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RESEARCH PAPER

# Intellectual Capital Investments and Company's Profitability: French Context

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**ABSTRACT**
The purpose of this paper is to investigate the effects of R&D investments on the company profitability, with special focus on the French most innovative companies. The study is divided into three parts aiming to address the three key research questions raised in the study: the first research question examines the influence of R&D investments on company intangible assets; second research question calculates efficiency of capitalized or transformed intangible assets value coming from R&D investments, whereas the third research question examines generated returns on capitalized assets. The method used in this study is the Efficiency of Intellectual Capital (EIC) method developed by Krstić and Bonić (2016). This method investigates the process of Intellectual Capital (IC) value creation within French companies. The study proves that R&D investments influence positively the intangible assets value after a long-term period of investments. After the new intangible assets are created and developed, they positively influence their efficiency, whereas the impact on the company profitability is not determined in the same year. The main research limitations come from the fact that the observed sample of companies is small, and the access to the financial information related to the R&D expenses is limited to the official accounts of companies, whereas companies are not obliged to disclose this information by accounting rules. This study confirms that high-innovative French companies transform long-term R&D investments into concrete intangible assets values. On the practitioners' side, the study represents a motive for managers to focus more on the investments in IC that will create a concrete value and generate further economic benefits from that value, rather than to concentrate only on short-term improvements of financial performance.

**Key words:** *R&D expenditures, investments in IC, IC, return on assets methods, financial performance, France*

**JEL Classification:** E22

## INTRODUCTION

Global economy has dramatically changed during the last thirty years. The change in the form of transition from industrial economy to knowledge-based economy was a revolution in the corporate world. These changes are mostly influenced by the global information and technological trends which put emphasis on the innovation and IC as the key factors of global competition (Petković et al., 2020). Growing awareness and importance of intangible assets are coming directly from the increasing difference between market and book value of companies (Lev, 2001). Because of the importance of intangible assets, companies' investments are about

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50% only in the sphere of intangible assets, precisely in (R&D), personnel development, infrastructure (Fuller, 2002). Kaplan and Norton (2004) documented that 75% of the market value of US companies comes from intangible assets.

According to Lev and Schwartz (1971), all company's intangibles make up its own IC. IC is everything known by everybody in a company, and it brings a necessary competitive advantage to the company (Serenko and Bontis, 2004; Stewart, 1991). The company competitiveness, attractiveness, and financial performance are driven by its IC.

The topic of investments in IC brings a debate because if a company decides to invest in intellectual resources and expects improvement in competitive advantage, managers should measure the return on them. In order to manage IC properly, it is of high importance to measure them in the right way. The treatment of IC in a company accounts has been changed drastically. The main decision relates to capitalizing investments in IC, as this can transform knowledge into concrete value. The IC investments have the main ability to make contributions to more than one production cycle and lead to the accumulation in the form of an asset. However, this is where the greatest difficulty lies because organization must measure these investments consistently and systematically over time (Belo et al., 2014; Bloom and Van Reenen, 2010).

The aim of this study is to make an empirical investigation of effects of investments in R&D on the company financial performance by implementing the EIC model developed by Krstić and Bonić (2016). The sample is composed of 61 French companies over the period from 2008 to 2016. In the research paper, the complex statistical regression analyses are implemented in order to answer the three main research hypotheses: (1) following the investments in intellectual capital; (2) capitalization of investments intellectual capital into concrete assets value; and (3) measuring the influence of capitalized assets on the company's financial profitability.

The paper is organized as follows. Section 2 presents the theoretical background and literature review of the IC investments in company performance. Section 3 explains developed research methodology. Section 4 presents empirical findings, whereas Section 5 concludes the paper.

## LITERATURE REVIEW

### The conceptualization of IC investments

A unique definition of IC investments has not been found until now because it mainly depends on the purpose of a study. On one side, investments are understood as expenditures for IC components. On the other side, some researchers perceive investments in IC as intangible investments, knowledge-based investments, intangible activities, etc. (Lentjushenkova and Lapina, 2014). According to Piekkola (2011), the IC investments are capital formation expenditures of a company. The definition of "investments" is not only focused on financial performances, but also on non-financial performances, such as productivity, quality and improvement (Lentjushenkova and Lapina, 2014).

Many researchers consider IC investments as the key-drivers of financial company performance. Based on the literature, IC investments are linked to value factors (Dumay, 2012). According to Molodchik et al. (2012) IC investments are the IC part concentrated on improving company competitive advantage and financial performance that will further cause an increase in the company value. The study by Rodriguez-Castellanos et al. (2011) proves that companies investing in IC have a better financial performance.

