II. RESEARCH METHODOLOGY

In order to carry out the study, the first stage consisted in the processing of data from the annual financial statements and published reports of companies listed on regulated markets. These companies were analyzed by industry. Later we created a database, and the values were calculated as the average of each industry with the help of the Excel program provided by the Microsoft suite. The main indicators targeted were goodwill, R&D - 5 years ago, Capitalized R&D as % of Invested Capital, EV/EBITDA, insider holdings, and the main goal was to determine how goodwill is influenced by the other mentioned indicators. In this sense, I used the statistical program IBM SPSS Statistics 26 with the help of which I created a multiple regression model. We defined goodwill as the dependent variable and the other indicators mentioned above as the independent variables. Through econometric modeling, we then determined the order of influence of the independent variables on the dependent one, then we wrote the equation of the model, meaning that we rewrote the goodwill with the help of the other variables. The most important part was observing how the independent variables influence the dependent one and finding an explanation to justify this behavior from an economic point of view. Finally, the histogram and P-P Plot were built, after which some conclusions related to the validity of the chosen model were drawn.

III. LITERATURE REVIEW

In accounting practice, reference is always made to the need to pay particular attention to assigning a correct definition of goodwill (Cosmulese, Grosu and Hlaciuc, 2017). The term "goodwill" was originally used to refer to the value created by customer loyalty. One of the earliest definitions of goodwill is that of Lord Elton in 1810, given in the context of a bar in England more than 190 years ago, who defined the notion of goodwill as nothing more than the probability that a customer will appeal to the old place. However, accountants have criticized this definition because it links the notion of goodwill with the idea of place (Qasim, Ayman and Naser, 2013).

The concept of goodwill has changed significantly over time. Its component elements have been subject to change over time, along with the creation of accounting institutions or bodies that regulate their assessment. For a long time, goodwill was considered to be the good and valuable relationship of a business owner with its customers. It was used to reflect the value created through customer loyalty. Goodwill is seen as an important element in a business enterprise. It is perceived as an intangible asset that comes from other intangible assets of the company. Its presence can be indicated by relatively high levels of return on invested capital. Many researchers have defined goodwill as the company's ability to earn excess profit compared to another company. Excess profit is attributed to certain intangible elements of the company that are considered sources of goodwill. These intangible resources enable a company to achieve revenues above those expected (Sacui, 2015).

Among the elements that can be attributed to the notion of goodwill we can list:

- the location of the business and the reputation of the place;
- the reputation, personality and skill of the owner and its employees;
- quality of goods and services;
- use of a business name;
- the use of advertising (Cosmulese et al., 2017).

In the work "Analysis of internally generated goodwill indicators: a case study of the Slovak Republic", the authors identified other elements to which we can link the notion of goodwill. Among these we can list: company reputation; company name; prestige; brand. They claim that goodwill is reflected in the relationship between the company and other market participants, as well as by the perception of the company in the eyes of its customers (Podhorska et al., 2019).

Table no. 1 illustrates other definitions attributed to the concept of goodwill by various authors who have approached this research topic over time.

Table 1. Ways to define goodwill

Author	The year	Definition
Lord Macnaughton	1901	It is a simple thing to describe, difficult to define. Goodwill is the benefit and advantage of a business's own name, reputation and connections.
Leake	1921	Any kind of property such as business connections associated with names, persons and places of business, trademarks, patents and designs, copyrights and the right to exercise monopolies.
Paton	1922	Goodwill represents the ability of the enterprise to create abnormal income.
Nelson	1953	Goodwill refers to favorable attitudes towards an enterprise. It includes the favorable attitude of customers, employees, investors, suppliers, government authorities, politicians and the general public.
Casson	1977	Goodwill is like health - wealth that everyone wants to have, but few are willing to put in the effort to keep.
Hendriksen	1982	Assessing intangible attitudes toward the firm, including employee, supplier, and consumer attitudes.
Grinyer	1990	The value of all valuable intangible assets not identified on the balance sheet.
Arnold	1992	Goodwill is a problem that won't go away.
Maly	2002	Goodwill represents the company's excellent reputation for business partners, financial institutions, the public and customers at home and abroad.
Zelenka	2006	Goodwill represents a company's reputation.
Goodman	2016	None of us can buy goodwill, we have to earn it.
Charlynne	2018	Goodwill is an interdisciplinary issue and an intangible asset.

Source: Podhorska et al., 2019

It can be easily seen that this concept, namely goodwill, has been and still is a topic of interest among economic researchers. Moreover, the multitude of definitions and attempts to clarify this notion, supports the fact that goodwill is a controversial subject.

