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RELATIONSHIP BETWEEN INVESTMENTS IN INTELLECTUAL CAPITAL AND TOTAL BOOK VALUE

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Abstract:

In this paper the contribution of intellectual capital components in the overall intellectual capital value is investigated. This paper adopted quantitative statistical methods Lambda phase measurement and Shapley's value on the sample of 498 French companies in the period of 2008 to 2016 in order to estimate the highest and lowest contributions of intellectual capital components. For the purpose of the study, the official financial information from the companies' annual reports were taken from the financial database "Point Risk". The paper concentrates on two out of three intellectual capital components: structural and customer capital components. By the Shapley's value final result, the greatest importance has the customer capital component, which represents company's commercial activities with the coefficient of 0.29911. On the other side, the lowest importance has the structural capital component that represents value coming from research and development expenses with the coefficient of 0.07463 This study contributes to the management sciences literature by examining distribution of contribution of two intellectual capital components in the annual reports of French companies.

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INTRODUCTION

The main company's goal is to maximize stockholders' equity. In such a global, dynamic, and competitive market as it is at the moment, maximization of equity is not an easy task. In the last two decades, the market has changed dramatically. From supply-based, where the focus was on producers, to demand-based and completely concentrated on customers. Even though we are witnessing radical changes, accounting measurement tools and rules remained the same. Because of that, companies are looking for more advanced tools that will not only measure classical financial results but non-financial ones as well.

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To better adapt to the continuously evolving global market, companies used their efficiency and flexibility in a combination with advanced technology. This includes all different types of the latest technology that will result in better performance (Li *et al.*, 2020), and further sustainable competitive advantage (Sakas *et al.*, 2014).

In the last decades, the structure of investments completely changed. In the previous century, tangible asset investments dominated intangible assets on a global market. The best examples of that are the most developed economies, such as the USA, Australia, and the EU. These findings were justified by an official report published by OECD (2013).

The first author who ever used the term "intellectual capital" was Galbraith (1969). He emphasized the importance of a company's knowledge as a main strategic resource. This resource can be in the form of management skills, technology, know-how, expertise, processes, and many others. After Galbraith, many authors adopted the findings, so in recent years the topic of intellectual capital was widely expanded, mostly because of global economic transformation.

Authors Petković & Đorđević (2021) worked intensively on the topic of investments in intellectual capital which becomes interesting mostly because of high-level of uncertainty and riskiness of the global market. Mostly speaking, decision-makers and managers focus on short-term and immediate results that do not bring a long-term competitive advantage. Authors suggest that long-term economic benefits can be expected to come only after long-term investments in a company's intellectual capital. Economic benefits will appear in more than one production cycle. It was defined that intellectual capital is a company's knowledge and main strategic resource in the current global economy (Noordin & Mohtar, 2013).

The main research objective is to explore the transformation process from investments in intellectual capital components into concrete assets value. Results can motivate decision-makers and managers to plan in the long term and to invest in the company's intellectual capital which will result in longer and constant economic benefits. Until now, the main focus was on immediate and short-term results such as profits, sales, and share prices, and not so much on long-term constant and stable financial results. These kinds of benefits are not possible without a transformation process within a company. The study is focused on French pharmaceutical companies because France is seen as one of the most innovative worldwide economies (Department for Business Innovation & Skills, 2012; Hollanders *et al.*, 2016; Triki-Damak & Halioui, 2013; Guidara & Boujelbene, 2015), but also because French pharmaceutical industry is one of the most profitable (Statista, 2022) and most-employed industry in Europe (Statista, 2020).

The research paper is composed of the main 5 sections. Section 2 presents the literature review. Section 3 works on the research methodology, whereas Section 4 explains the final results. Finally, section 5 concludes the paper.

LITERATURE REVIEW

What is Intellectual Capital?

Intellectual capital became more important after the 4.0 digital revolution or the New economic era which drastically changed the relationship between machines and humans. The New era brought higher attention to innovations, knowledge, and know-how as the main drivers for long-term competitive advantage. Table 1 gives an overview of the most important definitions of intellectual capital from the literature.

