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# KNOWLEDGE-BASED ECONOMY - KEY ISSUES IN THE INTELLECTUAL CAPITAL MEASUREMENT BY EXAMPLE OF TWO HUNGARIAN STOCK EXCHANGE COMPANIES

Review  
Article

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## Keywords

*Intangibles, intellectual capital,  
Human capital,  
Relational capital,  
Organizational capital,  
Value Added Intellectual Coefficient (VAIC),*

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## JEL Classification

M10

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## Abstract

*In their article, the authors emphasize the importance of measuring intellectual capital. The difference between the company's market and book value is intellectual capital, which has been present within knowledge-based society for decades. A number of economists have made suggestions related to its measurement; however, no unified standpoint has been developed. Therefore, currently its value does not appear in financial statements. The reason for this is the fact that while the recorded book value of enterprises is tangible, the value of intellectual capital is difficult to quantify, it is a so-called hidden value. In the scope of their study, the authors discuss the relevance of measuring intellectual capital by describing their results provided by Baruch Lev's knowledge capital valuation.*

## INTRODUCTION

Intellectual capital has contributed significantly to the corporate successes – and at the same time the corporate failures – of the past decades. We seek answers to the following questions through the concept of intellectual capital, including the possibilities of its measurement:

- What does mean the intellectual capital concept?
- To what extent is it measurable and tangible?
- Evaluating a company and taking into account its assets, where does appear this invaluable corporate value-driver or does it appear at all?

The question arises: what sort of value do intangible goods represent to enterprises besides tangible goods as a result of the market competition and the development of corporate environment? What value do human knowledge, corporate culture, professional skills, and abilities represent? These factors are essential for the effective operation of the company.

## DEFINITION OF INTELLECTUAL CAPITAL

John Kenneth Galbraith used the term intellectual capital first; according to him, the intellectual capital means more than pure intellect, it also includes a certain intellectual act (Gösi, 2009).

A number of studies prove that the traditional resources in themselves (for example machines, devices, production equipment or financial resources) are not the most valuable primary production factors of our days, but in several cases, intangible resources - often referred to as intellectual capital - such as human resources, business relationships, brands and efficient organizational structures) come into the foreground (Harangozó, 2012).

"Every activity of a company is established and determined by those persons who form the corporate organization. Business units, offices, computers, automated equipment and everything else that is utilized by a modern company are unproductive without human effort and control. Humans design equipment and organize them into a system, they decide about computer applications and modernizations, they ensure capital requirements and decide applicable accounting and financial methods. All aspects of a company activity are determined by the expertise, motivation, and effectiveness of the people consisting the organization" (Likert, 1967).

Intangibles are those assets that are not classifiable as any category of tangibles and contribute to increasing the company value. As synonyms of these assets, we can also meet the term of intellectual capital (Juhász, 2004). Under intellectual capital, Wiederhold (2014) means intangible factors that are

involved in the value creation, which are practically convertible into value. Currently, the majority of product value originates from intangible assets and only a smaller proportion of tangible assets. If such products are sold in large quantities, their high incomes involve low production costs. Additional value beyond the production cost is owing to the people and their knowledge, using which added value is created (Wiederhold, 2014).

Bélyácz and Kovács (2015) analyze the role of the goods they call 'intangible materials' in corporate growth and they point out the impact of the development of these assets on the income status and market value of companies.

According to Al-Ali (2003), the intellectual capital means those intangible resources and assets what the organizations use for value creation to convert them into new services, products, and processes. In business, intangible and tangible resources have always been recorded when they produced value for the company. However, earlier these elements accounted for a smaller share of the total resources of the company, but in the information and knowledge-based economy, this proportion is steadily increasing, and currently, intangible assets represent the majority.

Sveiby (2001) elaborated his "invisible balance sheet" theory at the end of the 1980s and at the same time, he created the concept of knowledge management, which is still treated as the foundation of intellectual capital concept (Figure 1). The definition of intellectual capital was extended by Drucker (1993). In 1995, Skandia was the first to publish his evaluation of intellectual capital publicly. The Danish have published the first-ever guide to intellectual capital measurement in 2000 (Klausz, 2006).

Visible assets and their sources appear in the upper part of Sveiby's balance sheet, while at the bottom – as under the bottom line items – invisible capital and its sources. Items of invisible capital include the employees' competence, external and internal structures, while invisible sources contain the conditional commitments of employees and the shareholders' invisible equity.

It is no coincidence that well-operating companies are sold above their book value in case of an acquisition, and the markets trade with their shares at a price being well above their book value. This fact expresses that the book value contains only the so-called visible goods beyond certain elements of intangible assets (items above the line in Figure 1). Goodwill of companies realized on the market and the price of shares realized on the market also recognize the value of the additional three capital elements that do not report the current accounting procedures and which remain invisible below the surface (items below the line in Figure 1) (Boda, 2005).