For a clearer understanding of this concept, it is important to note that the term goodwill can refer to several types of goodwill. Confusion sometimes arises due to the translation from English, since in this language in which the international accounting standards were developed, a single term is used to express different concepts, namely goodwill.

The term "goodwill" is often misinterpreted as the value attributed to the net assets acquired in business combinations that exceeds the net book value of those assets. However, this approach would only work as an adequate interpretation for "secondary-goodwill" (often also called acquired goodwill). Internally generated goodwill (primary-goodwill) on the other hand, often remains neglected probably because it cannot be legally recognized in financial statements in accordance with IFRS or other generally accepted accounting standards (Cevela, 2017).

The term "goodwill", used without other mentions, hides the fact that there are several types of goodwill, such as internally generated, acquired when buying a set of assets or when buying an entity (Nobes, 2021). Table no. 2 sets out the terms used in two language groups for "goodwill" with the specification of the type of goodwill referred to. The first language group comprises the Germanic languages (English, German, Dutch and Swedish) and the second language group comprises four Latin-based languages (Italian, French, Spanish and Portuguese).

Table 2. Terms used for "goodwill" in two language groups

1. Language	2. The daily register	3. Non-entity purchase goodwill, legal term	4. Entity-purchase goodwill, legal term	5. IAS 38 (internally generated) and IFRS 3 (purchased)
English	Goodwill	Goodwill	Goodwill	Goodwill
German	Wohllwollen	Geschäfts- Oder Firmenwert	Geschäfts- Oder Firmenwert	Geschäfts- Oder Firmenwert
Dutch	Welwillendheid	Goodwill	Goodwill	Goodwill
Swedish	Välvilja	(Inkråms)Goodwill	Goodwill	Goodwill
Italian	Buona Volontà	Avviamento	Differenza Da Consolidamento	Avviamento
French	Bonne Volonté	Fonds Commercial	Écart d'acquisition	Goodwill
Spanish (europe)	Buena voluntad	Fondo de comercio	Fondo de comercio	Fondo de comercio
Portuguese (europe)	Boa vontade	Trespasse (old); Goodwill (new)	Diferença de consolidação (old); Goodwill (new)	Goodwill
Portuguese (brazil)	Boa vontade	Ágio por expectativa de rentabilidade futura	Ágio por expectativa de rentabilidade futura	Ágio por expectativa de rentabilidade futura

Source: Nobes, 2017

As can be seen from table no. 2, in English a single term is used for all types of goodwill, namely "goodwill". There is also a close connection between the terms used within each of the two language groups.

Regarding the types of goodwill, two types have already been mentioned in the text. These are:

- purchased goodwill (purchased goodwill, secondary-goodwill);
- internally generated goodwill (internally generated goodwill, primary-goodwill).

Purchased goodwill represents the excess of the purchase price of the acquired business over the fair value of its identifiable net tangible and intangible assets. It arises as a result of mergers and acquisitions (IFRS 3 – Business Combinations) and its assessment is regulated by IFRS 3 Business Combinations. Also, purchased goodwill is subject to an impairment test (IAS 36 - Depreciation of assets) regulated by IAS 36 Depreciation of assets. Internally generated goodwill, unlike the purchased one, cannot be recognized in the financial statements as it does not meet the recognition criteria of an asset (IAS 38 - Intangible assets) imposed by IAS 38 Intangible assets.

This classification of goodwill into two categories is important in order to assign a more precise definition to each type. Internally generated goodwill will be the main subject of interest in this research paper, and the term goodwill used in the following will refer to this type of goodwill. In turn, goodwill (internally generated goodwill) has been defined by many economic researchers. It can be defined as a potential intangible asset of the firm that is expected to generate future economic benefits. It can contribute significantly to the success of a business, and its value can be very high, although it is not directly visible in the financial statements (Podhorska et al., 2019). Also, goodwill could be considered the future excess over a reasonable rate of return (Garcia, Katsuo and Mourik, 2018). Goodwill can be associated with the qualification of employees, customer loyalty, positive relations with business partners, the qualification of top management. It can also include events that have a positive effect on the company (Weissova, 2015).

Goodwill reflects the synergies of a business's net assets and factors related to market imperfections, such as where the business has the ability to earn monopoly profits or where there are barriers to market entry by potential competitors. Internally generated goodwill is the result of synergies in which a company's assets are engaged. These synergies can be grouped into synergies that occur between the firm's assets and synergies that occur between the firm's assets and its environment (Sacui, 2015).