Table 1. Definitions of Intellectual capital

Authors	Definitions of intellectual capital
Battisti *et al.* (2015)	Stated that besides the development of services and products, intellectual assets improve a company's competitive advantage resulting in changing clients' expectations and better the company's environmental adaptation. Intellectual capital as a company's main knowledge contributes to the company's economic development.
Bontis *et al.* (2015)	Intellectual capital is replacing traditional resources, such as labor and land, and becoming a strategically important resource.
Mignon & Walliser (2015)	Intellectual capital motivates growth mostly because the initial cost of creating certain knowledge is not repeated and brings economies of scale.
McDowell *et al.* (2018)	Intellectual capital is defined as the intangible economic value of one organization that is composed of three main components, and those are human capital, organizational capital, and relational capital.
Mahmood & Mubarik (2020)	Researchers stated that the relationship between intellectual capital and new technology must be stronger within one company.
Liu & Jiang (2020), McDowell *et al.* (2018), and Saxena (2015)	Discussed intellectual capital components classification and confirmed three main dimensions that we will be adopting in our study, and those are human, organizational, and relational capital.

In Table 1 above, the authors defined intellectual capital as a strategic resource that is improving a company's performance and competitive advantage. The company's knowledge represents the expertise or specialty in the industry company belongs to and operates. As previously defined in Table 1, intellectual capital, or a company's knowledge is divided into three main components: human capital, organizational capital, and relational capital. The company cannot expect a competitive advantage without investing in all three components at the same time (Pap *et al.*, 2021).

What employees possess and bring to the company, without a doubt influences highly positively on organizational financial performance. That is why human capital is seen as the most important part of intellectual capital (Mahmood & Mubarik, 2020). According to Mubarik *et al.* (2018), human capital represents a collective ability to resolve organizational problems that will strengthen relationships with suppliers and customers.

Organizational or structural capital consists of all resources owned by one company. Those resources can be tangible or intangible. For instance, databases, software, machines, organizational structure, organizational culture, knowledge, patents, licenses, know-how, documentation, etc. (Mahmood & Mubarik, 2020). Every organization tries to transform human capital into organizational capital, or precisely, to transform employees' values, ideas, and projects into assets that we remain within a company, even one day employees leave the company. Liu & Jiang (2020) confirmed the previous statement and added that this transformation must be according to the main business strategies.

Finally, relational or external capital is defined as a sum of all relationships with a company's main stakeholders, such as customers, suppliers, competitors, the public, partners, investors, government, and others. These relationships result in knowledge sharing and learning from each other (Carmeli & Azeroual, 2009). These relationships influence other internal employees within an organization and must be built on high collaboration, trust, confidence, empathy, and especially with strategically important partners (Mahmood & Mubarik, 2020; Rezaei *et al*., 2020).

Determination and Capitalization of Intellectual Capital Investments

In order to better understand the process of investment decision-making, it is highly important to accept the approach determined by behavioral finance and that is element of irrationality (Mijailović & Mizdraković, 2023). Authors Kujansivu & Lönnqvist (2007) defined investments in intellectual capital as long-term expenditures with tendencies to improve a company's financial results. Authors link these expenditures with research and development (R&D) expenses, advertising expenses, IT and programming, and many other intangible assets expenses. Lentjushenkova & Lapina (2014) expanded this list with personnel and managerial expenses, business processes, and organizational culture expenses. Petkovic *et al.* (2021) presented all relevant definitions of investments in intellectual capital from the existing literature and concluded that investments are seen as long-term expenditures with economic expectations within highly-innovative companies.

According to Lev (2001) - successful companies pay more attention to the recognition of intellectual capital investments into concrete assets value. Many companies belong to highly innovative or knowledge-intensive industries, such as information technology, financial services, pharmaceutical, consulting, laws, and others that rely on their functionality on intellectual assets. The process of recognition is called the capitalization process and it represents treating capital expenditures as an investment and accumulating capital within a company's long-term basis (Barnes & McClure, 2009).

