INTANGIBLE ASSETS AND ADDED VALUE OF INDUSTRIAL COMPANIES

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ABSTRACT
Investments in intangible assets are an important factor for improving performance of industrial companies, including increase in their added value. In a time of economic transformation, when national strategy is oriented towards creating a value-added economy in Bulgaria, every sectoral and corporate research in this field is relevant and significant. This report analyzes the dynamics of intangible assets and their structural share in non-current assets of industrial companies over the period 2007–2018. It also examines level and dynamics of added value created by these companies and relationship between her and intangible assets. On this basis, there are opportunities to improve the investment strategy of industrial companies.

Key words: intangible assets, value added, investments, industry, companies

INTRODUCTION
Bulgaria is entering a new stage of economic development towards resource-saving growth, dictated by long-term objective factors and conjuncture impact of the coronavirus pandemic. This transformation is aimed to create an economy of added value. The main directions of this multilateral process include following (1):

− Development of science, innovation and technology as incentives for economic development;
− Accelerating digitalization of economy and industry (2) to increase efficiency;
− Creation of new industrial infrastructure through construction of new industrial and high-tech zones and parks.

Investments in intangible assets (IA) are directly related to main guidelines of

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economic transformation. They increase competitiveness of industrial companies (3) and increase added value created by them. According to International Accounting Standards and National Accounting Standards (IAS 38 and NAS 38) (4, 5), an intangible asset is an identifiable non-monetary asset that is an identifiable non-monetary asset without a physical substance. In balance sheets these assets are independent group to which are added following four articles:

1. Property rights.
2. Software products.
3. Development products.
4. Other intangible assets.

MODELS AND RESULTS
In order to study dynamics of investments in non-current assets, including intangible assets and their impact on value added, a sample of 15 industrial companies was made, which perform best on the Bulgarian Stock Exchange, Sofia (6), which suggests that these are the most - successful public companies. The analyzed period is 2007–2018, which covers the base year 2007 pre-crisis year and the next 11-year post-crisis period. The empirical study made it possible to compile **Table 1:**

Table 1. *Dynamics and structure of investments of industrial companies (2007–2018)*

Companies	Non-current assets (thousand BGN)		Intangible assets (thousand BGN)		Relative share: IA / NCA, (%)		
	2007	**2018**	**2007**	**2018**	**2007**	**2018**	**Change (%)**
1. Alkomet AD	113 816	230 061	20	741	0.0002	0.0032	1500.00
2. Sopharma AD	192 534	410 609	750	5 183	0.0039	0.0126	223.08
3. Monbat AD	57 843	131 368	51	274	0.0009	0.0021	133.33
4. Neochim AD	100 551	86 263	17	82	0.0002	0.0010	400.00
5. Yuriy Gagarin AD	40 692	69 771	169	148	0.0042	0.0021	-50.00
6. Hydraulic Elements and Systems AD	10 741	25 948	52	227	0.0048	0.0087	81.25
7. Zaharni zavodi AD	49 368	63 755	22	24	0.0004	0.0004	-
8. M+C Hydraulic AD	27 948	40 726	259	113	0.0093	0.0028	-69.89
9. Lavena AD	3 150	15 481	62	530	0.0197	0.0342	73.60
10. EMKA AD	10 090	15 997	31	24	0.0031	0.0015	-106.67
11. Elhim Iskra AD	10 251	22 258	71	48	0.0069	0.0022	-68.11
12. Korado-Bulgaria AD	4 258	15 119	23	8	0.0054	0.0005	-90.74
13. Sirma Group AD	27 256	117 982	8 966	89 582	0,3290	0.7593	130.79
14. Tchaikapharma AD	31 751	33 594	3 223	2 871	0.1015	0.0855	-15.76
15. Biovet AD	87 693	448 759	15 749	52 287	0.1796	0.1165	-35.13
Total:	767 942	1 727 691	29 465	152 244	0.0384	0.0881	129.43

Source: Authors' own research

Following models were used in compiling the **Table 1:**

1. Increase in non-current assets is defined as follows:

$$G_{nca} = \frac{NCA_t}{NCA_{t-n}} \cdot 100 - 100 \qquad (1)$$

where
G_{nca} – is the growth of non-current assets, (%);
NCA_t – non-current assets for the current year (2018);
NCA_{t-n} – non-current assets for the base year (2007).