According to the authors Ma and Hopkins, goodwill consists of:

- the current value of the synergistic benefits expected from the interaction of the firm's assets;
- the present value of the synergistic benefits expected from the firm's interaction with its environment (Ma & Hopkins, 1988).

An often cited definition of goodwill is that given by Johnson and Petrone, where the notion of goodwill is explained as the ability of an independent business to obtain a higher rate of return on an organized collection of net assets than would be expected if these assets should be acquired separately (Johnson & Petrone, 1998). We can conclude that the definition of goodwill with reference to internally generated goodwill is consistent with the expected present value of abnormal earnings (residual income model) (Zhang, 2013).

It is important to distinguish the notion of goodwill from the other intangible assets of the firm (Sacui, 2015). In this sense, we will present in table no. 3 main characteristics that make this delimitation possible.

Table 3. Characteristics that distinguish goodwill from other intangible assets

No. crt.	Characteristics	Authors
1.	Goodwill is created internally based on activities undertaken to develop and maintain intangible assets. Goodwill is the result of synergies within a company and certain research and development expenses, improvement of human resources activities, new marketing strategies, which lead to an increase in the value of the company's assets (Johnson & Petrone, 1998).	Johnson, Petrone
2.	Goodwill is the product of the combination of a firm's identifiable tangible and intangible assets. It represents the additional value created by the firm's individual assets as they are used in combination with each other. Goodwill is described as the additional value of the utility assets in the combination. (Johnson, 2005).	Johnson, T.
3.	Goodwill is based on the earning capacity of the company. It represents a firm's ability to earn earnings above the operating value of the firm's other tangible and intangible assets (Sacui, 2015).	Sacui V.
4.	Goodwill is a composite item that is attached to the entire company. It can only be identified with the business as a whole. For this reason, goodwill is considered the most intangible of intangibles (Sacui, 2015).	Sacui V.
5.	Goodwill is not a separable asset. It cannot be transferred without selling the business with which it is associated, which is why goodwill is considered the riskiest component of company value. Johnson and Tearney stated that "if you can sell goodwill, then it is something other than goodwill" (Johnson & Tearney, 1993).	Johnson, Tearney
6.	Goodwill is about the future. Its presence reflects the potential for growth and generating future benefits. It can be created by investors' expectations about future capital expenditures, future mergers and acquisitions, future products and services, future customers or consumers. The presence of goodwill is reflected in higher rates of return on invested capital and purchase premiums paid for companies and their shares (Sacui, 2015).	Reilly, R. F.

Source: Own processing

Currently, goodwill is an invisible asset of the company. Even though it is likely to be present in most companies, it does not appear in the financial statements. From an accounting point of view, goodwill only arises in a business combination when the purchase price exceeds the sum of the fair value of the identifiable assets. Thus, acquired goodwill is recorded, while internally generated goodwill is not, but its economic nature is completely independent of a business combination.

IV. RESULTS AND DISCUSSION

The creation of the database and the processing of economic information had an important role in the creation of an econometric model for establishing a model between the variables goodwill (in millions of dollars), insider holdings, R&D over a period of 5 years (in millions of dollars), capitalized R&D as percentage of invested capital, EV/EBITDA.

In order to analyze the data and to validate the regression type model, the IBM SPSS Statistics 26 program was used. The model we proposed aims to analyze the correlation of dependence between goodwill and the independent variables insider holdings, R&D over a period of 5 years (in millions of dollars), capitalized R&D as a percentage of invested capital, EV/EBITDA according to table no. 4.

Table 4. The analyzes variables

Variables Entered/Removed ^a			
Model	Variables Entered	Variables Removed	Method
1	Insider Holdings, R&D - 5 yearsago (in \$ millions), Capitalized R&D as % of Invested Capital, EV/EBITDA ^b	.	Enter
a. Dependent Variable: Goodwill (in \$ millions)			
b. All requested variables entered.			

Source: Own processing in SPSS 26

The dependent variable goodwill refers to the goodwill reported in the last quarter balance sheet of the

firms, and its value represents an average of all firms in the industry group. The independent variable insider holdings represents an average of the shares held by insiders (managers, directors, founders) expressed as a percentage of the total shares among the companies in the group. R&D represents an estimate of the capitalization of research and development, based on a straight-line amortization period of 5 years. The capitalized value of research and development is added to equity and invested capital. Capitalized R&D as % of invested capital reflects the extent of investment in research and development, relative to investment in more traditional capital expenditure. EV/EBITDA refers to aggregate enterprise value divided by aggregate earnings before interest and taxes, for all firms in the group (enterprise value = market capitalization + total debt - cash). This independent variable represents a multiple of pre-tax operating earnings at which firms trade.