Examining the market capitalization of companies, it is perceptible that companies have a higher market value than book value, which is not a new phenomenon, but there are more significant differences within the knowledge-based economy (Betbulls, 2015). Book value usually shows the value of tangible and capital assets of the company. Sometimes, some intangibles appear amongst the permanent assets, but these do not precisely reflect the real value of intangibles of the company. Market value shows the hidden value recognized by the market; such as the reputation, the innovative ability, the employees' knowledge, but even the added value of corporate culture (Al-Ali, 2003). The difference between market value and book value is attributed to intellectual capital, which might possess a significant value for businesses. Intellectual capital is often identified with intellectual property rights by many, which is a misinterpret approach because it does not cover every intangible asset. Intellectual property is a part of the intellectual capital that can be owned, such as a patent or a trademark (Wiederhold, 2014). One of the features of intellectual capital is that it can be recorded in such cases as patents, but at the same time, it may be flexible like the ability and knowledge of people. Another feature of intellectual capital is that it can be input and output of a value-creating process simultaneously because intellectual capital can be considered as the knowledge converted into value or as the final product of the knowledge transformation (Dzinkowski, 2000).

### **ELEMENTS OF INTELLECTUAL CAPITAL**

Edvinsson and Sullivan define intellectual capital as the knowledge that can be converted into value. The typology elaborated by Edvinsson (1997) became widespread, where the author distinguishes between human capital and structural capital as a primary level (Figure 2). In this concept, the human capital contains the elements of knowledge that are related to people themselves. Among others, human capital is enriched by employee/manager competencies, skills, abilities, accumulated experiences, corporate philosophy and culture (Harangozó, 2012). Edvinsson further breaks down the structural capital to client capital (customer capital) and organizational capital. Customer capital is a more accurate term because it contains all knowledge elements that belong to the external relationships of the company and the values of which are not included in the financial statements. The latter category includes the innovation capability of the company (innovation capital) and the so-called process capital which is related to processes and internal corporate structures (Edvinsson, 2002; Harangozó, 2012).

Essentially, the human capital definitions of Edvinsson and Sveiby are almost identical, with the difference that organizational culture and corporate philosophy are not part of the human capital category of Sveiby. Structural capital corresponds to Edvinsson's concept of organizational capital, complemented by corporate culture, and client capital can be equivalent to relationship capital (Sveiby, 2001). Due to its simplicity, the categorization of Sveiby becomes the most widely accepted.

In the management literature, intellectual capital mostly refers to resources that do not have a material-physical or financial form of appearance but are valuable to the company (Kaufmann-Schneider, 2004).

Immaterial resources themselves do not necessarily constitute value, but they become valuable in the course of the value-creating processes of the company. Research and development, marketing and advertising, corporate HR and IT are the most important carriers of non-objectified values (Gu-Lev, 2003).

According to another approach, immaterial resources are those assets of the company based on knowledge. This approach emphasizes those organizational (internal) characteristics such as employee knowledge and experience, organizational processes, or the information system.

### **MEASUREMENT POSSIBILITIES OF INTELLECTUAL CAPITAL**

By measuring the intellectual capital, we can identify how the production generates added value or be acquainted with the value of intangible assets (Wiederhold, 2014). Measurement and management of intellectual capital play an increasingly important role in the long-term success of the company (van den Berg, 2003). Traditional corporate valuation methods build on revenues and cash flows, forgetting about the decisive role of intellectual capital (Berzkalne - Zelgalve, 2014).

Maximizing corporate value has to be the primary goal of company executives (Berzkalne - Zelgalve, 2014); to achieve this objective, managers and investors need to know corporate intellectual capital as well, which has become a primary value-creating tool of our time. According to Turner and Jackson-Cox (2002), there can be three main reasons for measuring intellectual capital. On the one hand, companies invest considerable capital in the development of their employees, including the improvement of their knowledge. On the other hand, knowing the value of intellectual capital can help to manage it, and it can also help to identify the companies that are consequently growing or decreasing by intellectual capital thereby helping investors to have a clear view of the market. Third,

getting to know the return on intellectual investment. If company management is aware of the long-term prospects of this area, resource allocation may become more efficient (Juhász, 2004). Measurement might be important due to the motivation of the company to learn, as this may make certain costs visible and value creation possibilities may become more comfortable to explore (Sveiby, 2001).

The most important problem is with an intellectual capital measurement that usually we can only rely on indicators that are far from the analysed event and its effect, which might result in the opposed position among the promises of the measurement method developers, and the expectations of company managers and the phenomena actually measured by the system (Sveiby, 2001). According to the literature, there are shortcomings in the accounting evaluation of intangible assets. Most regulations take into account market valuations only, therefore if the company itself creates knowledge or added value, it is not possible to recognize it. An intangible asset may be reported on the balance sheet if it can be separated from goodwill if the company can influence the asset itself and the associated cash flows or if its cost is well measurable. However, most of these conditions do not apply for intellectual capital (Juhász, 2004). Limitations of financial statements regarding the company value creation underline the fact that currently not the manufacture of products and material goods, but the creation of intellectual capital is to be considered the source of economic value (Berzkalne-Zelgalve, 2014). The accounting system does not provide enough information to determine the value of such a company that predominantly possesses intangible assets (van den Berg, 2003). A special way of measuring the intellectual capital is the ranking of the different universities done by special research institutions or journals based on several evaluation criteria (Kómíves-Dajnoki, 2015).

