Intangible Assets: Importance in the Knowledge-Based Economy and the Role in Value Creation of a Company

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Abstract: The paper is devoted to the question of how important Intangible Assets (IA) are in today's knowledge-based economy. The latest surveys show that the value of companies is now mostly generated by Intangible Assets, and not by "traditional" assets having a tangible form. The main research objective is to define the impact of fundamental value of both tangible and intangible assets on the market value of assets of Russian companies. As a general approach used herein for IA evaluation, the method of *calculated intangible value* offered by T. Stewart was chosen. Developed econometric models are tested on the data of Russian stock market from 2001 to 2005 year. In the focus of the research there is both the analysis of the sampled companies (43 companies) as a whole as well as divided into five aggregated fields: mechanical engineering, extractive industry, engineering, communication services, and metallurgy. Some suggestions for managing IA in Russian companies are presented in the paper. In conclusion, the main directions for further research in this field are outlined.

Keywords: knowledge-based economy, intangible assets, intellectual capital, valuation, calculated intangible value

1. Introduction: Knowledge Management and intangible assets

In today's economy – knowledge-based economy – the value of goods, services and companies is created not only by tangible assets but mostly by assets based on all kinds of knowledge – Intangible Assets. Results obtained from traditional factors such as labour, land and capital are more and more dependant on effective usage of knowledge and therefore knowledge management.

The main characteristics of knowledge-based economy or intangible economy according to Andriessen (2004) are the following:

- Knowledge replaces labour and capital as fundamental resources in production and intangible assets create a substantial part of the value added of companies;
- The knowledge content of the products and services is growing rapidly;
- The concept of ownership of resources has changed: knowledge resides in the head of employees;
- The organizations have changed and the management of intangible resources is different from tangible or financial resources.

Only about ten years passed since K.Wiig, a guru in the sphere of Intellectual Capital, published his books on the point of Knowledge Management. Now there is a huge amount of works in this field – articles, books, reports which provide not only new scientific information, but also practical recommendations for companies on how to improve their management and results using Intangible Assets. Among them are such famous works as [Prusak, 1997; Davenport, Prusak, 2000], [Nonaka, Takeuchi, 1995], [Stapleton, 2003], [Stewart, 1997] and others.

While the questions on Knowledge Management and Intangible Assets have interested a huge number of scientists from all over the world, only a few Russian scientists pay much attention to this point. Some narrow questions are discussed in works of [Katkalo, 2002, 2003a; Efremov, Hanykov, 2002; 2003] and some surveys on the strategy of a company concerning IA are represented in works of [Tambovtsev, 2000; Klejner, 2002; Kotelkin, Musin, 2003; Milner, 2003; Gurkov, 2004].

In 1959 Penrose E. wrote that a company is both an administrative organization and a set of resources: productive and human. According to Penrose just the resources themselves do not take place in production processes, all resources should be transformed into services. Services are the function of experience and knowledge obtained by a company. This thought was widely developed only in 1980s. And now almost everyone stays to the position of Nonaka and Takeuchi who wrote in their book "The knowledge – creating company" that only those companies that can create knowledge can be successful in today's world.

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The knowledge in today's economy becomes a locomotive that defines the development of the contemporary companies. The successful companies are, undoubtedly, those constantly introducing the innovations based on new technologies as well as on knowledge, experience and attainments of their employees. It is arguable that the value of companies is now mostly generated by Intangible Assets, and not by "traditional" assets having the tangible form.

The surveys reveal that 2/3 American companies have recently turned to pro-active thinking and place a higher emphasis on collection and analysis of non-financial data. The same surveys confirm the fact, that one third of all the effected investment solutions is based on the existing Intangible Assets, and that the decisions made on the basis of Intangible Assets allow to make a more accurate prediction of income and profitability of a company in the future, and, hence, the company's value for the shareholders. The inclusion of the effects connected with the Intangible Assets of a company into the measuring system of the activity results admits making them more efficient, and, therefore, opens the possibility of making executive compensation system more efficient as well.

Even though there does not exist the only one right method for knowledge valuation, nowadays a wide variety of methods are developed. According to the latest surveys only from 6 to 30% of company's value are obtained from tangible assets. Everything else comes from Intangible Assets. That is why about 50% of all investments of companies are made in the sphere of Intangible Assets: R&D, personnel development, infrastructure, etc. [see Fuler, 2002]. That is why it is more and more important for managers to pay attention to Intangible Assets and be able to evaluate them in order to use them more effectively and obtain core competences for their companies.