The analysis that we are going to carry out aims to determine the dependency relationship of goodwill in relation to the dynamics of several influencing factors. In this sense, we will use the multiple linear regression model, customized in the work (Melega et al., 2021) and adapted for the indicators analyzed in this study, in the form:

$$Goodwill = \alpha + \beta_1 * Insider\ Holdings + \beta_2 * R\&D5yearsago + \beta_3 * Capitalized\ R\&D\ as\ \% \ of\ Invested\ Capital + \beta_4 * EV/EBITDA + \epsilon$$

Where:

- Goodwill is the dependent variable of the model;
- Insider Holdings, R&D - 5 years ago (in \$ millions), Capitalized R&D as % of Invested Capital, EV/EBITDA are the independent variables;
- α , β_1 , β_2 , β_3 , β_4 are the parameters of the regression model;
- ϵ is the random error variable.

This stage of the research is devoted to the demonstration that the determined model describes the analyzed economic problem, and the degree of confidence is high. It is desired to determine the degree of sensitivity of the dependent variable to the variation of the independent variables.

The value of the correlation ratio is determined in table no. 5.

Table 5. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.994 ^a	.987	.986	\$132,770.42402
a. Predictors: (Constant), Insider Holdings, R&D - 5 yearsago (in \$ millions), Capitalized R&D as % of Invested Capital, EV/EBITDA				
b. Dependent Variable: Goodwill (in \$ millions)				

Source: Own processing in SPSS 26

The Summary table shows us how strong is the influence of the variables we used in the design of the econometric model. R is called the multiple correlation ratio and expresses the intensity between the chosen variables, and R square represents the multiple determination ratio. From the data presented in the table, we notice that both R and R square exceed the threshold of 0.75, so we can say that we have a very strong correlation between variables, of 99.4%, and the variation of goodwill is explained in proportion to 98.7 % of the variation of the independent variables.

Insiders refer to managers, directors, founders. They have access to certain information that outsiders do not have, and the behavior of the first category to increase their shares can be interpreted as a positive signal to attract more external investors, which will lead to an increase in the value of the firm and will also affect the value of the goodwill.

Regarding the EV/EBITDA ratio, we know that it is calculated according to the following formula: EV/EBITDA = (Market cap + net debt)/EBITDA. An increase in its value could mean an increase in the value of the numerator, i.e. an increase in the market cap. Goodwill is by far the major component of market capitalization, hence the correlation between goodwill and EV/EBITDA.

Regarding R&D, we can say that the fair value of technology developed internally through the research and development process is not recorded on the company's balance sheet. The main reason is to look at research and development expenses as operating expenses instead of capital expenses, even though these expenses create benefits over many years. Therefore, the book value of the firm's equity becomes significantly lower than its market value. However, when the firm is acquired by another company, the market value of the new technology enters the acquirer's balance sheet mainly in the form of goodwill (Park, 2019).

If the value of a firm's human resources is higher, technological sensitivity and the knowledge spillover effect can favor information absorption during the R&D process. Also, the enterprise's technical staff who have knowledge in technological fields can increase the opportunity of knowledge integration to create new technologies and develop research and development activities. Such human resources indicate that the integration

of skills and knowledge in an organization can have a positive impact on the research and development activities of the enterprise. Practically, a large investment in R&D presupposes a high degree of knowledge and skills of the employees, and the training and qualification of the staff are among the elements attributed to the notion of goodwill, a fact that justifies the dependence of these variables.

In the paper "Factors affecting firm's R&D investment decisions", the author cites Weerawardena, O'Casey and Julian who argue that a higher degree of innovation (acquired through research and development activities) leads to better brand performance of a company. This once again reinforces that goodwill has a close relationship with R&D investment (Yung, Feng and Hsin, 2015).

Next, we validate the multiple linear model from an econometric point of view through the Anova test in table no. 6.

Table 6. Anova

Model	Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	119660105187536.500	4	29915026296884.125	1697.019	.000 ^b
	Residual	1568890709004.464	89	17627985494.432		
	Total	121228995896540.970	93			
a. Dependent Variable: Goodwill (in \$ millions)						
b. Predictors: (Constant), Insider Holdings, R&D - 5 years ago (in \$ millions), Capitalized R&D as % of Invested Capital, EV/EBITDA						

Source: Own processing in SPSS 26

According to the Anova table, the variance components have the following values: estimated explained variance 119660105187536.500, estimated residual variance 1568890709004.464, and estimated total variance 121228995896540.970. The value of the Fisher test is high, namely 1697.019. The Sig value is significant in accepting the model from an econometric point of view. If its value is less than 0.05 then the multiple linear model is validated in proportion to 95%. In our case, Sig has the value 0 < 0.05, which means that the independent variables chosen have a significant influence in the variation of the dependent variable goodwill, and the multiple regression model chosen is representative.