### MEASUREMENT METHODS OF INTELLECTUAL CAPITAL

Measurement of intellectual capital can divide into two large groups: scorecard methods (Skandia Navigator, Balanced Score Card, VCI [Value Creation Index]) and financial methods. The first group takes into account all the "components" constituting intellectual capital and characterizes them with appropriate indicators. The second group measured intellectual capital on an organizational level and based on financial aspects (Luthy, 1998). The group of financial evaluation can divide into three more categories:

1. *Direct Methods*: They estimate the financial value of intellectual capital by identifying its components (TVC [Total Value Creation]).

2. *Return-based methods*: These methods investigate the return on assets invested in intellectual capital and determine the value as a function of return (EVA [Economic Value Added], MVA [Market Value Added], CIV [Calculated Intangible Value], VAIC [Value Added Intellectual Coefficient], Baruch-Lev's knowledge capital valuation).

3. *Market Value Based Methods*: Its book value reduces market capitalization of the company, and the difference will be the value of intellectual capital (Tobin Q ratio, Stewart's intellectual capital) (Sveiby, 2001; Luthy, 1998).

We describe only the VAIC from the methods listed above because we use only this method in our study.

### VALUE ADDED INTELLECTUAL COEFFICIENT - VAIC

Elaboration of the *Value Added Intellectual Coefficient* (VAIC) ratio goes back to the 1990s and is related to the professor Pulic. VAIC does not simply measure the amount and value of intellectual capital, but it also provides insight into its effectiveness. The ratio considers added value one of the most important indicators of enterprises. For example, the ratio does not define employees as cost components, but the creators of value. According to the method, intellectual capital is also capable of creating value.

Calculation of the VAIC starts with *corporate value added* (CVA), which we can obtain by subtracting *material expenses* (ME) from the *net sales revenues* (NSR):

$$CVA = NSR - ME$$

Another formula was also elaborated for the calculation of CVA. In this case, corporate value added can calculate the summation of *operating profit* (OP), *employee costs* (EC), *depreciation* (D) and *amortization* (A):

$$CVA = OP + EC + D + A$$

The calculation of added value results in an objective ratio representing the success of the company regarding its value creation ability. Nevertheless, this value creation process requires investment in resources, including employee salaries, dividends, etc. However, after calculating the added value, the efficiency of resources also needs to be determined. The first is the *value-added capital coefficient* (VACA), which can obtain by dividing CVA with capital value using by the company, which is nothing but the *book value of the company's assets* (BVCA).

$$VACA = \frac{CVA}{BVCA}$$

As a second element, the *Value Added Human Capital Coefficient* (VAHU) is determined. It is worth mentioning here that in the approach of VAIC, wages and salaries are not treated as costs but as investments. Employees are practically investing with their knowledge and skills; the market values this investment, and it appears as value added as well. In the formula of the coefficient, CVA represents corporate value added, while SEC represents the *sum of employee costs*. The ratio presents the value-added provided by human capital.

$$VAHU = \frac{CVA}{SEC}$$

The third element is *Value Added Structural Capital Coefficient* (VASC). The amount of structural capital depends on the value added and the efficiency of human capital as well; it can calculate their difference. The structural capital coefficient can calculate as the *Ratio of Structural Capital* (RST), and corporate value added (CVA):

$$VASC = \frac{RST}{CVA} = \frac{SEC - RST}{CVA}$$

The value of VAIC can finally determine the ratios calculated above. The value-added intellectual capital coefficient is the sum of value added capital coefficient, value-added human capital coefficient, and value-added structural capital coefficient.

$$VAIC = VACA + VAHU + VASC$$

Due to its calculation method, the higher this ratio, the better the company operates and the better the efficiency of intellectual capital (Löre, 2011; AIP, 2006.).

The advantages of VAIC include that it provides such a standardized and consequent basis for measurement, which makes companies comparable at international level. Another advantage is that the calculations of the method are objective and verifiable. The calculation of VAIC is relatively simple, which significantly contributed to the international acceptance of the method, as it is easy to understand for both external and internal stakeholders (AIP, 2006).

However, like everything else, VAIC has a disadvantage as well. In the course of calculating value added, this method does not disregard amortization which results in higher values of the ratio in the case of enterprises which have a capital-intensive strategy or a high depreciation rate. The reason for that is both VAHU and VASC include amortization, and due to this fact, results might be inconsistent (Löre, 2011).

## INTELLECTUAL VALUE CALCULATION IN PRACTICE

ANY Biztonsági Nyomda (ANY Security Printing House [ANY Plc.] Plc. and Kulcs-Soft Plc. stock exchange companies have been selected for the study. When selecting them, it was our objective to involve companies from different industrial sectors, where the presence of intellectual capital associated with their activity is presumable. We used publicly available reports to collect the information required for calculation and applying the method.

Equity and market value of ANY Plc. are different; the market value is higher than the equity reported on the balance sheet. Except for the third year of the analysis, the market value of equity is higher than all the liabilities&equity of the company, since this follows that the company possesses intellectual capital (Figure 3).

The presence of intellectual capital is also assumable in the case of Kulcs-Soft Plc., as the market value of equity is much higher than the book value of both the equity and total assets (Figure 4).