1.1 The approaches to intangible assets and intellectual capital definition

There exist various approaches to defining the *Intangibles*, *Intangible Assets* and *Intellectual Capital*. Some authors consider these terms to be synonyms, while the others still separate them from each other. Apart from that, a number of authors do not offer any definition, but only separate the basic components, being a part of the concepts referred above. Without claiming the completeness, lets us examine the basic approaches to defining Intangible Assets and Intellectual Capital. At that, we shall firstly give the approaches to the definitions of the concepts, and afterwards consider the composition and structure of Intangible Assets (Intellectual Capital).

According to the opinion of B. Lev, to which the authors of this paper subscribe, the terms Intangible Assets, Knowledge Assets and Intellectual Capital are interchangeable owing to the fact that all three terms are "widely used: Intangible Assets in accounting literature, Knowledge Assets – by economists, Intellectual Capital – in management and law literature; and on the whole they come to the same: to the future benefits that are not embodied materially" (Lev, 2003).

Hence, Intangible Assets, or Intellectual Capital, are defined by B.Lev as "non-physical sources of value (claims to future benefits) generated by innovation (discovery), unique organizational designs, or human resource practices". Intangible Assets, as defined in (Lönnqvist, Mettänen, 2002), are non-material sources of creating a company's value, based on the employees capabilities, organizations' resources, the way of operating and relations with the shareholders. In (Lönnqvist, Mettänen, 2002), as in (Lev, 2003), the terms *Intellectual Capital* and *Intangible Assets* are suggested for interchangeable usage.

The generic definitions presented above may be somewhat concretized. Thus, (Rechtman, 2001) mentions the following definition given by the Financial Accounting Standards Board (FASB), according to which one can refer to Intangible Assets the assets having no material form that appear as a result of (1) *past events* that has a (2) *measurable effect* and that presents a (3) *future benefit*. The similar definition, but referring to *Intangibles* is given in (Bouteiller, 2002), where they are defined as assets arising as a result of past events and possess three main attributes: they are non physical in nature, they are capable of producing future economic net benefits, and they are protected legally or through a de facto right.

As shown earlier, along with *Intangible Assets* concept the term "*Intellectual Capital*" is used. Various definitions of Intellectual Capital are mentioned in (Klein, Prusack, 1994; Edvinsson, Mallone, 1997; Stewart, 1997; Sullivan, 2000). In (Bouteiller, 2002), the definitions of Intellectual Capital existing in literature are generalized, and the following variant is suggested: "Intellectual Capital – is a developmental knowledge that is human, structural, and customer-based, and needs to be aligned with the corporate strategy and formalized / packaged in some way." We would like to separately stress, that in (Bouteiller, 2002), as well as in (Lev, 2003), the concepts of Intangible Assets and Intellectual Capital are synonyms. A.Brooking adheres

to the same position and considers Intellectual Capital as the term given to the combined Intangible Assets which enable the company to function. (Brooking, 1996, p.12).

At the same time, there are quite a number of papers that make a difference between the concepts of Intellectual Capital and Intangible Assets. Thus, in particular, in (Ståhle, Grönroos, 2000, p.192-199), Intellectual Capital concept is divided into potential and realized one, i.e. leading to the increase of Economic Value Added. At the same time, it is accentuated, that Intangible Assets are only a constituent part of the potential Intellectual Capital. In (Starovic, Marr, 2003), a widespread approach is described, under which Intellectual Capital (or Intangibles) is a broader concept than Intangible Assets. In this sense, Intangible Assets are only a part of Intellectual Capital acknowledged as the assets in a company's bookkeeping and accounting records.

The authors assume that narrowing of the Intangible Assets concept only to the assets acknowledged in accounting is unjustified. Such opinion is a result of confusing two different problems. Firstly, what an asset is in general, and secondly, which assets can be acknowledged in accounting and which can not. In view of the fact that under the asset is basically understood any possible future economic benefit, obtained and controlled by a company, as a result of past transactions and events (Volkov, 2006a), then all the elements (tangible or intangible) coming within the above definition appear to be a company's assets.