To recognize long-term capital expenditure into the balance sheet as a concrete asset, whether it is tangible, intangible, or financial (nowadays also digital), some criteria must be met. According to the current international accounting framework, a company can recognize and capitalize intangible assets within the total book value only if meet six different criteria by International Accounting Standard (IAS) 38. Those six criteria are initiative to develop an intangible asset for further usage, possibility to sell or use intangible assets, building a new intangible asset based on required technical conditions, ability to obtain financial benefits, possibility to complete development of intangible asset based on existing financial, technical, or other criteria, and the possibility to adequately measure all related historical costs to that intangible item. Based on the IAS 16 Property, Plant, and Equipment (PPE), a company can develop internally their tangible assets, if only meet two criteria, and those are the association between the used item and future economic benefits and historical costs with the same item.

Link between Intellectual Capital Investments and Financial Performance

Until now, numerous studies investigated the positive correlation between intellectual capital and financial performance. Nadeem *et al.* (2021) see intellectual capital as a basis for achieving long-term competitive advantage and innovation. However, what is important to highlight is a company's heterogeneity of investments in intellectual resources (Arrighetti *et al*., 2014). Barney *et al.* (2001) confirmed intellectual capital as a critical source of competitive advantage, but more importantly, value-creation processes do not come from investing in physical assets anymore. Economic benefits come from investing in knowledge assets. Various studies proved a positive relationship between R&D expenses and a company's growth (Ho *et al*., 2006), and improve productivity (Ding & Stolowy, 2007).

Mehralian *et al.* (2012) were especially focused on the pharmaceutical industry. The authors proved the highly positive relationship between intellectual capital and financial performance. Pal & Soriya (2012) examined the significant impact of intellectual capital on the performance of the Indian pharmaceutical industry. Intellectual capital influence positively on the business performance in the pharmaceutical industry of Jordan (Sharabati *et al*., 2010). Thakur–Wernz & Wernz (2022) proved that intellectual capital plays an important role in the success of Indian pharmaceutical companies.

Intellectual capital is seen as a company's knowledge in a combination with advanced technology bringing higher financial performance in the long term (Mahmood & Mubarik, 2020). Bhatti *et al.* (2021) also confirmed that intellectual capital enhances organizational innovations, development, foresight, and ability. Authors Ivanović *et al.* (2022) state that innovative activities and innovative ideas influence on the company's final performance. Zlatković (2018) sees intellectual capital as the main driver of a company's competitiveness and economic financial performance.

DATA AND METHODOLOGY

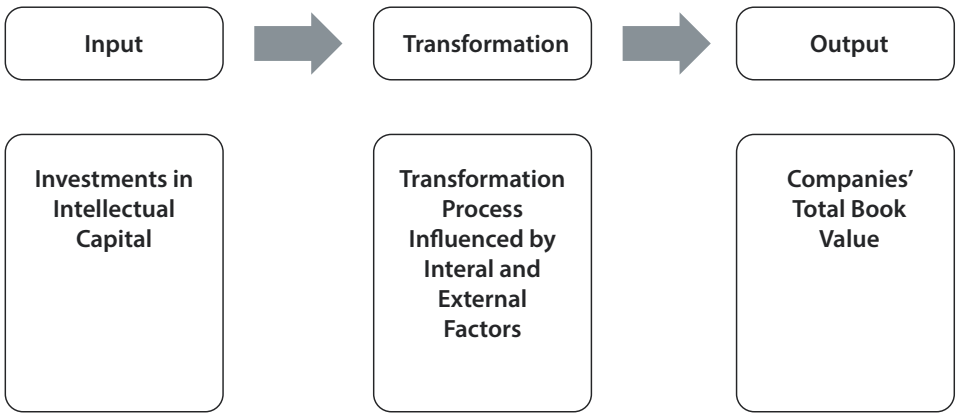
Data and research sample

The financial data used for the study was obtained from the French financial database "Point Risk". The annual reports were collected for 36 pharmaceutical companies over 9 years, between 2008 and 2016. Of the total 36 companies 12 are micro-size, 15 are small-size companies and 9 are large-size companies. We did not have any medium-sized companies. For the study, we observed all French pharmaceutical companies available from the financial database that had required financial information. The financial information is in absolute value because of two reasons: (1) the focus is on internal perspective and managers and decision-makers, not on investors; (2) research papers presented in the literature review are all in absolute value.