Based on Figures 3-4, we can find that it is also true in case of the investigated companies, namely the market values are higher than their book value, and that surplus must have some underlying content. Therefore the presence of intellectual capital in companies is probable.

## CALCULATION OF VAIC

This ratio calculation starts from the corporate value added (CVA), which show in Figure 5. CVA is positive in case of both companies, in each analyzed period, which means that both companies created value in the course of their operation. ANY Plc. has greater CVAs than Kulcs-Soft Plc., but their growth is not considerable. However, there was a huge leap in the fifth year, which in our opinion, could be due to a significant increase in the revenue of security products. ANY Plc. has created a 4 billion HUF added value even at the lowest point. However, Kulcs-Soft Plc. has a lower CVA, nearly 400 million HUF is the lowest value, and almost 875 million HUF is the highest.

In Figure 5 we can also see that Kulcs-Soft Plc. created a steadily increasing value added. Based on the results, the existence of intellectual capital makes probable at both companies. Increasing CVA is not surprising if the activities of the two companies take into consideration. Within IT and innovative sectors, usually, the knowledge of employees and the benefits provided by software can increase value. However, this cannot detect by the bookkeeping activities of a company. On that basis, we can assume that employee knowledge creates the most of the intellectual capital. Therefore

human capital will create the highest part of the CVA.

The next step in VAIC calculation is to determine the value added capital coefficient (VACA). As shown in Figure 6, the VACA of ANY Plc. was similar to that of its CVA, but with a lower projection. In the first year, VACA of this company started at 0.43, and it reached a value of 0.7 by the fifth year. By contrast, Kulcs-Soft Plc. showed an increasing tendency until 2013, and its capital value added decreased only in the fifth year; however, it was around 0.85 even then.

One of the essential components of intellectual capital is human capital, that shows that a surplus also recognized by the market has been generated from investing in human capital through the knowledge and other capabilities of employees. In other words, how much value generate a unit of investment in human capital.

Figure 7 shows the Value Added Human Capital Coefficient (VAHU) values obtained at the analyzed companies, which are much above 1 in the case of both companies in every analyzed period. In the first two years, VAHU developed similarly in case of both companies, there was only one-hundredth difference, in the first year to the advantage of ANY Plc. and to Kulcs-Soft Plc in the second. This difference slightly increased in the following years. We can find that Kulcs-Soft Plc. has achieved a higher efficiency regarding this indicator.

Except for the increase and the subsequent decrease in the second year of the company, we can establish a steadily increasing trend regarding the value added of human capital in the case of Kulcs-Soft Plc; this means that the surplus value of employee knowledge is continuously growing.

The next essential element of intellectual capital is *Value Added Structural Capital Coefficient* (VASC). The result of VASC calculation can see in Figure 8. The values of this indicator assume lower values than the VAHU ratio, but the tendency is similar to it the case of both companies. The reason for this may be that the size of structural capital depends on human capital and corporate capital. VASC of ANY Plc. ranged from 0.26 to 0.31, while the other company had a minimally larger interval: values ranged from 0.25 to 0.35.

Following the above, the value of VAIC has been calculated, which can be done using summing up by the above three indicators. The result can show in Figure 9. As expected, the VAIC ratio shows a similar picture as its composing elements. All values are above 2, we can say that the value-added of intellectual capital is very positive for both companies. There is a relatively steady increase in the case of Kulcs-Soft Plc., except the slight decrease observed in the third year. The value of VAIC was the lowest in the first year of the analysis; it was 2.26 while the highest value was 2.75 in the fifth year.

Slightly lower values have been obtained in the case of ANY Plc., than in the case of the software developer company. The lowest VAIC value of 2.04 occurs in two years for this company; the first and the third years. As in the case of Kulcs-Soft Plc., the highest value (2.14) was obtained in the last year.

Figures 10 and 11 show the distribution of the VAIC ratio of the two companies among the components. For both companies, human capital is the most significant part of the value added of intellectual capital. At ANY Plc., this ratio was between 58.88% and 66.17% during the analyzed period. VACA follows VAHU, the value of which ranged from 21.10% to 28.42% during the last five years, thus far below the previous index. Value-added of structural capital contributed to the least extent to the VAIC index of ANY Plc. with its value ranging from 11.44% to 13.67%.

In this case, the statement of *Lőre* (2011) according to which the VAIC ratio penalizes companies the human capital of which has a higher proportion than structural capital. Namely, we can realize that even though the value added of ANY Plc is higher than that of the other analyzed company, the VAIC index is still lower. In our opinion, this can explain by the proportion of structural and human capital. Taking all of the above into account, the high proportion of VAHU might justify the idea that human capital plays a particularly important role in companies operating in such areas.