## R&D expenditures as IC investments

Most of the researchers link IC investments to R&D expenses (Bandeira and Afonso, 2010). Researchers define IC investments as different kinds of costs or expenditures, such as R&D expenditures, advertising expenditures, labor costs, etc. This approach is used mainly because it is easy to collect this financial information from financial statements and annual reports (Lentjushenkova and Lapina, 2014). Bandeira and Afonso (2010) prove that market treats R&D expenses as investments in IC, more precisely in structural capital. Martín-de-Castro et al. (2011) state that the structural capital is composed of technological and organizational capital. Making a decision to invest in a company IC requires setting a company goal and estimating the amount of necessary financial resources. For instance, if a company decides to invest in its R&D, the same company must also invest in hiring qualified employees that will be able to perform and realize pre-planned R&D activities. At the same time, these qualified employees must be trained and educated continuously in order to keep their level of qualification competitive. Finally, if a company invests in its R&D and hires qualified personnel, it is necessary to focus on stakeholders' demands and requirements because it is not possible to imagine and generate future benefits without that (Lentjushenkova and Lapina, 2014).

Investments in IC very often do not generate immediate results and returns. Some period is necessary to produce effects on company performance. The results today must come from the investments made in previous periods (García-Zambrano et al., 2018). Results from investments in IC components vary from each other. For instance, the study by Awano et al. (2010) proved that investments in IC produce results after 3-5 years regarding training, reputation and branding, and 4-7 years regarding R&D and software.

According to the study by Khamoussi Halioui (2013) the capitalization of R&D expenses is possible in France, but it is up to the management to decide whether to expense or capitalize. It is important to understand that the capitalization process is highly risky process, mostly because the investments belong to high IC intensive companies. The same author explains that based on the IFRS/IAS it is possible to capitalize R&D expenses, only under certain conditions, whereas under GAAP this is not allowed. Under GAAP, it is only possible to expense R&D expenses. Based on the synthetized literature review of various studies by Lentjushenkova et al. (2016), some of the potential outcomes of IC investments are: profit growth, future costs reduction, market share growth, productivity growth, business value improvement, customer satisfaction, and staff loyalty improvement.

## R&D expenditures and company financial performance

R&D investments differ from other types of investments by their nature and other attributes, such as company specificity, information asymmetry, and high level of uncertainty and risk (Holmstrom, 1989). R&D costs are not intangible assets. R&D expenses often result in the development of patents or copyrights (product, process, idea, formula, etc.) (Warfield et al., 2008). Research activities are planned search or critical investigation focused on the discovery of new knowledge, whereas development activities are translation of research findings into a concrete plan or design for a new product or process (Warfield et al., 2008).

It is proved that investments in R&D are seen as an important form of investments in high-technology (Karl-Heinz, 2005). Most studies prove that R&D positively influence productivity, profits, sales, and employment growth of a company (Lentjushenkova and Lapina, 2014). Chauvin and Hirschey (1993) reveal that advertising and R&D expenditures have large and positive effects on corporate market value. This indicates higher future cash flows for companies with greater R&D and advertising expenses. Maggina (2011) states that one company makes decisions at least one year before investing in R&D and the forecast is around 90% adequate when using a logit specification. Chang and Hsieh (2011) investigated the relationship between R&D investments and operating, financial and market performance of a company. The

association between these variables is proved to be positive and statistically significant. This is a proof that R&D investments are used as a source of "value creation" based on the Taiwanese example (Chang and Hsieh, 2011). Megna and Klock (1993) state that investments in R&D are directly related to the number of patents, or, to be more precise, directly related to increase in a company book value. Lev (2004) investigated the R&D investments of the textile company DuPont for the period from 1985 to 2000. The investments have influence on two thirds of the increase in the value generated within a company.

**Return on assets methods for IC measurement**

According to Marr et al. (2003) the starting reason for measuring IC is that it helps companies in determining their corporate strategies. The successful corporate strategy implementation will further enable the company diversification and expansion plans. Additionally, companies will benefit by establishing management compensation systems for upcoming years, together with appropriate communication with key external stakeholders. Kontic and Čabrilo (2009) argue in favor of IC measurement by taking into considerations all risks of not measuring it. Labor shortages, low productivity, skills mismatches or talents going to competitors are only some of the consequences of not measuring IC within a company.

Until now, there have been many possibilities to use IC in the value process creation of an organization. Following the Luthy's work (1998), Sveiby categorizes measurement methods in the following four groups:

- Direct IC methods (DIC),
- Market Capitalization methods (MCM),
- Return on Assets methods (ROA) and
- Scorecard methods (SC).

ROA methods are: Economic Value Added (EVA™), Market Value Added (MVA™), Human Resource Accounting (HRA), Value Added Intellectual Coefficient (VAIC™), Calculated Intangible Value (CIV), Knowledge Capital Earnings (KCE), EIC method developed by Krstić and Bonić (2016). The EIC methodological framework is developed by Krstić and Bonić (2016) for measuring the efficiency of the total IC of a company, by means of calculating the partial efficiency measures of IC components. This method combines the financial accounting valuation with the market valuation by determining the value of the IC from two parts: the IC disclosed on the balance sheet of an enterprise, and the undisclosed IC.