Research Methodology

The research paper was based on Molodchik *et al.* (2012) methodology. The authors developed Intellectual Capital Transformation Evaluating Model or ICTEM model. This model explores the transformation process from intellectual capital into a company's performance. We adapted the model to our purposes and observed the investments in intellectual capital as an input, the transformation process as the main process of converting investments into concrete value, and finally, the company's total book value improvement as an output. We are more interested in the transformation process that will potentially lead to the creation of new values in the form of assets. These assets will bring profitability or additional financial benefits to companies.

Figure 1. Intellectual Capital Transformation Evaluation Model (ICTEM)



***Source**: Molodchik et al.- (2012)*

In Figure 1 above is the model presented. Investments in intellectual capital are long-term expenditures in human, organizational and relational components of intellectual capital. Pap *et al*. (2021) proved that investments must include all intellectual capital components at the same time, not only one or two exclusively. Internal and external factors influence the transformation process. Internal factors are company size, age, and global market orientation. On the other side, external factors are the industry they belong to, the country where they are headquartered, the level of market development, and the sub-indexes of the knowledge economy. Finally, the output is a company's long-term book value or asset value.

The research goal will be to empirically test the link between the investments in intellectual capital components and total book value as a final company's performance. The purpose is to see, whether French pharmaceutical companies create value in the form of long-term asset values.

The following hypotheses are tested:

H1: French pharmaceutical and high-technology companies transform and capitalize their investments in intellectual capital into concrete assets and improve a company's total book value.

H1.1: Investments in human capital, influence positively on the companies' total book value;

H1.2: Investments in structural capital influence positively the companies' total book value;

H1.3: Investments in relational capital influence positively the companies' total book value;

H2: Improvement of total book value within French highly-innovative pharmaceutical companies continue even more to progress in the upcoming years.

RESULTS AND DISCUSSION

Model 1 – Multiple Regression Analysis

Multiple regression analysis is a statistical technique that can be used to analyze the relationship between a single dependent variable and several independent variables. The objective of multiple regression analysis is to use the independent variables whose values are known to predict the value of the single dependent value.

In this article the following variables are observed: Total Book Value (TBV) (dependent), Personal Costs (InvestPERSON) (independent), Research and Development Costs (InvestR&D) (independent) and Commercial Costs (InvestCOMMEA) (independent). We had one control variable, and that is the Size of companies (also as independent). Indicators for these variables were taken previously from the methodology justified in the study by Molodchik *et al.* (2012).

We name variables as follows: $y=TBV$, $x_1=InvestPERSON$, $x_2=InvestR\&D$, $x_3=InvestCOMMEA$ *and* $x_4=Size$.

The following multiple regression model is considered:

$$y=\beta_0+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\beta_4 x_4+\varepsilon, \quad (1)$$

where ε is white noise and $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$ are coefficients which have to be determined. It is necessary to evaluate the model, to examine whether the regression is statistically significant and if so which of the coefficients are statistically significant.

Table 2. Model 1 statistical results

	β_4	β_3	β_2	β_1	β_0
β Coefficients	19332586.7109	-1.1606	-1.1389	5.9791	-28687947.6802
$S_{\beta i}$ errors	9196078.0702	2.1589	1.6739	1.0979	21068755.9537
R^2	0.9372				
F-statistics	115.6357				
t-statistics	2.1023	-0.5376	-0.6804	5.4459	-1.3616
t-critical	2.0395				
F-critical	2.6787				

***Source**: Authors' calculation*

Table 2 above presents statistical results. The Least Square Method was used to estimate regression coefficients:

$$y= -28687947.6802+5.9791x_1-1.13893x_2-1.1606x_3+19332586.7109x_4. \quad (2)$$

The research model 1 has the starting β_0 with the coefficient of -28687947.6802. Model 1 shows that total book value is positively influenced by personal costs with a coefficient of 5.9791 and size with coefficient of 19332586.7109. Variables research and development and commercial costs influence negatively, -1.1389 and -1.1606 respectively. The results show that regression is statistically significant with the critical area c =(2.6787,+∞) and realized value of test statistic F =115.6357.