2. Increase in intangible assets:
$$G_{ia} = \frac{IA_t}{IA_{t-n}} \cdot 100 - 100 \qquad (2)$$

where
G_{ia} is the growth of intangible assets (%);
IA_t – intangible assets for the current year;
IA_{t-n} – intangible assets for the base year.

3. Relative share of intangible assets in the structure of non-current assets:

$$Rsn_t = \frac{IA_t}{NCA_{t-n}} \cdot 100 - 100 \qquad (3)$$

where
Rsn_t is relative share.

4. Increase in the relative share (%):

$$G_{Rsh} = \frac{Rsh_t}{Rsh_{t-n}} \cdot 100 - 100 \qquad (4)$$

where
G_{Rsh} is growth of the relative share.

The data from **Table 1** show that during the analyzed period investments in non-current assets for all companies increased by 124.98%. At same time, intangible assets increased by outpacing growth: 416.69%. This positive trend is reflected differently in structure of assets. The intangible assets Alkomet AD increased the most, but this increase was due to a very low level of these assets in the base year 2007. For the same reason is the high increase in share of intangible assets of Neohim AD. The growth rate of relative share of these assets of Sopharma AD (7), Monbat AD and Sirma group AD (8) is relatively high. With significantly lower rates rising share of two companies: Hydraulic Elements and Systems AD and Lavena AD (9).

In a company (Zaharni zavodi AD) there is no change in the share of intangible assets in structure of non-current assets (NCA). It actually divides companies into two groups:

Group I – 7 companies with increasing share of intangible assets.
Group II – 7 companies with a decrease in share of IA.

Significant (over 50%) is reduction of this share in four companies: EMKA AD, Korado-Bulgaria AD, M+C Hydraulic AD and Elhim Iskra AD.

The analysis of book value and relative share of IA shows that branch affiliation has a strong influence on structure of investments. There are five companies with relatively high absolute value and relative share of these assets:

IT company Sirma group AD, which has highest share of IA, as in the beginning, and at the end of the period. Sirma group AD is one of largest Bulgarian IT companies, founded in 1992. It specializes in IT technologies and software development, application and system integration. The company creates and develops world-class semantic software, cognitive business solutions, industrial applications, mobile platforms and applications, ERP software, solutions and services for the financial industry, payment services, e-government platforms and more. Within the group, the subsidiaries create unique new products and services in their vertical specialization.

The mission of Sirma group AD is to enable companies to migrate to intelligent enterprise giving them cognitive software platform for intelligent transformation workflow and management transformation.

For 2018, the structure of the company's IA is as follows:
- property rights – 31.99%;
- software products – 0.04%;
- products from the development activity – 66.96%;
- other intangible assets – 1.00%.

Company for the production of feed additives, active substances and finished medicines for animals Biovet AD (10) has its own R&D institute. Development of research has traditionally direction in the company's activities which is confirmed by wide range of products implemented in the production and finding a very good market acceptance in the veterinary practice of almost all countries in the world. Biovet AD is the first pharmaceutical company in Bulgaria that has established and applies a system of total quality management. The structure of the IA for 2018 is as follows:
- property rights – 3.09%;
- software products – 0.41%;

- products from the development activity – 82.37%;
- other intangible assets – 14.13%.

The pharmaceutical company Tchaikapharma AD is in third place in terms of relative share of IA. An unfavorable investment trend has emerged: both the share and the absolute value of the IA are declining. The study shows that in 2018 the following asset structure was formed:
- property rights – 42.76%;
- software products – 0%;
- products from the development activity – 57.24%;
- other intangible assets – 0%.

It is very impressive that all three companies have a very high relative share of R&D products in the structure of intangible assets. Development activities according to international and national standards is implementing research findings or other knowledge to a plan or design for the production of new or substantially improved materials, devices, products, processes or services prior to the commencement of commercial production or use. This activity is expression on the so-called "spillover effect" (11). With this effect a company takes advantage from investment of another company to create a specific innovation.