## CONCLUSIONS

For both of the companies, the VAIC values confirmed the presence of intellectual capital. In the course of applying the VAIC ratio, the smaller Kulcs-Soft Plc. represented a higher ratio value. Therefore the stronger effect of intellectual capital at Kulcs-Soft Plc. is assumable. However, proportionally the Kulcs-Soft Plc. can create more value-added intellectual capital. We have seen that intellectual capital makes up a large part of the assets of both companies, including human capital, which contributes most to the value creation of the company. However, we must not forget the fact that publicly used data was used in the application of the methods, so we did not have all the information available, and therefore the results contain certain distortions. Nevertheless, we think, and our results show that intellectual capital plays a significant role in the life of companies. Each of the analyzed companies is active in a field based on knowledge, so this result is not surprising. Also, considering likely that even if to a lesser extent, this characteristic is typical of companies in other industries as well.

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**ANNEXES**

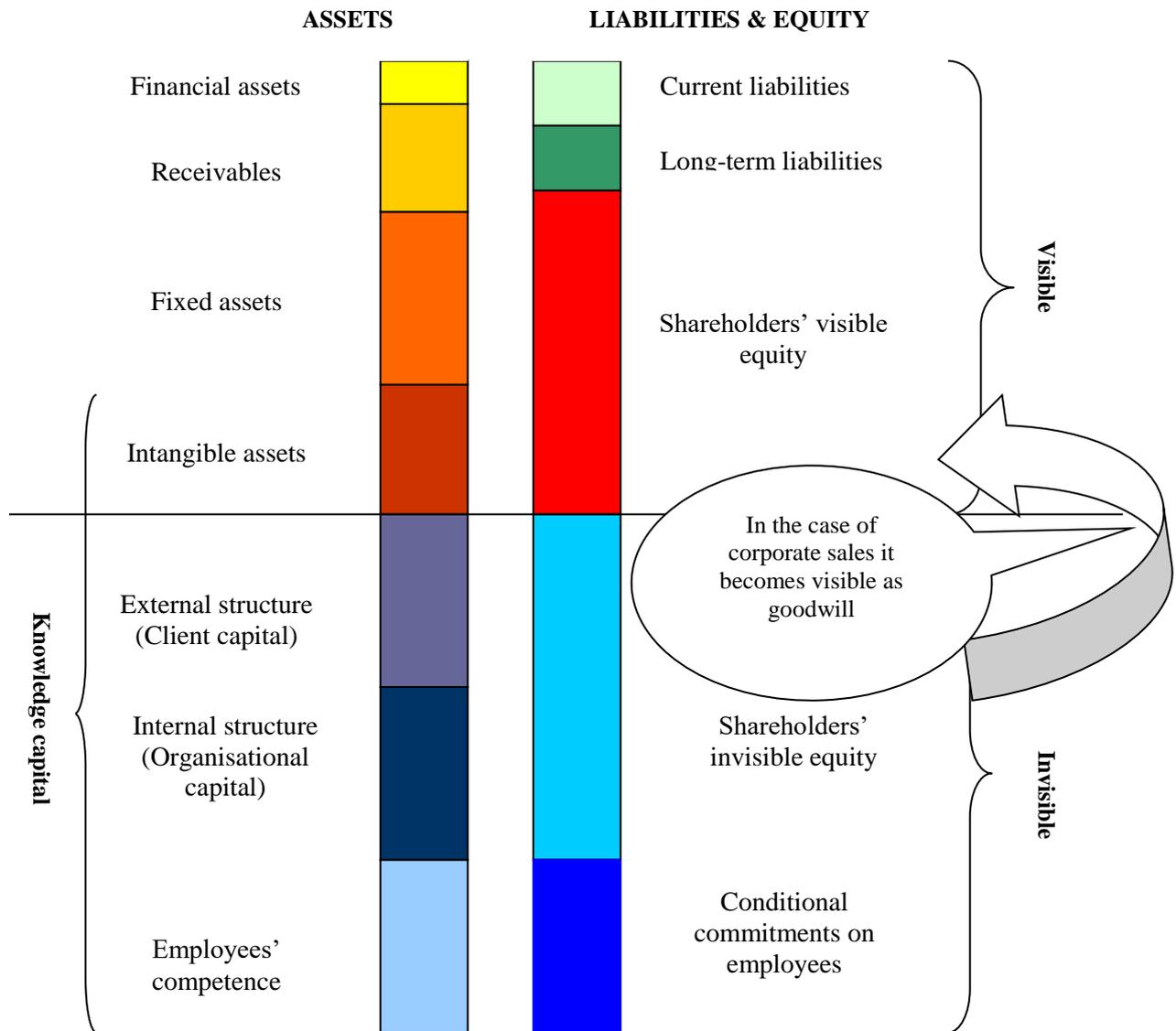


Figure 1: **Balance sheet of knowledge organization**  
 Source: own editing based on Sveiby, 2001