Then the following hypotheses are tested:

H_{0i} *coefficient* β_i *is not statistically significant*

H_{1i} *coefficient* β_i *is statistically significant* (i=1,…,4).

Realized values of test statistics are: t_{b0}= -1.3616, t_{b1} =5.4459, t_{b2} =-0.6804, t_{b3} =-0.5376, t_{b4} =2.1023.

The statistical results prove that coefficients β_0, β_2 and β_3 are not statistically significant, while coefficients $\beta 1$ and β_4 are statistically significant, taking into consideration that the critical area is c=(-∞,-2.0395)∪(2.0395,+∞). Null hypotheses H_{01} and H_{04} are rejected, while the null hypotheses H_{00}, H_{02} and H_{03} are accepted because values of test statistics t_{b0}, t_{b2} and t_{b3} are out of the critical area.

Multicollinearity

Next thing we want to examine is whether there is multicollinearity between independent variables. Multicollinearity happens when independent variables in the regression model are highly correlated to each other.

In order to check multicollinearity we used the Variance Inflation Factor (VIF) for each independent variable. VIF is a measure of multicollinearity in the set of multiple regression variables. The higher the value of VIF, the higher correlation between this variable and the rest of variables.

Table 3. Multicollinearity calculation for model 1

Statistic	x_1	x_2	x_3	x_4
R^2	0.942	0.140	0.942	0.168
VIF	17.391	1.163	17.295	1.202

Source: *Authors' calculation*

The higher the value of VIF, the greater the correlation of the variable with other variables. Value of 1 means there is no correlation. Values of more than 4 or 5 are sometimes regarded as being moderate to high, with values of 10 or more being regarded as very high. In our case there is high correlation between variables x_1 and x_3. To avoid this problem we will transform independent variables.

Heteroscedasticity

We want to examine heteroscedasticity. The concept of heteroscedasticity - the opposite being homoscedasticity - is used in statistics, especially in the context of linear regression or for time series analysis, to describe the case where the variance of errors of the model is not the same for all observations, while often one of the basic assumption in modeling is that the variances are homogeneous and that the errors of the model are identically distributed.

Why is heteroscedasticity a problem? In linear regression analysis, the fact that the errors or residuals of the model are not homoscedastic has the consequence that the model coefficients estimated using The Ordinary Least Squares (OLS) are neither unbiased nor those with minimum variance. The estimation of their variance is not reliable.

The following hypotheses are tested:

- H_0: Residuals are homoscedastic
- H_1: Residuals are heteroscedastic

Using Breusch-Pagan test we concluded that **residuals are heteroscedastic**. In order to avoid heteroscedastic we have to transform independent variables.

Model 2 – Multipre Regression Analysis of transformed model

While analyzing model 1 we have concluded that residuals are heteroscedastic and independent variables are multicollinear. Now we will transform independent variables in order to avoid multicollinearity and heteroscedasticity.

We name variables as follows: $y = ln(TBV)$, $x_1 = ln(InvestPERSON)$, $x_2 = ln(InvestR\&D)$, x_3=($InvestCOMMEA$) and x_4=$Size$.

The following multiple regression model is considered:

$$y=\beta_0+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\beta_4 x_4+ \varepsilon, \quad (3)$$

where ε is white noise and β_0, β_1, β_2, β_3, β_4 are coefficients which we have to be determined. It is necessary to evaluate the model, to examine whether the regression is statistically significant and if so which of the coefficients are statistically significant.

Table 4. Model 2 statistical results

	β_4	β_3	β_2	β_1	β_0
β Coefficients	0.2390	0.0774	-0.0038	0.8614	2.1525
$S_{\beta i}$ errors	0.1404	0.0714	0.0838	0.1339	1.7262
R^2	0.7947				
F-statistics	30.0139				
t-statistics	1.7015	1.0837	-0.0447	6.4303	1.2469
t-critical	2.0395				
F-critical	2.6787				

Source: *Authors' calculation*

The Least Square Method was used to estimate regression coefficients

$$y=2.1525+0.8614x_1-0.0038x_2+0.0774x_3+0.02390x_4. \quad (4)$$

The research model 2 has the starting β_0 with the coefficient of 2.1525. The results show that regression is statistically significant with the critical area c=(2.6787,+∞) and realized value of test statistic F=30.0139.