Lavena AD is in fourth place in terms of relative share of IA. Established in 1962 as a producer of essential oils, the company expanded its operations and produces cosmetics, food additives and hygiene products. Knowing the herbs and the process of extracting precious oils from them, the company became a leading manufacturer of high quality natural products in the country. From its laboratories the company developed new products, which are rapidly moving into production and hence to the growing industrial companies in our country. The structure of the IA in 2018 is as follows:
- property rights – 41.51%;
- software products – 53.40%;
- products from development – 0%;
- other intangible assets – 5.09%.

The largest public pharmaceutical company Sopharma AD is in fifth place in terms of relative share, reporting a high growth in the book value of IA (nearly 7 times). The company is a leading manufacturer and distributor of health-related products. The

business model of Sopharma AD is vertically integrated, passing through the entire chain of activity. The company's strategy is to present more affordable treatment than IA in 2018 is as follows:

- property rights – 71.95%;
- software products – 27.92%;
- products from the development activity – 0%;
- other intangible assets – 0.13%.

In all other surveyed companies the relative share of IA in the structure of intangible assets is lower than 1%. Especially low this share is in three companies: Zaharni zavodi AD, Korado-Bulgaria AD and Neohim AD. This is one of the reasons why these companies reduce their competitiveness and lose important markets.

"Value added" is one of the key indicators of business performance (12, 13). Is considered, that is source of the wealth of company and basis of allocation between different social groups and categories. In practice, it is actually the magnitude of wealth created by company for a certain period of time. Value added is influenced by various factors, including investments in intangible assets. In order to reveal there a relationship between values added, intangible assets and corporate growth in specific conditions of activity of the surveyed companies during the analyzed period is drawn up **Table 2:**

Table 2. Dynamics of value added, intangible assets and corporate growth of industrial companies (2007–2018), %

Companies	Value added	Intangible assets	Corporate growth
1. Alkomet AD	202.73	3 605.00	81.54
2. Sopharma AD	57.61	591.07	87.66
3. Monbat AD	-10.66	437.25	143.14
4. Neochim AD	-61.05	382.35	8.99
5. Yuriy Gagarin AD	-4.74	146.75	88.16
6. Hydraulic Elements and Systems AD	86.85	336.54	46.11
7. Zaharni zavodi AD	19.89	9.09	37.54
8. M+C Hydraulic AD	151.59	-56.37	83.31
9. Lavena AD	476.01	754.84	588.82
10. EMKA AD	71.19	-32.58	58.77
11. Elhim Iskra AD	-7.89	-32.40	25.39
12. Korado-Bulgaria AD	642.53	63.22	122.56
13. Sirma group AD	628.73	899.13	379.94
14. Tchaikapharma AD	64.71	-10.86	90.86
15. Biovet AD	324.89	186.66	310.88
Total:	176.16	262.48*	143.58

Source: Authors' own research

The dynamics of the parameters of the economic development of the industrial companies presented in **Table 2** is determined by the following models:

- Value added growth:

$$G_{VA} = \frac{VA_t}{VA_{t-n}} . 100 - 100 \qquad (5)$$

where
G_{VA} is growth in value added;
VA_t – value added for the t-th year;
VA_{t-n} – value added for the base year.

- Growth of intangible assets is determined by the following model (2);
- Corporate growth is determined by the following model:

$$C_g = \frac{Sc_t}{Sc_{t-n}} . 100 - 100 \qquad (6)$$

where
Cg is corporate growth;
Sc_t – integrated indicator for the size of the industrial company in the t-th year;
Sc_{t-n} – integrated indicator for the size of the industrial company in the base (t-n) year.

The size of the integrated company is determined by the following model:

$$S_c = \sqrt[4]{a.NSR.bVA.cTA.dLE} \quad (7)$$

where
Sc is an integrated indicator of size of the industrial company, defined as a "geometric weighted average" of level of 4 unit indicators;
NSR – net sales revenue;
VA – value added;
TA – total assets;
LE – labor costs (salaries and insurance).
a, b, c, d are coefficients of significance (relative weights) of unit indicators. For the purposes of present study, they are determined in an expert manner, with the following values adopted: a = 0.25, b = 0.35, c = 0.20, d = 0.20. The analysis of data in **Table 2** shows that value added created by all surveyed companies increases significantly: 176.16%, which is over 16% on average per year. Four companies stand out with their very high growth: Korado-Bulgaria AD, Sirma group AD, Lavena AD and Biovet AD. Relatively high is increase in added value two more companies: Alkomet AD and M+C Hydraulic AD. In five companies the growth is low. The result in four companies is unfavorable, as the reduction of added value in Neohim AD is significant – in 2018 this company realized a loss of nearly BGN 20 million. In other three companies in this group (Monbat AD, Elhim Iskra AD and Yuriy Gagarin AD) the decrease was insignificant and was mainly due to a decrease in the financial result.