It is quite another matter, if these elements match the criteria of recognition in bookkeeping and accounting or not. Thus, according to (IFAC 38), "intangible asset is an identifiable non-financial asset, having no physical form and serving for production usage or for providing the goods or services, for leasing to others or for administrative purposes." The Russian accounting standards (PBU 14/2000) supplement the enumerated criteria with a range of conditions for "recognition assets by accounting and bookkeeping as intangible". Consequently, if summarizing the criteria of recognition of Intangible Assets, it appears that any non-financial, non-physical assets that can be divided from other property of the company and having the utility period of (as a rule) more that 12 months may be referred to Intangible Assets.

Thus, the authors' position may be summarized as follows. Any asset, belonging to a company or controlled by it, having no physical or financial (in case of financial investment) form, but capable of producing future economic benefits is an Intangible Asset. The aggregate of Intangible Assets of a company may also be named Intellectual Capital, or Intangibles. At the same time, two subgroups should be distinguished within Intangible Assets: *recognized Intangible Assets* and *non-recognized Intangible Assets* in bookkeeping and accounting (see Figure 1).

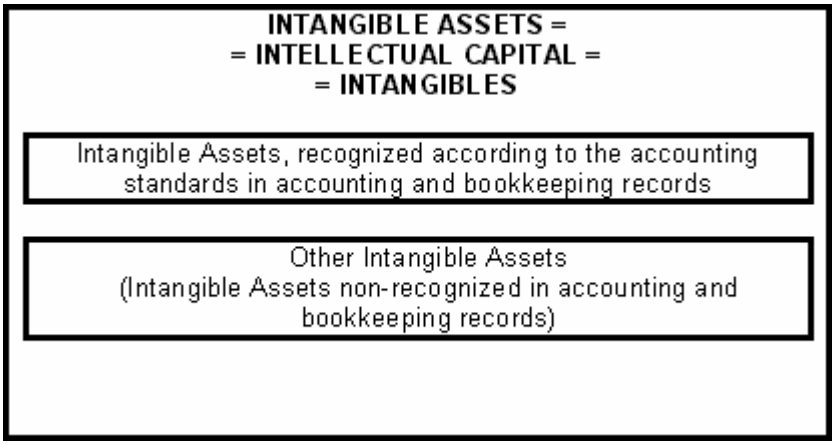

Figure 1: The intangible assets concept

2. Evaluation of intangible assets:

2.1 The method of calculated intangible value

The Intangible Assets evaluation problem is immensely complicated and disputable. Apart from the specific character of the evaluated subject (its intangibility), the difficulty of the problem is connected with the fact that in this case the evaluation models do not only give the numerical evaluation, but also in a certain way determine the essence of the evaluated subject. But it is clear that the problem is really important in the

century of knowledge-based economy when IA have become the most important resources for a company and when they need to be managed in the best way.

A great number of papers are devoted to the problem of Intangible Assets evaluation. The reviews of various approaches to this kind of assets evaluation are presented in the works by [Luthy, 1998; Sveiby, 2002; Bontis, 2001; Petty, Guthrie, 2000; Andrissen, Tissen, 2004]. Besides, some Russian researchers also develop the above problem in their works [Kozyrev, Makarov, 2003; Bukhvalov 2004a; 2004b; 2004c]. The task of this paper does not include the detailed analysis of all existing approaches; therefore we have chosen only one approach for this purpose.

As a general approach used herein for IA evaluation, we have chosen the method of *Calculated Intangible Value (CIV)* offered by T. Stewart [Stewart, 1995]. According to CIV, intangible value of a company is determined as a difference between the company's value (which, in its turn, is determined by the book value of the company's assets and discounted flow of residual operating income) and the possessed value of its tangible assets (determined by the book value of these assets and discounted flow of residual earnings using the average industrial rate of return). This difference characterizes the company's capability to use the Intangible Assets in order to "outrun" the competitors in the industry.

The calculation of Intangible Assets value in accordance with the chosen valuation method (CIV) is based on the residual operating income (REOI) model as a variant of fundamental value of equity model. *Residual operating income* is a net operating income of a company after cost deduction on all company's capital. In this case investments mean book value of net assets (*NA*) of a company. Consequently, we take here the value of net operating income for the income, i.e. the value of income before interest but after taxes (or earnings before interest – *EBI*) and we take the rate of weighed average cost of all capital (*WACC*) — k_w for the required return.

