

INTELLECTUAL CAPITAL AND COMPANY VALUE: THE EXAMPLE OF THE WARSAW STOCK EXCHANGE

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Purpose: The main purpose of the study is to ascertain whether intellectual capital will affect company growth expressed by the earnings per share (EPS) indicator.

Design/methodology/approach: The relationship between the company's growth expressed by EPS and intellectual capital was checked using the vector autoregression (VAR) model.

Findings: This study analyzed the relationship between measures of intellectual capital and the future development of companies listed on the main market of the Warsaw Stock Exchange. It demonstrated that measures of intellectual capital are reflected in the future growth of enterprises, especially earnings per share, and that the development phase can change the results related to the opportunity for company growth and future development.

Research limitations/implications: The sample size is small for any generalization. A mixed method approach in the future could contribute to a holistic finding

Practical implications: The results of empirical analyzes reflect the growth of enterprises and should be based on various economic measures, because it is impossible to clearly determine which indicators influence or do not influence this growth and to what extent they determine it.

Originality/value: The added value of the presented research results concerns the demonstration that investments in human capital influence the increase in the value of the enterprise on the capital market. Although the Polish market, with companies listed on the WIG, is considered an example of a developing economy, the Polish capital market has not yet been covered by this type of research.

Keywords: company growth, EPS, intellectual capital, Warsaw Stock Exchange.

Category of the paper: research paper.

1. Introduction

The main goal of a modern enterprise is to maximize its value in the long term. It results from the productivity not only of the enterprise's tangible resources, but also its intangible assets. For a long time, what determined a company's position and value was predominantly its material resources (Jordão et al., 2022). However, an enterprise's value depends less and less on tangible assets; the factor that is increasingly important for the growth of the company's

value is the ability to use intangible resources, i.e., its intellectual capital. Each company has these assets, but not all of them appreciate their importance or manage them effectively, and it is the effective management of this capital that is vital for the development of the company and shaping its value (Munir, Djaelani, 2022).

The dynamically changing political and economic conditions after 1989 and the transition from a centrally planned economy to a capitalist economy, resulted in a thriving development of the labor market in Poland. Taking advantage of the achievements of the global economy, access to knowledge and technological thought at the highest level, and observing global standards in the approach to organizations and employees forced changes in the functioning of numerous modern enterprises emerging in Poland. Outwork was less and less important; thought and specialist knowledge became more important, and such knowledge could only be provided by well-educated, satisfied, and loyal employees. Its important role in the functioning and development of enterprises began to be noticed. A man, with his knowledge, experience and competence, became one of the most important factors in the organization. Success in a competitive market often depended on the human resources available (Snyder, Pierce, 2002). The implementation of modern information technologies and the increase in the share of specialized service companies in the Polish market meant that companies increasingly sought employees whose knowledge and skills would allow them to be successful.

The main purpose of the study is to ascertain whether intellectual capital will affect company growth expressed by the earnings per share (EPS) indicator (Salvi et al., 2020). It results from the productivity not only of the enterprise's tangible resources, but also its intangible assets. The relationship between the company's growth expressed by EPS and intellectual capital was checked using the vector autoregression (VAR) model.

The added value of the presented research results concerns the demonstration that investments in human capital influence the increase in the value of the enterprise on the capital market. Although the Polish market, with companies listed on the WIG, is considered an example of a developing economy, the Polish capital market has not yet been covered by this type of research.

The paper comprises the following sections: a literature review, a presentation of the data and methods, a discussion of the research results and conclusions.

2. Literature review

Value is one of the most important elements of a company, and the maximization of value is the goal of modern enterprises. The conscious influence on the company's value formation is manifested through institutionalized and formal actions. By utilizing a comprehensive understanding of the essence, features, and determinants of the company's value, coupled with

proper analysis, these actions can maximize value to benefit owners while shaping the desired pace of development and image of the company (Dmitriev et al., 2020; Berzkalne, Zelgalve, 2014; Tseng, Goo, 2005). Thus, a precise definition and understanding of the sources of company value are essential to the development of any company management strategy aimed at maximizing its value.