The next table, table no. 7, includes the coefficients of the model.

Table 7. Model coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error				Beta	Lower Bound
1	(Constant)	19933.437	44004.205		.453	.652	-67501.980	107368.855
	R&D - 5 years ago (in \$ millions)	7.037	.086	.996	82.268	.000	6.867	7.207
	Capitalized R&D as % of Invested Capital	-5827.432	842.049	-.084	-6.921	.000	-7500.567	-4154.298
	EV/EBITDA	619.834	870.702	.009	.712	.478	-1110.233	2349.901
	Insider Holdings	1444.475	2099.325	.009	.688	.493	-2726.840	5615.790
a. Dependent Variable: Goodwill (in \$ millions)								

Source: Own processing in SPSS 26

The table includes the regression parameters of the model with the help of which we can determine the estimated equation, that is, we can rewrite the goodwill according to the analyzed factors. The equation has the following form:

$$Goodwill = 19933.437 + 7.037 * R\&D5yearsago - 5827.432 * Capitalized\ R\&D\ as\ \% \ of\ Invested\ Capital + 619.834 * EV/EBITDA + 1444.475 * Insider\ Holdings$$

Also from the Coefficients table we can read the intervals from which α , β_1 , β_2 , β_3 and β_4 can take values, namely (-67501.980; 107368.855), (6.867; 7.207), (-7500.567; -4154.298), (-1110.233; 2349.901), respectively (-2726,840; 5615,790).

We can also read the values for t related to the independent variables, namely 82.268 related to R&D - 5 years ago, -6.921 related to Capitalized R&D as % of Invested Capital, 0.712 related to EV/EBITDA and 0.688 related to Insider Holdings.

The most important parameter in the table is Sig, because it gives us the order of influence. It helps us see which independent variable most influences the dependent variable goodwill and how it influences it. The variable that registers the lowest value for Sig influences the strongest goodwill, and if several variables have an equal value for Sig, then the order will be established according to the value for t (the variable that has a higher value for t influences the dependent variable more strongly).

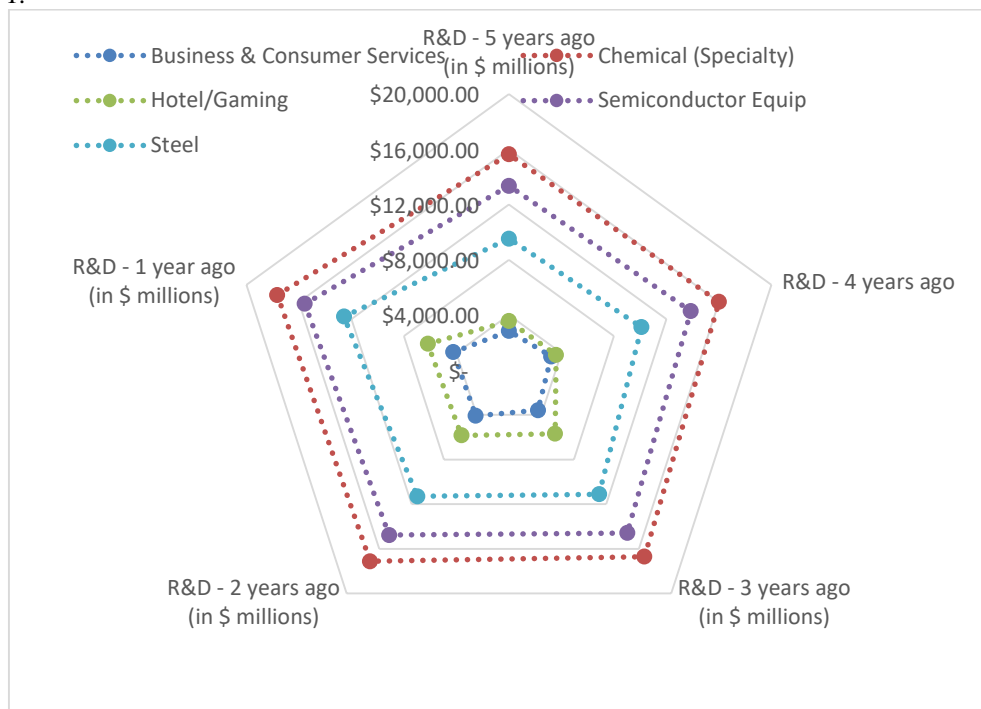
Thus, the order of influence in the case of our model is as follows: R&D - 5 years ago, followed by Capitalized R&D as % of Invested Capital, then EV/EBITDA and Insider Holdings.