As regards the ROA methods, which are the monetary group of methods, their major strength is that these methods are suitable for comparison of different companies in the same sector of activities. On the other side, their main weakness is the lack of information constituting IC. The ROA methods are characterized by utilizing financial information from financial statements. They are very easy for calculation because financial information is mostly available. They are very often used in acquisition and merger processes as indicators of success or comparison of performance of intangible assets that are a subject of transactions (Gogan, 2014).

The most implemented method in practice is certainly the Pulic's VAIC method (Pulic, 2000). Many previous studies proved a positive relationship between IC and a company financial performance by using the VAIC method (Chu et al., 2011; Joshi et al., 2013; Pal and Soriya, 2012). Śledzik (2012) investigated the efficiency of IC in the banking sector in Poland for the period 2005-2009, and concluded that the IC efficiency was to a great extent depended on the human capital efficiency. Gigante (2013) analysed 64 banks in Europe for the period 2004-2007, and determined the correlation between IC and financial performance of the analysed banks, while the correlation between IC and market value was not confirmed.

Sardo and Serrasqueiro (2017) studied the impact of IC on the financial performance measured by ROA in the 8 European countries for the period 2004-2015, and concluded that IC efficiency had a positive impact on financial performance.

## DATA AND METHODOLOGY

### Innovativeness of French companies

The book published by Hollanders et al. (2016) proves that French economy is highly innovative. Innovative performance increased in the period from 2008 to 2012, declined briefly from 2013 to 2014, and continued increasing again from 2015 until today. The innovative performance is 10% higher than the European average in 2010, and it is 9% higher than the European average in 2015. French strength lies in open, excellent and attractive systems and innovators. The best performing indicator is seen in non-EU doctorate students who have the opportunity to start and successfully realize their research in France. Furthermore, France has marked highly positive growth in most of the indicators, such as license and patents, international scientific co-publications and new doctorate graduate papers. The French economy distinguishes itself from other European economies by high growth in SMEs innovating in-house, innovative collaboration of SMEs, and product/service innovations.

According to Triki-Damak and Halioui (2013), France as a country spends a lot of resources on innovations. France is 10$^{th}$ most innovative country in the European Union that invests 1.31% of GDP in R&D expenditures. According to Younes (2015), France is seen as the second most R&D intensive country in the European Union by the Economics of Industrial Research and Innovation (EIRI).

Based on the study of Department for Business Innovation & Skills (2012), France occupies 7$^{th}$ place in Europe regarding the level of investments in intangible assets. Based on the same study, France spends 1.2% GDP on scientific R&D, 2.3% on organizational competence (excluding trainings), and 4.1% of GDP on other investments in intangible capital, which is almost 10% of GDP in total.

It is evident that scientific R&D, other product developments, design and research in the part of innovative property, and firm-specific human capital and organizational capital in the economic competency part all play a crucial role with the biggest ratio in the whole French economy. In all three main areas: computerized information, innovative property, and economic competencies, measurement indicators are higher than 1.0 in total which means that companies invest more in intangibles than in tangible assets. These ratios are the main proof that the French economy is highly innovative (Barnes and McClure, 2009).

### Data and research sample

The study is focused on the data gathered by the financial database “Point Risk”. It comprises of financial information from the financial statements of French companies during the period 2008-2016. In the sample are only included companies from high-technology industries with the percentage of intangible assets in total book value higher than 40%. This indicator confirms high level of intangibility of company assets.

The data contains 11 high-technology French industries. The classification of industries is proposed by Francis and Schipper (1999). The high-technology industries covered by the study are: Computed Hardware, Research, Development, Testing Services, Drugs, Computer Programming, Software, Data Processing, Computer and Office Equipment, Electrical Industrial Apparatus, Telephone Communications, Household Audio, Video Equipment, Audio Receiving, Telephone Communications, and Electrical Machinery and Equipment, Excluding Computers. The initial sample started with 495 observed companies, and after inclusion of companies with

intangible assets in total book value higher than 40%, and exclusion of companies with missing data, the final sample is composed of 61 companies.

## Conceptual research model and hypotheses

High-technology companies are recognized as highly innovative companies. The level of innovativeness of these companies can be identified based on the level of achieved revenues from sales which is used for investments in R&D. Namely, for competitive advantage of high-technology innovative companies it is very important them to substantially invest in R&D, i.e. to have as high as possible Research Intensity Indicator (RII). However, it is not only important to make substantial investments in R&D activities every year during a long-term period, but also to efficiently use those investments. Their efficient usage means providing innovations of products and processes, which have to be effected in the prospective growth of gross profits from year to year during investment period. The efficiency of R&D investments is observed through Return on Research capital (RORC) indicator.