The residual income model, the theoretical evidence in this research area, the practical application of the model, the fundamental works and present-day publications on the point are presented in [Volkov, 2006б, 2005а, 2005б, 2004а; 2004б; Bukhvalov, Volkov, 2005а, 2005б; Volkov, Berezinets, 2006а, 2006б].

As mentioned above, the basis for valuation in this paper is the REOI model:

$$V_E^{REOI_j} = E_0^{BV} + \sum_{j=1}^{\infty} \frac{REOI_j}{(1+k_W)^j} = \left[NA_0^{BV} + \sum_{j=1}^{\infty} \frac{REOI_j}{(1+k_W)^j} \right] - D_0 \ , \qquad (1)$$

where V_E^{REOI} — the fundamental value of equity according to the REOI model;

E_0^{BV}, NA_0^{BV}, D_0 — book value of equity, net assets and debt at the moment (respectively);

$REOI_j$ — residual operating income in year *j*. REOI variant is EVA (economic added value);

k_W — weighted average cost of capital (*WACC*)

The value in square brackets in the formula (1) is a fundamental value of assets according to the REOI model (V_A):

$$V_A^{REOI_j} = NA_0^{BV} + \sum_{j=1}^{\infty} \frac{REOI_j}{(1+k_W)^j} \ . \qquad (2)$$

Here, the residual operating income equals the residual earnings after deducting the cost of invested capital:

$$REOI_j = NOPAT_j - k_W \times NA_{j-1}^{BV} \ , \qquad (3)$$

where *NOPAT* — net operating profit after taxes (also *EBI – earnings before interest*), calculated according to the formula:

$$NOPAT = NI + i \times (1-t), \qquad (4)$$

where *NI* — net income

I — interest

T — income tax rate according to the income statement

If in expression (2) we presume that *REOI* value is constant within infinite research period, (*REOI* = *const*)[1], then model (2) may be presented as:

$$V_A^{REOI} = NA_0^{BV} + \frac{REOI}{k_W}. \quad (5)$$

Let us divide the book value of net assets into two constituents: tangible assets (NA_T) and intangible assets (NA_I). The upper index *BV* means that the assets are taken according to their book value:

$$NA^{BV} = NA_T^{BV} + NA_I^{BV}. \quad (6)$$

Let us presume that intangible assets are not reflected in the balance sheet at all, or their part in the book value is small enough to be neglected. Then, expression (6) transforms as follows:

$$NA^{BV} = NA_T^{BV}. \quad (7)$$

If accepting the presumption (7), model (5) turns into:

$$V_A^{REOI} = NA_T^{BV} + \frac{REOI}{k_W}. \quad (8)$$

Hence, the *REOI* defines the effect obtained by a company from both tangible and intangible assets. The main problem lies in dividing the general effect into constituent factors. In order to solve the problem, we shall set up the following interconnected hypotheses.

Hypothesis 1. The companies referring to the same industry are characterized by approximately similar structure of assets. Therefore we may presume, that one monetary unit invested into tangible assets gives the same return throughout all the companies of the industry.

Hypothesis 2. The intra-branch differences in return of companies are explained only by exclusive intangible assets of each company.

If to accept the mentioned hypotheses, then:

- the return on tangible assets is the same for all companies and equals the average industry return rate;
- the return on intangible assets is the difference between the actual return of a company and average return in industry. In this sense, the effect of intangible assets on general return rate may be either positive (if a company's return rate prevails the average industry return rate), or negative (if opposite).
- From the above, we draw two principal conclusions:
- the fundamental value of a company's equity may be either positive or zero (if the average industry return is larger than or equals null);
- the fundamental value of intangible assets may be either positive or negative, if the average industry return is non-negative.

Accepting the above presumptions, we shall distinguish in the REOI model the effects induced by tangible and intangible assets. For that, we shall re-arrange the expression (3) taking into account the presumption (7) as follows:

$$REOI = NOPAT - k_W \times NA_T^{BV} \pm RONA_{IAVG} \times NA_T^{BV}, \quad (9)$$

where $RONA_{IAVG}$ — industry average return on net assets.