From an econometric point of view, the Coefficients table would be interpreted as follows:

- If the value of R&D - 5 years ago increases by one unit, and the other variables remain constant, then goodwill will increase on average by 7.037 units;
- If the value of Capitalized R&D as % of Invested Capital decreases by one unit, and the other variables remain constant, then goodwill will decrease on average by 5827.432 units;
- If the EV/EBITDA value increases by one unit, and the other variables remain constant, then goodwill will increase on average by 619.834 units;
- If the value of Insider Holdings increases by one unit, other variables remaining constant, then goodwill will increase by an average of 1444.475 units.

Research and development expenses represent a sensitive element in the category of intangible investments. In their case, the issue that raises problems is their recognition as either an asset or an expense at the time of production. To establish this, companies are forced to divide the process of generating an intangible asset into two phases, namely: a research phase and a development phase (IAS 38). If an entity cannot distinguish the research phase from the development phase in the creation of an intangible asset, then the expenditure will be treated as having been incurred only in the research phase. Any intangible asset resulting from the research phase should not be recognized in accounting as an intangible asset, but will be recognized as an expense when incurred, because the entity cannot demonstrate that there is an intangible asset that is likely to generate economic benefits in the future. If an intangible asset results from the development phase, it will be recognized as an intangible asset in the balance sheet because the entity can demonstrate that the asset will generate future economic benefits, as the development phase of a project is more advanced than the research phase.

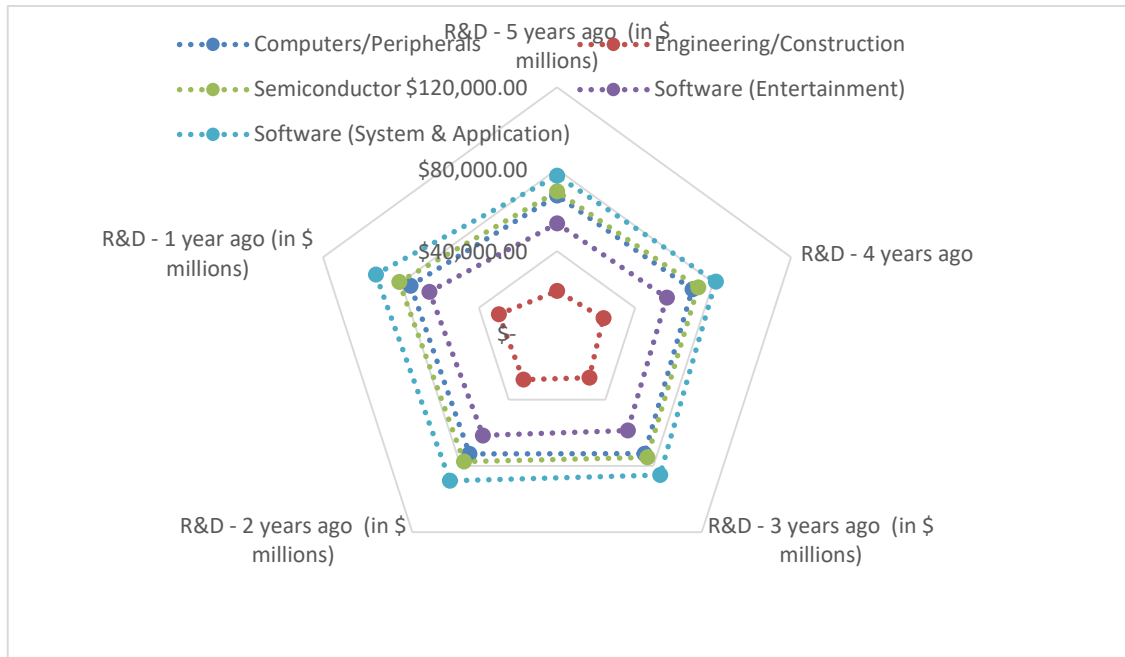
Research and development has shown a growing interest among companies lately, as they realize that this way they could maintain a competitive advantage. We can see the same trend among the industries in our database. They have seen increasing research and development expenditure over the past five years, as can be seen from graph no. 1.