Then the following hypotheses are tested:

- H_{0i} *coefficient* β_i *is not statistically significant*
- H_{1i} *coefficient* β_i *is statistically significant* (i=1,…,4).

Realized values of test statistics are: $t_{\beta 0}$ =1.2469, $t_{\beta 1}$ =6.4303, $t_{\beta 2}$ =-0.0447, $t_{\beta 3}$ =1.0837, $t_{\beta 4}$ =1.7015.

The statistical results prove that coefficient β_2 is not statistically significant, while coefficients β_0, β_1, β_3 and β_4 are statistically significant, taking into consideration that the critical area is c=(-∞,-2.0395)∪(2.0395,+∞). Null hypotheses H_{00}, H_{01}, H_{03} and H_{04} are rejected while the null hypotheses H_{02} is accepted because values of test statistics $t_{\beta 2}$ is out of the critical area.

Multicollinearity

Next thing we want to examine is whether there is multicollinearity between transformed independent variables.

Table 5. Multicollinearity calculation for model 2

Statistic	x_1	x_2	x_3	x_4
R^2	0.487	0.129	0.445	0.213
VIF	1.951	1.149	1.8	1.271

Source: *Authors' calculation*

Therefore, we can conclude that **there is no high correlation between transformed variables.**

Heteroscedasticity

Now we want to examine heteroscedasticity in transformed model. In model 1 we concluded that residual are heteroscedastic so we transformed independent variables.

The following hypotheses are tested:

- H_0: Residuals are homoscedastic
- H_1: Residuals are heteroscedastic

Using Breusch-Pagan test we concluded that residuals are homoscedastic.

Model 3 – Forecast Analysis

The goal is to make a forecast for Total Book Value based on the historical data. Moreover, the purpose of this part is to estimate the trend of Total Book Value in the upcoming years based on investments in intellectual capital made in previous period of 9 years.

The process of forecast analysis started with a time series of the observed variable for the time of 2008-2016. Next, we can use exponential smoothing t which represents a forecasting method. This method links decreasing weights on previously older observations. The AAA is additive error additive seasonality and additive trend. The AAA version is an exponential triple smoothing (ETS) that is used in our study. The value that is prediction is just a continuation of the previous historic values in a specific targeted time moment, which is a continuation of the timeline. This method is implemented in Excel and does all calculations automatically. The method is composed of three smoothing equations and one forecast equation. These three are – one for the level l_t,, one for the seasonal components s_t and one for the trend b_t. They are corresponding to parameters α, β and γ. The frequency of the seasonality related to the number of years is labeled as m, and in our case is just 1.

The additive method for the component form is:

$$\begin{aligned} y_{t+h|t} &= l_t + hb_t + s_{t+h-m(k+1)} \\ l_t &= a\left(y_t - s_{t-m}\right) + \left(1-a\right)\left(l_{t-1} + b_{t-1}\right) \\ b_t &= \beta^*\left(l_t - l_{t-1}\right) + \left(1-\beta^*\right)b_{t-1} \\ s_t &= \gamma\left(y_t - l_{t-1} - b_{t-1}\right) + \left(1-\gamma\right)s_{t-m}, \end{aligned} \tag{5}$$

k is the integer part coming from $(h\text{-}1)/m$ that will ensure that the seasonal indices are coming from the final year of the observed sample. We do now a weighted average between the non-seasonal forecast $l_t\text{-}1+b_{t-1}$ for time t the seasonally adjusted observation $y_t\text{-}s_t\text{-}m$. The seasonal equation shows a weighted average between the seasonal index of the same season last year (i.e., m time periods ago) and the current seasonal index, $y_t\text{-}l_t\text{-}1\text{-}b_t\text{-}1$. In our data we don't notice seasonality, but we do notice a growing trend. In order to estimate smoothing parameters and initial estimates, we have calculated RMSE (Root Mean Square Error). In our case, this is represented in the Table 6 below.