In the result of the re-arrangement we get:

$$REOI = \left[NOPAT - RONA_{IAVG} \times NA_T^{BV}\right] + \left[RONA_{IAVG} \times NA_T^{BV} - k_W \times NA_T^{BV}\right]. \quad (10)$$

Granting (5), expression (11) may be rewritten as follows:

[1] This assumption complies with the allowance of linear information dynamics (*LID*). *LID* is defined as the linear stochastic process, expressing time changes and correlation of accounting and non-accounting variables. *LID* gives forecast for future expected residual earnings value, resting on the actual value of accounting variables and other information at present time. Detailed variants of valuation models under various LID modifications are examined in [Volkov, 2006; Volkov, Berezinets, 2006a, 2006б].

$$REOI = \left[NA_T^{BV} \times \left(RONA - RONA_{IAVG}\right)\right] + \left[NA_T^{BV} \times \left(RONA_{IAVG} - k_W\right)\right]. \quad (11)$$

The expression in the first square brackets of formula (11) may be interpreted as residual operational income generated by intangible assets ($REOI_I$); the expression in the second square brackets – as residual operational income generated by tangible assets ($REOI_T$):

$$REOI_I = NA_T^{BV} \times \left(RONA - RONA_{IAVG}\right), \quad (12)$$

$$REOI_T = NA_T^{BV} \times \left(RONA_{IAVG} - k_W\right). \quad (13)$$

The fundamental value of assets formula (5) subject to (12) and (13) may be presented as:

$$V_A^{REOI} = NA_T^{BV} + \frac{REOI}{k_W} = \left[NA_T^{BV} + \frac{REOI_T}{k_W}\right] + \left[\frac{REOI_I}{k_W}\right] = V_T + V_I, \quad (14)$$

where fundamental value of a company's assets can be divided into the fundamental value of tangible assets (V_T) and intangible assets (V_I) as follows:

$$\begin{aligned} V_T^{REOI} &= NA_T^{BV} + \frac{NA_T^{BV} \times \left(RONA_{IAVG} - k_W\right)}{k_W} = \\ &= NA_T^{BV} \times \left(1 + \frac{RONA_{IAVG} - k_W}{k_W}\right) = NA_T^{BV} \times \frac{RONA_{IAVG}}{k_W}, \end{aligned} \quad (15)$$

$$V_I^{REOI} = \frac{REOI_I}{k_W} = NA_T^{BV} \times \frac{RONA - RONA_{IAVG}}{k_W}. \quad (16)$$

3. The drafting of the research models

Three models of the regression analysis which characterize the correlation between the market-value of assets and the fundamental value of tangible and intangible assets are analyzed in this research.

The market-value of a company's assets can be characterized by such subordination:

$$P_A^M = P_E^M + P_D^M, \quad (17)$$

where P_A^M, P_E^M, P_D^M – the market-value of assets, equity and debt thereafter.

Considering that the market-value of equity is market capitalization (Cap), and the market-value of dept (D) is usually assumed as its book value, equation (17) can be rewritten as:

$$P_A^M = Cap + D. \quad (18)$$

The market-value of assets for the model calculation are appointed as average weighted market capitalization to the content of bids over a period of 2nd quarter, which follows after the accounting year[2], plus book value of dept to the end of the accounting period.

Thereby the single-factor model, where the influence of fundamental value of intangible assets (V_I), which is appointed by the term (16), upon the market-value of assets of a company is shown, looks like the following:

$$P_A^M = \beta_0 + \beta_1 \times V_I + \varepsilon_1, \quad (19)$$

where β_0, β_1 - coefficients of the regression equation

ε_1 - random error;

The model which allows to evaluate the influence of fundamental value of tangible assets (V_T), appointed by the term (15), upon the market-value of a company's assets, looks like the following:

[2] The ground of such method of calculation of market capitalization is represented particularly in [Volkov, 2006b; Volkov, Berezinets, 2006a, 2006b]

$$P_A^M = \lambda_0 + \lambda_1 \times V_T + \varepsilon_2, \quad (20)$$

where λ_0, λ_1 - coefficients of the regression equation

ε_2 - random error

The third model is a two-factor one which includes the influence of fundamental value of both tangible and intangible assets upon the market-value of assets of a company:

$$P_A^M = \mu_0 + \mu_1 \times V_T + \mu_2 \times V_I + \varepsilon_3, \quad (21)$$

where μ_0, μ_1, μ_2 - coefficients of the regression equation

ε_3 - random error

4. Statistical information

The test of hypothesis was held on the sample of Russian companies-emitters, which sell their stocks within the Russian Trade System (RTS). Financial intermediaries (banks and financial institutes) were not included into the sample in order to adhere to the data uniformity. The final sample includes 43 companies. Firstly, three econometric models were checked on the whole sample of the companies, and then separately on each industry. The companies are divided into 6 aggregated industries: mechanical engineering (includes aircraft industry and automobile manufacturing), extractive industry (includes oil holdings and oil-and-gas companies), engineering, communication services, chemical industry and metallurgy (non-ferrous and ferrous metallurgy).

Information of the publicly available nonconsolidated financial accountancy of the companies from 2001 till 2005, accommodated on their sites, was used for analysis. The general content of the sample was 215 firm-years (43 firms during 5 years). At first, this number of firms was analyzed with the help of the approach introduced by Stewart. But after the correction of the approach, which will be described below, 172 firm-years contented the sample.

Primary information about the market capitalization of the researched companies was got from the site of stock exchange RTS (www.rts.ru). An average weighted market capitalization was used in analysis. Market capitalization represented by RTS was recounted into rubles on the average course, because ruble was elected as a currency for all the accounts. One of the most important problems of this analysis that was mentioned above is a problem of weighted average cost of capital (k_W). An average *RONA* for each industry is taken as a value of k_W in this analysis.

General statistical characteristics of the researched sample are represented in Table 1 .

Table 1: General statistical characteristics of the researched sample

№	Name of the variables/characteristic	Mean	Mediana	Standard deviation
1	Market-value of the assets (mlrd.rub)	81 558	17 862	167 988
2	Fundamental value of tangible assets (mlrd.rub.)	62 091	19 841	123 426
3	Fundamental value of intangible assets (mlrd. Rub.)	5 619	– 605	80 202

As it was shown before the method of calculated intangible value (CIV) which was offered by T. Stuart, is used in this research for Intangible Assets valuation. Possibility of the application of this method on the example of Merck company was shown in [Stewart, 1995]. Stewart used an average RONA for 3 years.

Firstly the authors of this paper tried to apply the same method for the research on the Russian market. The models were tested for finding relationship between the average market value of assets of companies and 5-year average fundamental values of tangible and intangible assets. And an average RONA for 5 years was used in order to calculate the fundamental values. But an application of this method showed to be not correct as the size of the sample in the each industry was not big enough.

The authors supposed that in Russian conditions upon the market value of assets in the analyzed year the most influence have fundamental values and respectively RONA of the previous year. By this fact the

relationship between market value of assets of the current year and fundamental values of tangible and intangible assets, based on the parameters of the previous year was analyzed in three introduced models.

5. The results of the research

The 1st stage of the research is an estimation of the regression equation on the whole sample of the analyzed companies-emitters.
The test of the model (19) brings the following results.
The coefficient of determination equals 0,341 and the whole equation and coefficients are significant. Thus with required rate of return being equal 13,44%, the considered equation is:

$$\hat{P}_A^M = 45731{,}8 + 0{,}5201 \times V_I . \quad (22)$$

T-test is used for the analysis of significance of explanatory variables (Student criterion), and F-test (Fisher criterion) is used for testing the models for adequacy. Null and alternative hypotheses are stated in the following way:

$$H_0 : \beta_1 = 0,$$
$$H_1 : \beta_1 \neq 0.$$

If null hypothesis is rejected and the alternative hypotheses is accepted, that means that market value of assets depends on the fundamental value of intangible assets. In our case the calculated value of t-statistics equals 3,84 and with 5% confidence level t-critical equals 1,974. If

$$-t_{crit} < t < t_{crit}$$

is not carried out, null hypothesis should be rejected and the alternative hypothesis should be accepted. That means that the market value of assets of Russian companies depends on the fundamental value of intangible assets.
The regression equation (20), the parameters of which are estimated with the help of Least Square Method, is the following:

$$\hat{P}_A^M = 4823{,}391 + 1{,}1299 \times V_T . \quad (23)$$

There the coefficient of determination equals 0,8044, that means that the obtained regression equation explains for 80,44% the modification of the market value of assets of a company with the help of the fundamental value of its tangible assets. In our case the calculated value of *t* equals 20,82 and the critical one equals 1,974, that means that null hypothesis should be rejected. Thus we can accept the assumption that in Russian conditions the market value of assets of a company depends on the fundamental value of its tangible assets.