In the 21st century, a company's success in the market must be associated with its ability to acquire and use intangible resources. A modern employer must efficiently and dynamically transform employees' skills, competencies, and knowledge into lucrative solutions and services. Developing new technologies, implementing advanced software, creating a positive brand image, or creating an extensive network of contacts and customer base will provide the organization with the greatest value a growing company can have – its intellectual capital (Postula, Chmielewski, 2019; Kasych, 2020; Ali, Anwar, 2021).

The intellectual capital of a company is a difficult concept to define clearly. The most common definition is perceiving it as a source of creating company value thanks to intangible resources, such as the skills and knowledge of company employees, patents, trademarks, information systems (Marcinkowska, 2013; Widiartanto et al., 2020). Intellectual capital is an asset that is created on the basis of knowledge from the above. intangible assets. These elements also shape the market value of the organization. It can therefore be concluded that intellectual capital, which is intangible, contributes to the process of creating tangible assets. It is the hidden potential of the enterprise (Edvinsson, 2000; Agomor et al., 2022).

Initially, intellectual capital consisted of two components, which were information together with knowledge capital and structural capital. The first element was both formal and informal. The second functioned as a process of collecting, storing and re-receiving information in order to communicate it in a processed form, i.e. knowledge. The consequence of this was the emergence of an idea whose aim was to improve the flow of information in various organizations through the use of network technologies. As a result, a new capital component has also emerged, which is customer capital (Crupi et al., 2021; Dumay et al., 2020; Alvino et al., 2021).

Currently, we can come across many different concepts related to the presentation of individual components of intellectual capital. In the literature, many authors present different, in their opinion, views. So far, it is difficult to specify this capital (Nirino et al., 2022).

Table 1.

Classification of elements of intellectual capital according to individual authors

| | | | |
|------------------------------------|---|--------------------------|---|
| Bratnicki (2000) | Human capital Social capital Organizational capital | Saint-Onge (1996) | Human capital Organizational capital Customer Capital |
| Edvinsson and Malone (1997) | Human capital Structural capital | Sullivan (1998) | Human capital Intellectual assets Intellectual property |

Cont. table 1.

| | | | |
|---------------------------------------|--|--------------------------------|---|
| Pietruszka-Ortyl et al. (2021) | Social capital Organizational capital | Ritvanen, Sveiby (2018) | Employee competencies The internal structure of the organization The external structure of the organization |
|---------------------------------------|--|--------------------------------|---|

Source: own study.

According to one of the authors, intellectual capital consists of human, structural or organizational capital. Others classify its elements as human assets, or intellectual property. In turn, others divide it through the prism of intangible resources. Undoubtedly, it can be seen that the most frequently mentioned component is human capital. In many concepts of intellectual capital, it is presented as the most important component from which other components may arise. The other elements have different names in given ideas, but they have a common property: one of the groups of components is external and the other is internal (Ujwary-Gil, 2009; Cremers et al., 2019).

Human capital is an element that consists of all skills, abilities, knowledge, experience and individual competences of employees and managers of the enterprise. In other words, it is also the employee's ability to perform the work entrusted to him and to solve the difficulties arising in the company. Human capital is based on the possibility of creating interpersonal relationships. This capital is responsible for the formation of knowledge in many organizations. Human capital does not constitute the property of the company, as it is only used during the employment of the employee. The poor quality of this capital significantly reduces the internal potential in the company (Sodirjonov, 2020; Batish et al., 2021).

Another element may be organizational capital, the components of which support the work of all employees. It can be grouped into structural capital (organizational structure of the company), process capital (methods, rules, techniques that improve work efficiency) and innovative capital (innovative awareness of the company). Compared to human capital, it can be owned by the company and is also the result of people's work (Bassi, Laurie, 1997; Tseng, Lee, 2014; Hsu, Fang, 2009; Alhasani et al., 2023).

Intellectual capital can also include market capital. It is the result of the involvement of human capital and organizational capital. It consists of the relationship between the external environment (customers, competitors, suppliers, partners) and the company. This capital also includes customer loyalty to the company. Just like organizational capital, it is owned by the company, but it can be sold. He is difficult in management because it is outside the enterprise (Bellucci et al., 2020; Quintero-Quintero et al., 2021; Rossi et al., 2021; Olarewaju et al., 2021).