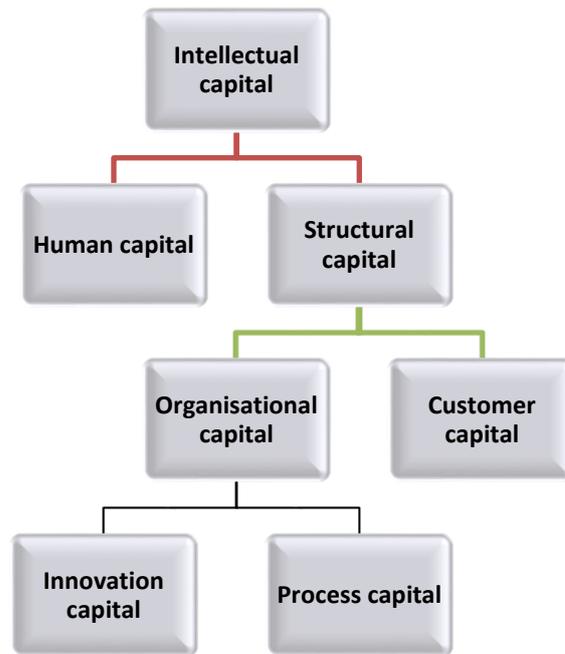


Figure 2: Components of intellectual capital  
Source: Own editing based on Edvinsson, 2002; Harangozó, 2012

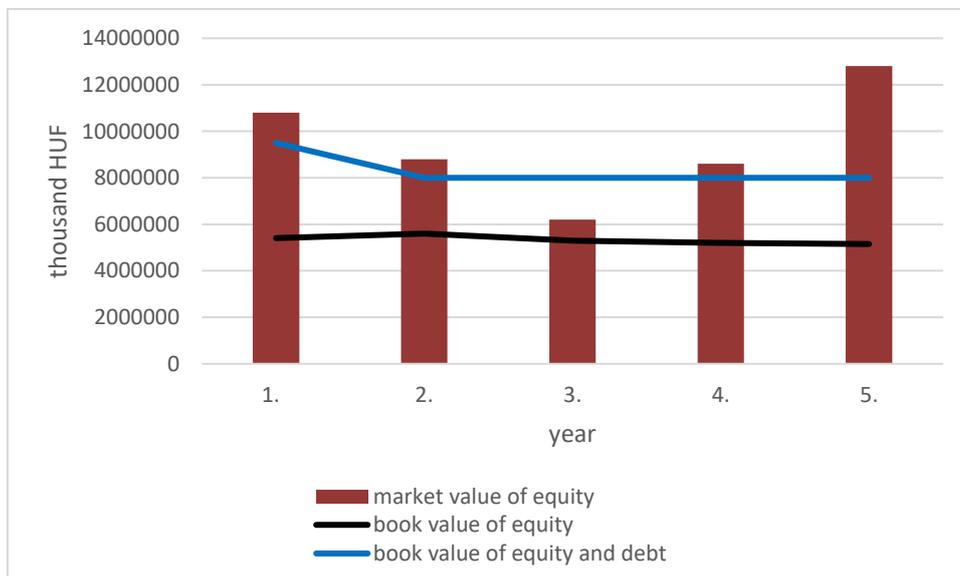


Figure 3: Equity of ANY Plc.  
Source: Own editing based on annual financial statements and own calculations

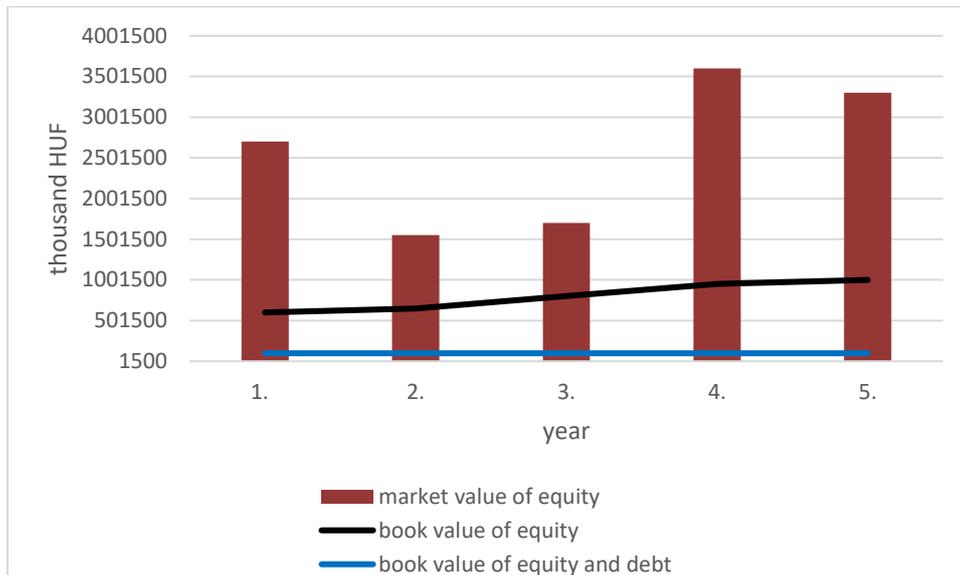


Figure 4: Equity of Key-Soft Plc.