Graph 1 – The evolution of research and development expenses over the last five years

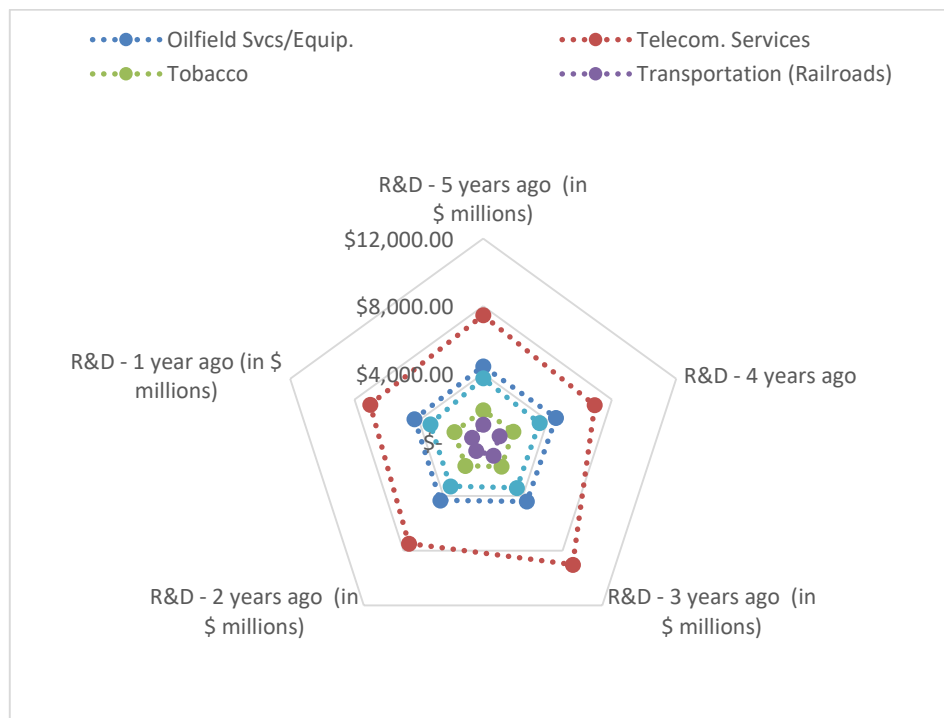
Source: Own processing in Microsoft Excel

The chart shows the upward trend in R&D spending for only five industries in the database for a clear and valid illustration. Also, the growing interest in the research and development process is also supported by chart no. 2 illustrating the R&D evolution of five other industries that have invested considerably larger amounts, even reaching about \$92,000.



Graph 2 - The evolution of research and development expenses over the last five years
Source: Own processing in Microsoft Excel

An important thing to mention is the fact that only at the level of seven industries there was a downward trend in the evolution of research and development expenses, as can be seen from graph no. 3.



Graph 3 - The evolution of research and development expenses over the last five years
Source: Own processing in Microsoft Excel

For the two industries not represented in the graph, the difference in R&D spending between year 5 and year 1 was small, about \$1000 and \$30, respectively. Research and development involves good staff training, the ability of technical staff to use knowledge to develop new technologies. This research and development process may result in the generation of intangible assets resulting from the development phase. All this leads to a market value significantly higher than the book value. Moreover, all these elements are considered factors that contribute to the formation of goodwill. Also, investments in research and development lead to a better performance of a firm's brand (Yung et al., 2015), which will make the market value of a firm exceed its book value when a firm is acquired, which will be reflected in the goodwill of the company acquiring the firm.

Even if no fixed assets are generated from the development process, and internally generated intangible assets cannot be recognized on the balance sheet, they still contribute to the success of the company and, in turn, will be reflected in the acquirer's goodwill in the event of a combination of enterprises. Otherwise, when the capitalized value of R&D as a percentage of invested capital will decrease, then it will adversely affect the value of goodwill. The third influencing variable is EV/EBITDA. It represents aggregate enterprise value divided by aggregate earnings before interest, taxes, and depreciation (enterprise value = market capitalization + total debt - cash). The value of a business can increase due to its reputation, name, brand, which will also have a positive effect on profit before taxes. All of these only contribute positively to the value of goodwill and it is generally accepted in the specialized literature that there is an interdependence between these variables.

As insiders, shareholders have private information about the future value of the firm. They have positive expectations about its future value. Consequently, they would increase their holdings after the recognition of goodwill to maximize their wealth. If shareholders are optimistic about the company's business prospects, they are more willing to increase their holdings to issue good internal information to the outside world, that is, they are optimistic about the company's future development trend. This behavior can also be used as a positive signal to attract more external investors. In this sense, the link between insider holdings and goodwill can be explained (Xiaofang et al., 2021).