This classification should also be supplemented by the region's capital. It is understood as intangible resources of the region, thanks to which it is possible to develop innovations and its absorption. It can be created by the degree of regional industrialization, labor mobility, location and technological development (Faggian et al., 2019).

Obtaining a competitive advantage by enterprises is a huge challenge in today's economic reality. This is because the contemporary determinant of competitiveness, apart from the proposed products and services, is the unique and unconventional knowledge that creates intellectual capital. Enterprises compete with each other in areas such as: innovation, flexibility, ability to adapt to changing consumer needs mainly through specific and hard-to-forge intangible deposits (i.e. intellectual capital) (Luthy, 1998; Poorani, Sullivan, 2019; Zahid, 2021). Intellectual capital is an important factor in the permanent success of the company and has a significant impact on its competitive advantage. It plays an increasingly important role in all organizations, both business, public and public benefit organizations. The need for identification, including measurement, and sustainable use and development of these hidden intellectual resources occurs in every organization. The value of knowledge-based companies, which make maximum use of the intellectual potential of people and possessed structural capital, increases the fastest in creating unique products and services. The companies that dominate the market in this area are: telecommunications companies, IT companies, trade and service companies, insurance companies and pharmaceutical concerns (Bassi, Laurie, 1997; Tseng, Lee, 2014; Hsu, Fang, 2009; Alhasani et al., 2023). Knowledge, competences, as well as rare, even unique skills of employees are perceived by some economists as very important and actually the only source of competitive advantage of a given company. It is worth noting that in the era of knowledge-based economy, the process of educating and developing employees is treated as a priority investment that is a tool for improving the current efficiency and shaping the strategic potential of the company (Bukh et al., 2001; Nirino et al., 2022).

The emergence of a new factor determining the market value of an enterprise, which is intellectual capital, forces the need to measure it. So far, a uniform measure of the value of a company's intellectual capital, recognized by all, has not been created. Experts in the subject try to create synthetic indicators based on the measurement of individual forms of intellectual capital. Due to the immeasurability of some elements, this task is very difficult (Kubicka, Dubanevich, 2017).

3. Research methods and statistical data

The main purpose of this study is to verify whether intellectual capital affects company growth, as expressed by the EPS indicator (Salvi et al., 2020; Subaida et al., 2018). In this paper, company growth is represented by the growth in earnings per share.

The growth rates of earnings per share are determined in the following way:

$$\Delta EPS_{+n} = \frac{EPS_n - EPS_0}{TA_0}, \quad (1)$$

where: EPS_n is earnings per share in n years ahead from year 0. Earnings growth is calculated in relation to asset size (Total Asset), as earnings can be negative. A change in the ratio from the negative and positive value of earnings is not symmetric and could affect the results.

Two indicators, Human Capital Value Added (HCVA) and Human Capital Return On Investment (HCROI), were adopted as the measures of intellectual capital for further analysis (Priyandana, 2022; Word Bank, 2021)

HCROI is an indicator of the return on investment in human capital. It is a metric that represents the dollar value that employees contributed compared to the resources employers spent on them, including compensations, benefits, and training. It can be treated as the basic measure of the profitability of human resources on the scale of the entire company (Zahid, 2021). It is the amount of profit made by a company against every dollar invested in their human capital compensation. The HCROI shows the ratio of income derived against total employment costs (Poorani, Sullivan, 2019). HCROI shows the financial value individually or collectively contributed by employees, providing a true measure of the productivity of human resources.

The indicator is calculated as follows:

$$HCROI = \frac{R - (OC - TLC)}{TLC} \quad (2)$$

where:

R = Revenue.

OC = Operating Costs.

TLC = Total Labor Costs.

A positive HCROI means that the costs of employee salaries translate into company revenues, leading to increased investment opportunities. By contrast, a negative HCROI means that the employees use more resources to perform their work than they generate income (Vodák, 2010). HCROI helps to analyze which factors help or hinder an organization's profitability and productivity, and they can be either organizational or personal factors.