Source: Own editing based on annual financial statements and own calculations

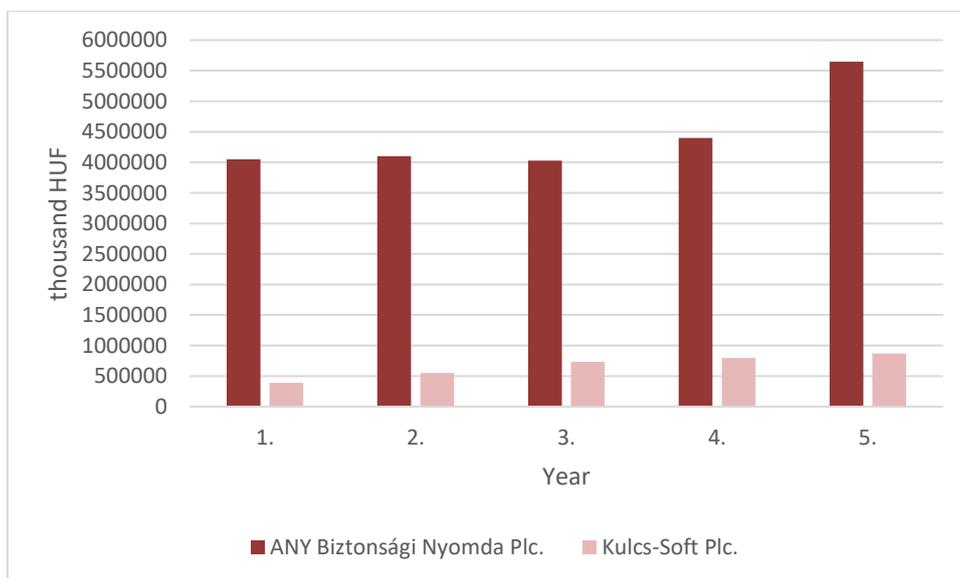


Figure 5: Corporate value added of ANY Plc. and Kulcs-Soft Plc

Source: own editing

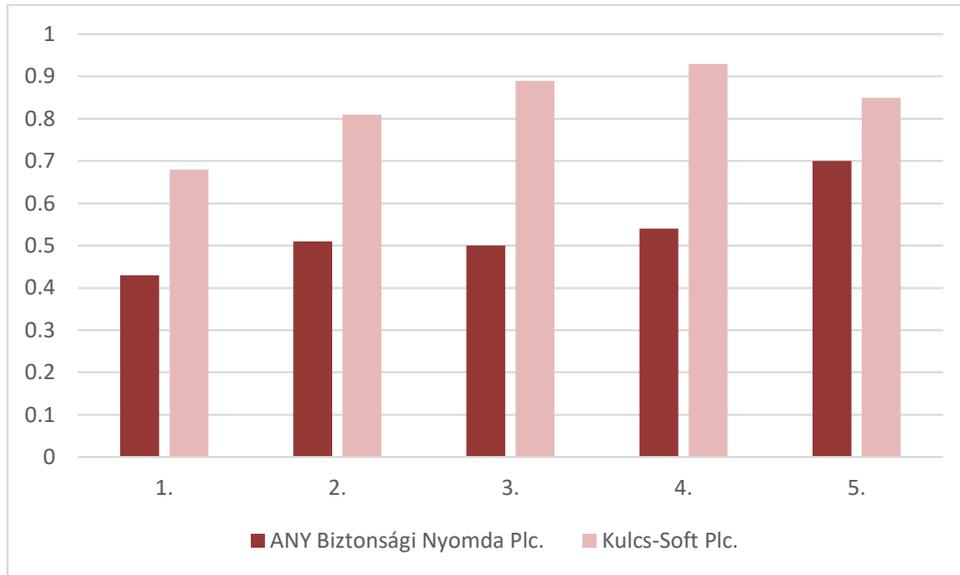


Figure 6: Value added of capital at ANY Plc. and Kulcs-Soft Plc  
*Source: Own editing*



Figure 7: Efficiency of human capital at the companies ANY Plc. and Kulcs-Soft Plc.  
*Source: Own editing*



Figure 8: Value added of structural capital coefficient at ANY Biztonsági Nyomda Plc. and Kulcs-Soft Plc.  
Source: Own editing