Table no. 8 provides information on the residuals, showing how well our model can predict.

Table 8. Residuals Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-\$184,029.6562	\$7,891,906.5000	\$252,946.4333	\$1,134,313.80037	94
Residual	-\$526,593.37500	\$513,226.46875	\$0.00000	\$129,883.76561	94
Std. Predicted Value	-.385	6.734	.000	1.000	94
Std. Residual	-3.966	3.866	.000	.978	94

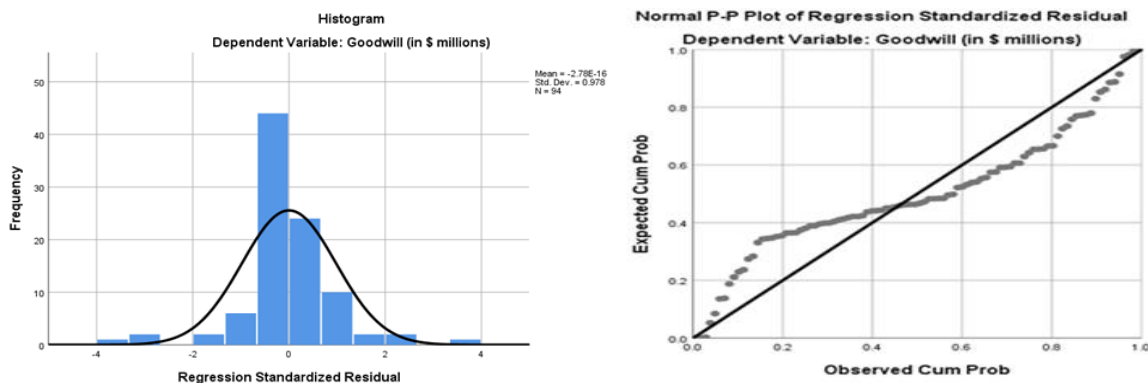
a. Dependent Variable: Goodwill (in \$ millions)

Source: Own processing in SPSS 26

Goodwill is influenced by the independent variables chosen, but sometimes the actual figures may vary from those identified by the multiple regression model. In this sense, the most important values in the table are the minimum value and the maximum value of the residual.

For our model, the minimum point of the residual is -\$526,593.37500 and the maximum point is \$513,226.46875.

Next we present the histogram related to the model illustrated in graph no. 4, as well as the P-P Plot diagram.



Graph 4 – Histogram and P-P Plot Diagram

Source: Own processing in SPSS 26

The histogram represents the curve of the data. This should look as close as possible to Gauss's bell. The

P-P Plot is used to assess whether the distribution of variables is consistent with a specified distribution. If the standardized residuals are normally distributed, the variances should fall on or very close to the normal distribution line.

From our graphs we notice that the histogram is almost uniform, but the distribution is imperfect, just like in the P-P Plot, because goodwill is also influenced by factors other than those used in the model, such as MS (market share), ROE (return on equity), CR (cash ratio), etc.

V. CONCLUSION

Following the analysis carried out, we can state that the chosen independent variables, namely Insider Holdings, R&D - 5 years ago (in \$ millions), Capitalized R&D as % of Invested Capital, EV/EBITDA, have an influence on the variation of the dependent variable goodwill. Thanks to the data provided by the SPSS program, we were able to view the tables that provide important information regarding the values of the multiple correlation ratio R and the multiple determination ratio R square. Both reports recorded very high values, exceeding the 75% threshold, which confirms that the model is compatible. Also, the value recorded by Sig is 0, falling within the limit of 0.05, and the F test > 0, prove that the relationship between the chosen variables exists and is very strong. We cannot omit the fact that the histogram does not have an identical bell shape of Gauss. This proves that there are no perfect models in economics. The imperfection of the curve is also due to the fact that goodwill can be influenced by other factors than those analyzed in the present study.

In conclusion, we note that the value of goodwill recorded by listed companies is dependent on the variation of the independent variables analyzed in our model, namely: Insider Holdings, R&D - 5 years ago (in \$ millions), Capitalized R&D as % of Invested Equity, EV/EBITDA. It is worth noting that the value of research and development expenditure was the first in order of influence, because investments in research and development lead to a better performance of a firm's brand, which will have an effect on its market value and will reflect in the amount of goodwill on the balance sheet of the company acquiring that firm. Also, the presented econometric model is not perfect, because goodwill is also influenced by many other factors whose identification and analysis could represent future research directions.

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