HCVA shows the company's profit that is attributable to the person employed. This profit includes taxation, and the cost of invested capital is deducted. It is an indicator, or measurement, of the financial value (profit) an average employee brings to an organization. In other words, it shows the average profit per employee or to what extent the average employee contributes to the bottom line. HCVA is commonly calculated on a quarterly basis, which means it is calculated four times each year. This measure is considered an important criterion for evaluating an enterprise's management staff. It shows what added value employees create for the organization in terms of full-time equivalents (Fariana, 2014; Ahmed et al., 2019).

The indicator is calculated as follows:

$$HCVA = \frac{R-(OC-TLC)}{E} \quad (3)$$

where:

R = Revenue.

OC = Operating Costs.

TLC = Total Labor Costs.

E = Number of employees (full-time equivalent).

The HCVA metric measures employees' profit contribution once costs have been removed. This metric can be embedded in the profit and loss statement and monitored, managed, and reported by month, by division, and compared to previous years. The HCVA looks at the human impact on revenue by numbers and by visuals. If HCVA is dropping, then it might be worth analyzing further employee data and determining if people are taking their allocated annual leave; if not, perhaps they are burnt out or stressed. Alternatively, the company may need to employ more people or change working practices.

The relationship between the company's growth expressed by Δ EPS and intellectual capital was checked using the vector autoregression (VAR) model.

The choice of lag order is a very important issue in the vector autoregressive model. There are several criteria that will indicate the best lag order. The most popular are:

- Akaike information criterion (AIC).
- Schwarz information criterion (BIC).
- Hannan-Quinn information criterion (HQ).

All of the above criteria point to the order of delay with the lowest value, which therefore gives the least information loss. When creating a VAR model, make sure that it does not have autocorrelation of residuals, not only in the case of the first order, but also higher. To answer the question of whether there is an autocorrelation, the Ljung-Box test can be used, and so it was done in this case. The Ljung-Box test did not show the existence of autocorrelation of residuals, not only in the case of the first order, but also higher.

As with AR models, in VAR model, it does not have a division into exogenous and endogenous variables, as each variable in the model affects the other variables, and the modeling process applies to each variable. Thanks to this dependence, it is possible to better model the studied phenomenon. In every process in the economy, there are conjugate dependencies, and their existence makes it possible to take VAR models into account. Another feature that distinguishes VAR models from ordinary structural models is that there are no zero restrictions imposed on the model's parameters. This process can be represented by the equations below:

$$y_t = \alpha_0 + \sum_{j=1}^k \alpha_{1j} y_{t-j} + \sum_{j=1}^k \beta_{1j} x_{t-j} + \varepsilon_{1t} \quad (4)$$

$$x_t = \alpha_0 + \sum_{j=1}^k \alpha_j x_{t-j} + \sum_{j=1}^k \beta_j y_{t-j} + \varepsilon_t \quad (5)$$

In that case, the null hypothesis is as follows:

$$H_0: \beta_1 = \beta_2 = \dots =: \beta_k = 0 \quad (6)$$

This means that there is no causality from the explanatory variable to the response variable.

The VAR model examined the impact of the measure of intellectual capital (HCROI or HCVA) on selected variables that explain the company's growth potential; the basic formula (4-6) is presented above. The VAR models were made to indicate the value of the impact factor in the case of a statistically significant relationship between the variables. The following financial data were analyzed:

- Δ EPS – earnings to the number of issued shares,
- IC_t – measure of intellectual capital (HCROI or HCVA) in period t .

The study was conducted on a group of non-financial companies listed on the Warsaw Stock Exchange included in the WIG index from 01/01/2013-31/12/2020. In addition, large companies included in the WIG 30 index and medium-sized companies included in the WIG 40 index were extracted from the WIG index to better verify whether the examined relationships also apply to the group of large and medium-sized companies. All companies that are also included in the WIG30 index, as well as banks and other financial institutions, were excluded from the mWIG40 index. The study was conducted on annual data. All data used in the study came from the NOTORIA and Bloomberg databases. Prices have been adjusted for equity changes such as pre-emptive rights, dividends, and splits. The table below presents data statistics for the analyzed indices.

Table 2.