So it can be concluded that in Russian conditions the market value of assets of a company depends on fundamental values of both tangible and intangible assets.

The analysis of two-factor model allows us to make the conclusion, in what degree each of the independent parameters influence the dependent one. As the result of the test the following regression equation is obtained:

$$\hat{P}_A^M = 8{,}0923 + 1{,}0966 \times V_T + 0{,}2689 \times V_I . \quad (24)$$

In this case the value of the coefficient of determination and adjusted coefficient of determination have high values (0,8199 and 0,8088 respectively), what says about the tight correlation between the analyzed variables. That means that in Russian conditions the market value of assets of companies for 81,99% depends on the fundamental value of its tangible and intangible assets.

The following hypotheses are formulated in order to test the significance of the explanatory variables, which the model contains:

$$H_0^1 : \mu_1 = 0, \quad H_1^1 : \mu_1 \neq 0$$
$$H_0^2 : \mu_2 = 0, \quad H_1^2 : \mu_2 \neq 0$$

As the test shows, null hypotheses can be rejected on both explanatory variables and that means that the market value of assets of Russian companies depends on fundamental value of both tangible and intangible assets. The results of the analysis concerning model (21) are represented in Table 2.

Table 2: The results of testing two-factor model (21) for the whole sample

№	The name of characteristic	Coefficients	
		m_1	m_2
1	Standard error	0,0529	0,0721
2	t-statistics	20,7	3,73
3	t-critical (5%-confidence level)	1,9741	1,9741
4	The conclusion about null hypothesis according to the results of t-test	To reject	To reject
5	Confidence interval (5%- significance level)		
	lower bound	0,9919	0,1265
	upper bound	1,2013	0,4113
6	F-statistics	73,32	
7	F-critical (5%- significance level)	3,0491	
8	The conclusion about null hypothesis according to the results of F-test	To reject	To reject

The 2nd stage of the research concerns the analysis of models on the sample that is divided into 5 selected industries: mechanical engineering (1), extractive industry (2), engineering (3), communication services (4) and metallurgy (5). Chemical industry was excluded because of the shortage of sample. The results of the analysis of single-factor models (19), (20) and two-factor model (21) are represented in Tables 3–5.

Table 3: The results of testing single-factor model (19)

№	The name of characteristic	Industry				
		(1)	(2)	(3)	(4)	(5)
1	Coefficient of determination R^2	0,1156	0,1038	0,5368	0,4464	0,3821
2	Standard error	0,2333	0,4630	0,1142	0,1188	0,3241
3	Confidence interval (5%- significance level)					
	lower bound	– 0,4004	– 0,3698	0,5556	0,0062	– 1,7962
	upper bound	0,5942	1,5169	1,0162	0,4907	– 0,1867
4	t- statistics	0,42	1,24	6,88	2,09	2,66
5	t-critical (5%-significance level)	2,101	2,032	2,0129	2,0322	2,101
6	The conclusion about null hypothesis according to the results of t-test	To accept	To accept	To reject	To reject	To reject

Table 4: The results of testing single-factor model (20)

№	The name of characteristic	Industry				
		(1)	(2)	(3)	(4)	(5)
1	Coefficient of determination R^2	0,2787	0,7288	0,8418	0,7308	0,8529
2	Standard error	0,2865	0,1212	0,1027	0,1640	0,1146
3	Confidence interval (5%- significance level)					
	lower bound	– 0,0667	0,8182	1,3217	0,7251	0,9335
	upper bound	1,1545	1,3157	1,7359	1,3939	1,5229
4	t- statistics	1,9	8,75	14,88	6,46	8,82
5	t-critical (5%-significance level)	2,101	2,032	2,013	2,032	2,101
6	The conclusion about null hypothesis according to the results of t-test	To accept	To reject	To reject	To reject	To reject

Table 5: The results of testing two-factor model (21)