In determining average growth rate of intangible assets of all companies extremely high growth of Alkomet AD has been eliminated, which is due to the very low book value of these assets in the base year 2007. In addition, for comparability of indicators, the growth of intangible assets is calculated as an unweighted arithmetic mean. For these reasons, growth is lower than that formed on the basis of data in **Table 1.** Nevertheless the growth of intangible assets of all companies is significantly higher that of value added. The comparative analysis of the dynamics of value added and intangible assets by individual companies shows that a certain relationship between them cannot be revealed. In fact, only two companies Sirma group AD and Lavena AD high increase in intangible assets is accompanied by a similar growth in value added. In three more companies (Sopharma AD, Alkomet AD and Hydraulic Elements and Systems AD) growth rates of intangible assets significantly ahead of those of value added. In other companies there are lower rates and opposite changes in level of factor indicator ("intangible assets") and result indicator ("value added").

Besides intangible assets as a factor influencing level of added value the indicator "corporate growth" was studied. The average indicators for all companies reveal a parallel increase of the two indicators: 13% "average annual corporate growth" corresponds to a 16% increase in "value added". Specific analysis on individual companies shows that here is difficult to detect certain dependence. In addition, there is multicollinearity between the two indicators, as value added participates in integrated indicator of the size of the company, and hence – in corporate growth.

As pointed out "value added" is a key indicator to assess the results of each business whose importance is growing steadily. Its level and dynamics are influenced by a large number of factors, which can be symbolically represented by the following model:

$$Y_k = F\left(\sum_{i=1}^{m} a_i X_i - \sum_{j=1}^{n} b_j X_j\right)$$

where
Y_k is the added value of the company;
X_i – level of the i-th stimulating factor;
a_i – coefficient of influence (significance) of the i-th factor;
X_j – level of the j-th retention factor;
b_j – coefficient of influence (significance) of the j-th retention factor.

In the mathematical model (8) factors affecting the added value is divided into two groups:

      Group I – stimulating growth of added value;
      Group II – holding back increase in value added.

For its part each of these groups is divided into two subgroups:
- external factors that are outside the company;
- internal factors, deriving from the company's activity.

The main goals of managers in value added management should be aimed at the following:
- − maximizing the power of influence of internal stimulating factors;
- − elimination or reduction of the power of internal influence retention factors;
- − the possible catalyzing effect of external stimulating factors;

- − the possible neutralization of the influence of external restraining factors.