Data descriptive statistics

| | Mean | Median | Std. Dev. |
|---------------|------------|----------|-----------|
| WIG | | | |
| HCROI | 335043.323 | 5930.680 | 699604.5 |
| HCVA | 1410.782 | 12.7753 | 3298.159 |
| EPS | 10.818 | 2.584 | 35.651 |
| WIG 30 | | | |
| HCROI | 4138.229 | 1304.085 | 8415.002 |
| HCVA | 4.203239 | 2.277347 | 6.749219 |
| EPS | 13.39585 | 1.22 | 48.38089 |
| WIG 40 | | | |
| HCROI | 6806.368 | 1186.446 | 12772.44 |
| HCVA | 10.69386 | 2.988823 | 16.16282 |
| EPS | 7.937046 | 4.925 | 8.251012 |

Source: own study.

As the table above shows, the HCROI and HCVA ratios in the WIG30 companies are lower than in the WIG40 companies. With EPS, the situation is reversed; higher values are recorded for large companies from the WIG30 index and lower for medium-sized companies included in the WIG40 index.

4. Empirical research

The main purpose of this study is to verify whether intellectual capital will affect the company's growth expressed by the Δ EPS indicator. The study was conducted using the VAR model, and the results from the individual groups of companies are presented in the table below. The Granger test (Bessler and Kling, 1984) of the analyzed variables was conducted first.

Table 3.
Granger test

| | F-Statistic | Prob. | F-Statistic | Prob. | F-Statistic | Prob. |
|----------------------------------|----------------|---------------|----------------|---------------|-----------------|---------------|
| | WIG30 | | WIG 40 | | WIG | |
| HCROI \Rightarrow Δ EPS | -0.0004 | 0.3985 | 0.00015 | 0.0240 | 0.000005 | 0.0484 |
| Δ EPS \Rightarrow HCROI | -11.9962 | 0.3985 | 243.438 | 0.0240 | 2420.1 | 0.0484 |
| HCVA \Rightarrow Δ EPS | 1.4518 | 0.0042 | -0.0574 | 0.1922 | 0.0005 | 0.3472 |
| Δ EPS \Rightarrow HCVA | 0.03646 | 0.0042 | -0.2203 | 0.1922 | 5.3441 | 0.3472 |

Source: own study.

As can be seen from Table 3 above, in the case of the WIG 40 indices and the entire WIG index, only the HCROI index has an impact on enterprise growth expressed as Δ EPS. On the other hand, in the case of the WIG30 index, i.e., an index that represents large companies, the HCVA index has an impact on Δ EPS. We created VAR models with one explanatory variable, namely HCROI and HCVA, and a dependent variable, Δ EPS. Our analysis demonstrated that Granger influence runs from HCROI and HCVA to Δ EPS. We selected one lag period for the dependent variable in each model. The results for the VAR models are presented in Table 4.

Table 4.
VAR models for selected variables

| Specification: | Δ EPS WIG 30 | Δ EPS WIG 40 | Δ EPS WIG |
|------------------|------------------------|------------------------|---------------------|
| Δ EPS(-1) | 0.7949 *** | 0.7798 *** | 0.789101 *** |
| Const | 1.4686 | 2.0730 *** | 2.51033 |
| HCROI | 0.0002 | 0.000005 ** | -0.0002 * |
| HCVA | 0.7736 ** | 0.01414 | 0.000028 |
| R-squared | 0.6359 | 0.6208 | 0.6245 |
| Adj. R-squared | 0.6285 | 0.6121 | 0.6205 |
| F-statistic | 85.6112 | 71.5074 | 156.9153 |

Note: */**/** Ratios are significant at 10% / 5% / 1%, respectively.

Source: own study.

The VAR model confirmed the previously reported results using the Granger test. There is a weak statistical relationship between the variable representing intellectual capital (HCROI) and the variable representing enterprise growth (Δ EPS) both for the entire WIG index and the WIG 40 index, which represents medium-sized companies. For the WIG30 index, there is no statistically significant relationship between the HCROI variable and Δ EPS, although there is one between the HCVA index and Δ EPS. This relationship could not be confirmed for the WIG and WIG 40 indexes, however, which also confirms the previous results in the Granger test.