Table 6. Calculation of Root Mean Square Error (RMSE)

Alpha	1.00
Beta	0.10
Gamma	0.00
MASE	0.40
SMAPE	0.03
MAE	2,102,913.10
RMSE	2,781,257.07

Source: *Authors' calculation*

We have also calculated the three types of errors values, and those are: MAE (Mean Absolute Error), SMAPE (Symmetric mean absolute percentage error) and MASE (Mean Absolute Scaled Error). Based on the errors, we can determine that our forecast is reasonable.

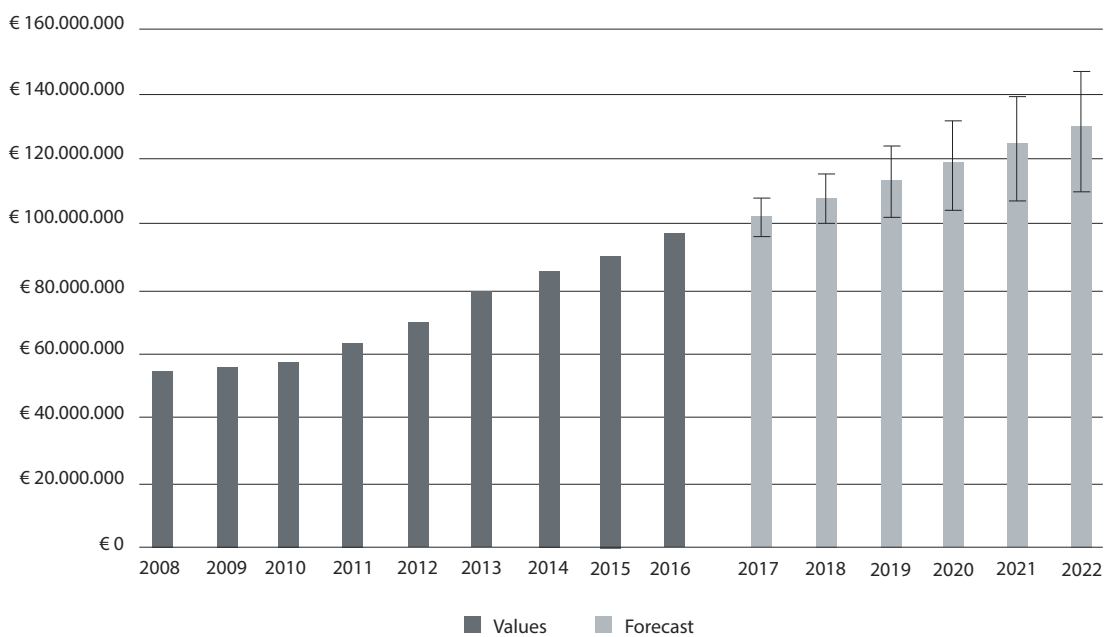
The next calculated is the confidence interval. The confidence interval is where potentially the predictions are expected to fall. This interval can help us to better understand the forecast accuracy. More confidence for a specific points can lead to a smaller interval. Our result proves that interval level is 95%, which means that there is the 95% of future points chance that values are expected to fall the given range. This is presented in the Table 7 below.

Table 7. Calculation of forecast and confidence intervals

Timeline	Values	Forecast	Confidence Interval
2008	€ 54.798.056		
2009	€ 56.308.222		
2010	€ 56.532.944		
2011	€ 63.171.444		
2012	€ 69.697.889		
2013	€ 79.196.056		
2014	€ 85.284.500		
2015	€ 90.327.389		
2016	€ 96.666.944		
2017		€ 102.303.276	€ 5.451.164
2018		€ 107.941.162	€ 8.091.644
2019		€ 113.579.048	€ 10.391.332
2020		€ 119.216.935	€ 12.562.360
2021		€ 124.854.821	€ 14.681.843
2022		€ 130.492.707	€ 16.786.695

Source: *Authors' calculation*

Figure 2. Future projections of TBV



Source: *Authors' calculation*

In the Figure 2, the positive trend is evident, for all three potential scenarios, Forecast, Lower Confidence Bound and Upper Confidence Bound. After multiple regression analysis and positive results, the projections confirmed positive relationships. Results presented here show that companies will continue improving their Total Book Value, precisely, increasing the value of their assets. Furthermore, this can bring more economic financial benefits and competitive advantage.