The main components of value added management can be represented by the following graphical model – **Figure 1:**
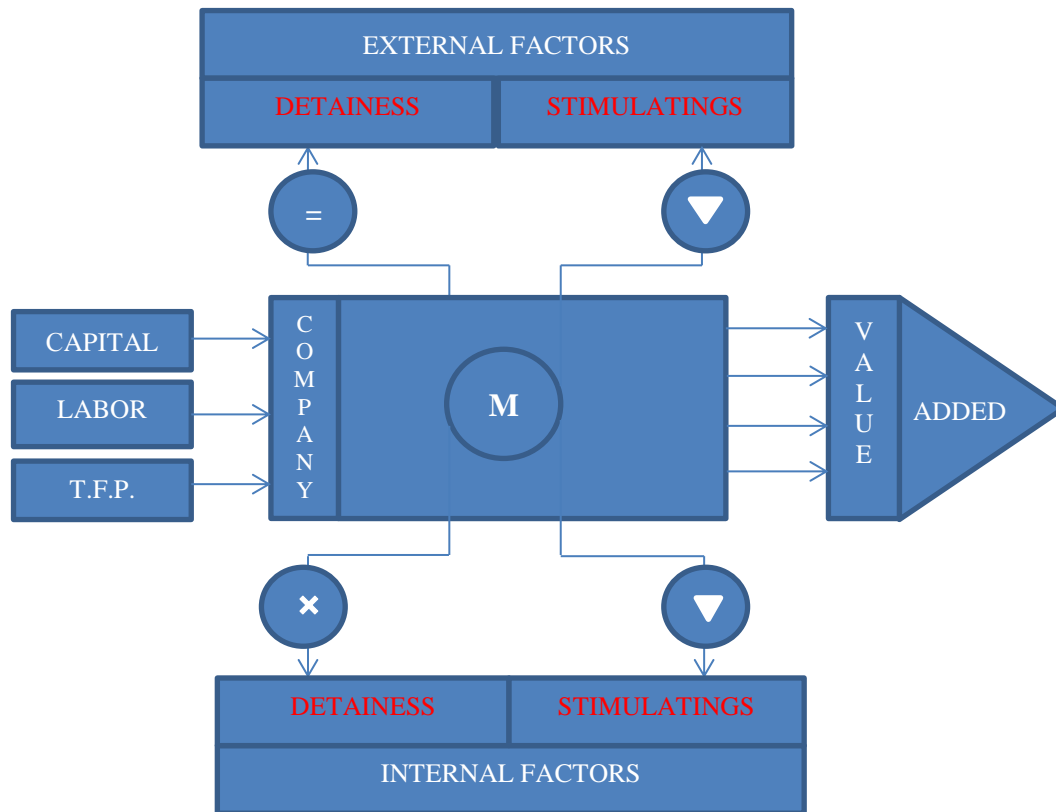

Figure 1. Model for managing the added value of industrial companies.
Source: Author's model – Konstantinova, Konarev.

DISCUSSION
In the management of the added value of industrial companies it is necessary to apply an algorithm containing the following stages:

Stage I: Disclosure of the stimulating and restraining factors under the specific conditions of activity of the separate company.

Stage II: Selection of factors of significant and insignificant.

Stage III: Distinguishing between systemic and random factors.

Stage IV: Determining the strength of influence of significant factors, especially the systemic ones.

Stage V: Digitization (quantitative expression) of influence of determining factors.

On this basis, conditions are created for improving the management of value added by

developing appropriate software and automating the work of managers with the means of artificial intelligence.

CONCLUSIONS
The performed measurement allows making the following main conclusions:
1. During the analyzed period the investments in non-current (fixed) assets, considered as supporting structure of industrial business increased significantly (124.98%). At the same time, intangible assets increased by outpacing growth – 416.69%. This positive trend is reflected differently in the asset structure of industrial companies.
2. Industry affiliation has a strong influence on the structure of investments. Five companies (Sirma group AD, Biovet AD, Tchaikapharma AD, Lavena AD and

Sopharma AD) stand out with relatively high absolute value and relative share of intangible assets. The first three companies have a very high relative share of R&D products in the asset structure. Development activity is a typical manifestation of the so-called "spillover effect", in which one company takes advantage of the private investment of another company to create a certain innovation.

3. "Added value" is a key indicator for assessing business, which expresses the magnitude of the company's wealth created. The level of this value, created by all surveyed companies, increased significantly – 176.16%. The comparative analysis of the dynamics of value added and intangible assets by individual companies shows that no definite relationship can be found between them. A significant proportion of companies have opposite changes in the level of the factor indicator, intangible assets and the resulting value added indicator.

4. Corporate growth has been studied as a factor for increasing value added. The average indicators of all companies reveal a parallel increase of the two indicators: 13% "average annual corporate growth" corresponds to a 16% increase in "value added". The specific analysis by individual companies shows that it is difficult to establish certain dependence. In addition, there is multicollinearity between the two indicators.

5. Value added is affecting by a large number of heterogeneous and divergent factors. They can be divided into two groups: external and internal factors. In turn each of these groups is divided into two subgroups: stimulating and restraining the growth of added value. Managers of industrial companies must apply a differentiated approach to value added management depending on the type and strength of influence of each factor.

6. For successful value added management it is necessary to apply an algorithm. On his basis the stimulating and restraining, significant and insignificant, systemically acting and accidental factors are revealed. Determining the strength of the influence of individual factors and the digitization of this influence and the

digitization of this influence creates conditions for improving the management of value added by developing appropriate software and automating the work of managers with the means of artificial intelligence.

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