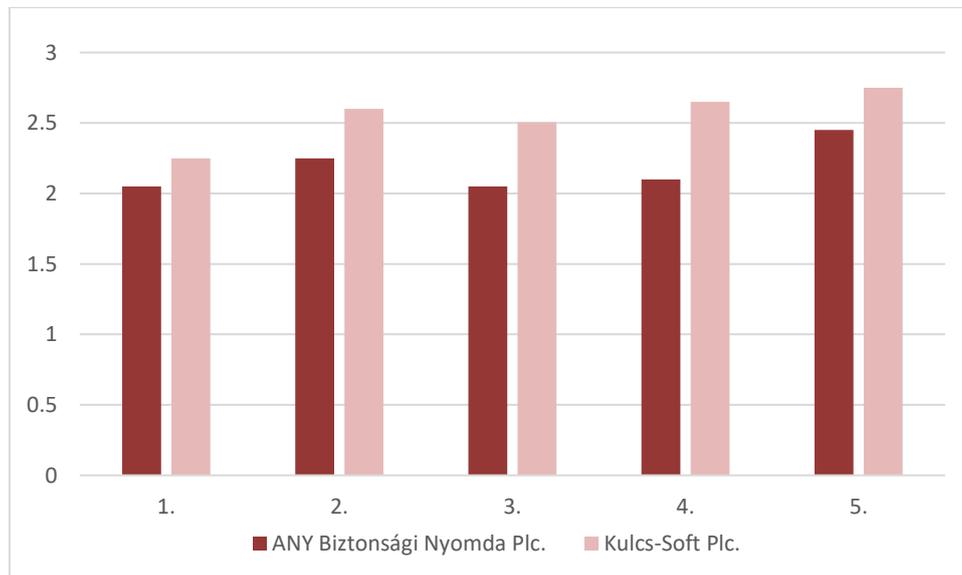
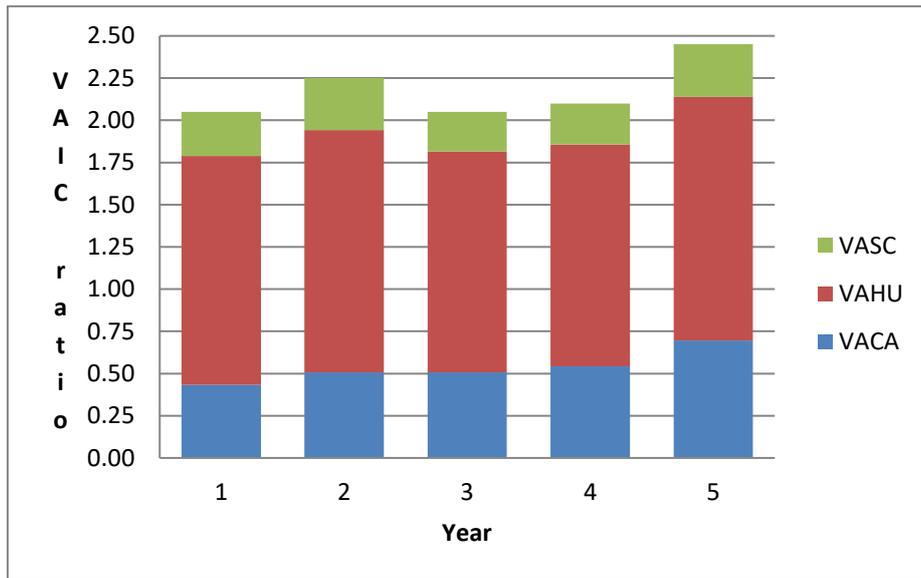
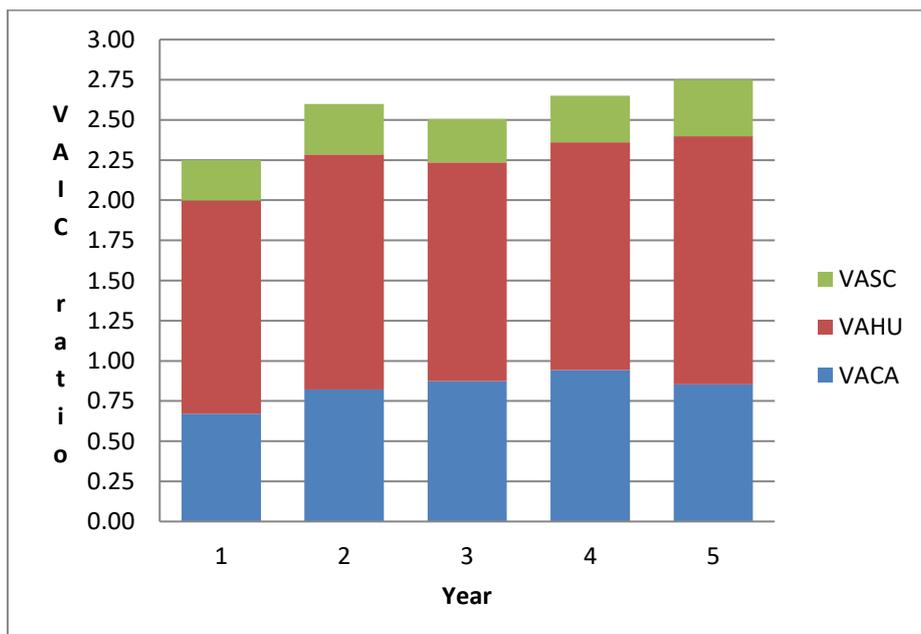


Figure 9: The VAIC ratios at the companies ANY Plc. and Kulcs-Soft Plc.  
Source: Own editing



Components	Years				
	1.	2.	3.	4.	5.
VASC	12,73%	13,67%	11,44%	11,57%	12,70%
VAHU	66,17%	63,82%	63,84%	62,63%	58,88%
VACA	21,10%	22,52%	24,72%	25,80%	28,42%

Figure 10: Distribution of the VAIC components at the ANY Biztonsági Nyomda Plc.  
Source: Own editing



<b>Components</b>	<b>Years</b>				
	<b>1.</b>	<b>2.</b>	<b>3.</b>	<b>4.</b>	<b>5.</b>
VASC	11,12%	12,13%	10,77%	10,91%	12,81%
VAHU	59,03%	56,27%	54,35%	53,49%	56,14%
VACA	29,84%	31,60%	34,88%	35,60%	31,04%

Figure 11: Distribution of the VAIC components at the Kulcs-Soft Plc.  
Source: Own editing