№	The name of characteristic	Industry				
		(1)	(2)	(3)	(4)	(5)
1	Coefficients of determination					
	— R^2	0,3242	0,7566	0,8425	0,7648	0,8811
	— adjusted R^2	0,0829	0,7166	0,8238	0,7256	0,8386
2	Standard errors					
	— coefficient m1	0,3725	0,1176	0,1762	0,1578	0,1602
	— coefficient m2	0,2739	0,2454	0,1146	0,0797	0,2211
3	t-test (5%-significance level)					
	— t-critical	2,109	2,035	2,014	2,034	2,109
	— t- statistics (m1)	2,08	8,97	9,03	6,37	7,66
	— t- statistics (m2)	– 0,97	2,05	2,44	2,08	1,82
4	The conclusion about null hypothesis according to the results of t-test	To accept	To reject	To reject	To reject	To reject
5	Confidence interval (5%- significance level)					
	— coefficient m1 lower bound upper bound	 – 0,0245 1,5735	 0,8149 1,2954	 1,2363 1,9478	 0,6837 1,3286	 1,0045 1,8312
	— coefficient m2 lower bound upper bound	 – 0,8538 0,3215	 – 0,0475 0,9549	 – 0,2821 0,1803	 0,0032 0,3289	 – 0,1964 0,8939
6	F- test (5%-significance level)					
	— F- critical	3,555	3,2759	3,1996	3,2759	3,555
	— F- statistics	1,34	18,65	44,95	19,51	19,07
7	The conclusion about null hypothesis according to the results of F-test	To accept	To reject	To reject	To reject	To reject

While testing the model (19) the following facts were found out: the relationship between the market value of assets of companies and the fundamental value of intangible assets was better explained in such industries as engineering and communication services where coefficients of determination equal 0,5368 and 0,4464 respectively. A little bit lower the level of correlation between the analyzed variables is in metallurgy, where the coefficient of determination equals 0,3821. Only in these industries null hypothesis is rejected. In all the other industries null hypothesis can not be rejected as the result of the analysis.

The test of model (20) revealed the following fact: the relationship between the market value of assets of companies and the fundamental value of tangible assets was better explained in such industries as metallurgy and engineering. Coefficients of determination for both industries are more than 0,84. Despite of the fact that the value of R^2 in the other industries is a little bit lower, in all the industries, except mechanical engineering, null hypothesis is rejected and the alternative hypothesis is accepted.

And after testing the two-factor model (21) in all the industries, except mechanical engineering, a very close relationship between the analyzed variables was found. Coefficient of determination in all the cases is more than 0,756. Null hypothesis is rejected in all the industries, that means that the market value of assets depends on the fundamental value of tangible and intangible assets in all the researched branches.

We can make a conclusion that on the Russian market the influence of fundamental value of tangible assets on the market value of assets of a company surpasses the influence of fundamental value of intangible assets upon the same parameter.

6. Conclusion

Intangible Assets are a company's "weightless wealth" that helps it to obtain real profit. Every company should understand that nowadays paying much attention to Knowledge Management in general and to

Intangible Assets especially may help to create and develop its core competences and thus yield competitive advantage on the market.

Using the balance-sheet methodology, firm value can be viewed as the sum of values of tangible and intangible assets. More precisely, valuation of a company's tangible assets to access the fair market value needs to be adjusted by the value of intangible assets. These idiosyncratic assets are now of greater importance than those already in place in terms of a company's value creation. Due to the strategic relevance of intangible assets management for a company's competitiveness, understanding the way these assets are converted into value is vital. In particular this understanding should help managers to be able to make better informed decisions with regard to intangible assets allocation and their management.

The tested econometric models show that unfortunately Russian companies still do not consider Intangible Assets as the key factor for success. In all industries it is still more profitable to invest in tangible assets than in intangible ones. One of the main conclusions that can be made is that in Russian economy tangible assets still play a more important role. The econometric results obtained with the significant coefficients confirm the fact that the developed models can be used for defining relationship between market value of assets and fundamental value of both tangible and intangible assets in practice.

It was really interesting to make the first step in Intangible Assets valuation on the Russian market with the help of Calculated Intangible Value method presented by Stewart. The further research in this field will develop not only the direction of testing the researched models for sustainability as statistical information accumulated, but also the direction of developing and testing other models of Intangible Assets valuation in Russian companies. Moreover, the problem of extracting separate elements of Intangible Assets from their aggregate value needs to be solved.

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