5. Discussion

The Granger causality test showed a causal relationship between HCROI and Δ EPS in the group of companies included in the WIG and WIG40 indexes. These results were confirmed in a study using the estimation of VAR for Δ EPS, in which the exact value of the impact factor was determined. For companies included in the WIG30 index, the impact of HCVA on Δ EPS was found (an increase in HCVA causes an increase in Δ EPS).

The company's value is most influenced by factors such as the increase in operating profit, the cash tax rate, the dynamics of revenue growth, working capital, the weighted average cost of capital, capital expenditure, and the period of competitive advantage. If managers correctly apply these factors in their decisions, it leads to a situation where the present value of cash flows is maximized at the same level as EPS (Wu et al., 2020; Samans et al., 2020). The results indicate that in the group of companies included in the WIG and WIG 40 indexes, there is a relationship between the increase in EPS and intellectual capital, expressed by the HCROI index. In the group of companies included in the WIG30 index, no such relationship was observed, either using the Granger method or the VAR model. This may be due to the fact that companies listed on WIG30 are characterized by traditional growth patterns (Sabourin et al., 2022; Goh, 2020). In the case of the WIG30 index, a relationship was observed between the increase in EPS and intellectual capital, expressed by the HCVA index. In the group of companies included in the WIG and WIG40 Index, no such relationship was observed, either using the Granger method or the VAR model. Many companies listed in the WIG and WIG 40 indexes are known for their nontraditional growth patterns. These companies often operate in innovative and disruptive industries, where their growth trajectory may differ significantly from that of more traditional and mature companies (Morales et al., 2022). Due to their growth-orientated nature, shares of companies listed on WIG and WIG 40 may show a higher level of price volatility compared to more mature companies, such as the blue chips included in WIG30. The valuations of these companies may be influenced by market sentiment, investor expectations, and future growth prospects (Hsu et al., 2019), but they are based on fundamental valuations related to growth.

6. Conclusion

Intellectual capital is an important factor that significantly helps companies develop and affects their effectiveness. Additionally, as the effective use of intellectual capital translates into the creation of added value, it is becoming increasingly popular among enterprises. They are beginning to see that value depends not only on material resources, but also increasingly on

intangible resources related to the ability to use knowledge and the ability to create the potential of intellectual capital. Intellectual capital management is a complicated, multi-stage process and requires a comprehensive approach. It involves identifying and managing individual components of intellectual capital while also focusing on the mutual relations between them. The greater the cooperation and mutual integration of the elements of intellectual capital, the greater the value created.

This study analyzed the relationship between measures of intellectual capital and the future development of companies listed on the main market of the Warsaw Stock Exchange. It demonstrated that measures of intellectual capital are reflected in the future growth of enterprises, especially earnings per share, and that the development phase can change the results related to the opportunity for company growth and future development. Based on the results, it can be concluded that for companies included in the WIG and WIG30 indexes, as well as medium-sized companies in the mWIG40 index, intellectual capital measured either by the HCROI or HCVA index significantly affects company growth expressed by the Δ EPS index. Different regression models characterize the increase in the EPS of companies listed on different markets. Certain factors contribute to the increase in Δ EPS – and thus value – based on different patterns that reflect internal strategies and external investor assessments of companies.

Intellectual capital is considered to be the hidden wealth of an organization that is not accounted for in financial statements and accounting systems. Intangible assets are recognized by investors, and they have a strong influence on the strategic decisions of companies and their shareholders. Nevertheless, which means that, in practice, there are many approaches to the concept. Effective intellectual capital management has become a new challenge for business managers. Thus, intellectual capital management has become a response to the emerging profound socio-economic changes. Managing intellectual capital effectively is a challenging task that requires two distinct approaches. Firstly, it involves identifying and managing the various components of intellectual capital. Secondly, there is a need to understand and manage the relationships between these components.

Future research should expand this topic, taking into account the level of development, asset structure and innovation of the studied companies. If high-tech enterprises develop in a less predictable way, it is necessary to analyze whether they effectively manage their value, and whether mature enterprises focus on growth and their condition, which, as expected, are positively related to each other and whether they effectively manage their value. Moreover, analyzes should focus on the impact of market crises on the relationship between investments in intellectual capital and the development of enterprises.

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