Finally, based on research findings, we will approach discussing research hypotheses. Hypothesis 1 was confirmed, proving that French pharmaceutical companies transform investments in intellectual capital components into total book value. Hypothesis 2 was confirmed, confirming that total book value will continue to grow in the upcoming years (2017, 2018, 2019, 2020, 2021 and 2022). Chizari *et al.* (2016) had identical results in their research. They proved a significantly positive relationship between intellectual capital and the company's value on a sample of 26 pharmaceutical companies listed in the Tehran Stock Exchange. The same results were published by Daryaee *et al.* (2011). On the other side, Tanideh (2013) proved that there is no relationship between intellectual capital and a company's corporate value.

CONCLUSION

Intellectual capital is seen as a company's strategic resource that improves final financial performance. Investments in intellectual capital and its components result in obtaining a long-term competitive advantage.

The research paper was focused on the 36 French pharmaceutical companies over the period 2008 and 2016. From the 36 companies, 12 were micro-size, 15 were small-size and 9 were large size. This industry was selected because it is seen as a highly innovative French industry. The research empirically investigated the effects of intellectual capital investments on the company's total book (assets) value. The three main research models were developed.

After a nine-year period of investment, the study proves value creation. The selected companies create new value into their book value that will further influence financial performance and bring economic benefits. These findings can motivate managers to make decisions and invest in their intellectual capital on the longer term. The study proposes that after capitalization and recognition of tangible or intangible assets within a company's total book value, assets will generate benefits in the long-term. Most of the studies are concentrated on obtaining short-term immediate benefits, such as profits, sales, share price, etc. These findings can motivate managers to make decisions and invest in the longer term. Future research may extend to exploring other innovative industries and determining the precise assets developed by intellectual capital investments. Furthermore, the future question may be what was precisely developed within a company's total book value, tangible, intangible or financial asset. This perspective is interesting and requires further research.

The paper limitations come from the small sample size of French pharmaceutical companies that met our requirements. Companies' official annual reports and accounts lack financial information such as research and development, marketing and personnel expenses. Taking into consideration that without a doubt, the total book value of French pharmaceutical companies increased influenced by intellectual capital investments, our future research will be focused on exploring what types of assets precisely were developed. It can be very interesting to see companies' development of tangible, intangible or financial assets. The same research could be extended on working to different highly-innovative industries not only in France but also in other countries as well.

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VEZA IZMEĐU INVESTICIJA U INTELEKTUALNI KAPITAL I KNJIGOVODSTVENE VREDNOSTI

Rezime:

Istraživački rad teži empirijskom istraživanju veze između investicija u intelektualni kapital i knjigovodstvene vrednosti francuskih farmaceutskih kompanija. Višestruke regresione analize su primenjene na 36 francuskih farmaceutskih kompanija u periodu od 2008 do 2016. Istraživački modeli istražuju proces transformacije troškova u konkretne vrednosti imovine prihvaćene i prepoznate po važećim računovodstvenim standardima. Investicije u strukturalnu komponentu intelektualnog kapital utiče negativno, sa koeficijentom od -0.00374. Sa druge strane, investicije u ljudsku komponentu i eksternu komponentu intelektualnog kapitala utiču pozitivno, sa koeficijentima 0.861388 i 0.077 respektivno. Istraživački uzorak, kao i nedostatak dostupnih finansijskih informacija o troškovima istraživanja i razvoja i marketinga u finansijskim izveštajima predstavljaju dva najveća ograničenja rada. Rezultati potvrđuju da francuske farmaceutske kompanije transformišu dugoročne investicije u intelektualni kapital u vrednosti imovine.

Ključne reči:
investicije u intelektualni kapital, knjigovodstvena vrednost, farmaceutska industrija, Francuska.

JEL klasifikacija:
O34, L25, L65