Investments in R&D, through innovation process in high-technology companies, are transformed i.e. capitalized in the value of generated intangible resource, which is recorded as visible intangible assets in the balance sheet, but also as invisible intellectual resources (human, structural, and relational). Economic efficiency of high-technology companies requires achievement of high economic efficiency in the use of intangible assets (as visible intellectual resource disclosed on the assets side of the balance sheet) and high economic efficiency in the use of invisible intellectual resource, which is not disclosed on the assets side of the balance sheet due to the limitations imposed by accounting standards (IAS 38, primarily).

For IC managers it is of utmost importance to measure and monitor the indicator of Efficiency of intangible assets investments (as visible segment). The efficiency of intangible assets investments determines the profitability of high-technology companies, which is measured by traditional indicator such as ROA. This framework shows how investments in R&D and efficient usage of intangible assets determine the efficacy (profitability) of high-technology companies. Key variables in the research conceptual framework are the following: *RII, RORC, IC Value Added (ICVA), Intangible assets and Goodwill (Iag), Eiag, and ROA.*

RII is the first given variable and it is defined as expenditures in R&D divided by the company sales. This indicator differs across different sectors of activities, whereas high-technology companies have the highest R&D intensity indicator (Milkovich et al., 1991).

RORC is calculated as quotient between gross profit of the current year and R&D expenditures from the previous observed period. This indicator shows how much of company gross profit in the current year comes from the R&D expenses from the previous period (Christensen and Derek van Bever, 2014). The formula is presented:

$$\text{RORC} = \frac{\text{Gross profit (t)}}{\text{Average of R\&D expenditures (t} - \text{n, t} - 1)}$$

*Iag* is a part of IC which is disclosed on the balance sheet. Total IC (*IC*), consisting of both the IC which is not visible (*ΔIC*) and the IC which is visible on the balance sheet *(Iag),* can be presented in the following way (Krstić and Bonić, 2016):

$$IC = Iag + \Delta IC$$

or

$$IC = Iag + Hc + SRc$$

where *Hc* denotes human capital (invisible in the assets side on the balance sheet), and *SRc* denotes structural and relation capital (invisible in the assets side on the balance sheet).

ICVA is a very important variable in this conceptual model. The *earnings before interest and tax* (*EBIT*), as the financial result, requires a correction by several categories which would lead to the creation of the category of ICVA. It can be calculated by the following formula (Krstić and Bonić, 2016):

$$ICVA = EBIT + D_{fa} + Am_{ia} + Iml + Pe$$

$D_{fa}$ is the depreciation of fixed or non-current assets, $Am_{ia}$ denotes the amortization of intangible assets with an identifiable useful life, *Iml* represents an impairment loss of intangible assets with indefinite useful lives (goodwill), and *Pe* stands for personal expenses or gross salary of employees and managers (net salary + salary taxes), other investments in human resources development such as cost of education, training, etc. Another way of calculating IC value added is (Krstić and Bonić, 2016):

$$ICVA = EBITDA + Pe$$

where *EBITDA* denotes the earnings before interest and tax, depreciation and amortization. The control of economic efficiency in the use of *Intangible assets and goodwill,* as a part of total IC (IC) that is visible or recorded on the assets side of the balance sheet, requires the measurement of *Efficiency of Intangible assets and Goodwill* (*Eiag*). This performance indicator shows how many units of *ICVA* can be generated per every 100 monetary units of the employed intangible assets and goodwill. This is actually the indicator of return on intangible assets and goodwill and the formula for the calculation is (Krstić and Bonić, 2016):

$$\text{Eiag} = \frac{\text{ICVA}}{\text{Iag}}$$

ROA is a traditional indicator for company profitability which is calculated according to the following formula.

$$\text{ROA} = \frac{\text{EBIT}}{\text{As}}$$

where *As* denotes Assets.

The main goal of the study is to investigate how profitable the capitalization process of R&D expenses, seen as investments in IC, is in the French context. Three research goals coming from the main goal are:

- Investigate how the R&D intensity indicator together with return on research capital (RORC) impact on the intangible assets (*Iag*);
- Investigate how the capitalized intangible assets (*Iag*) impacts on the efficiency of intangible assets (Eiag);
- Investigate how the efficiency of intangible assets (*Eiag*) impacts on the company profitability;
- In order to fulfill the above stated goals, the following hypotheses are tested:

***H1:*** *Investment in R&D of high-technology companies in the forms of Research Intenstity Indicator and Return on Research Control impact positively and create value in the balance sheet, (specifically create intangible assets and goodwill – Iag).*

***H2:*** *Capitalized and created intangible assets (Iag) influence positively on the efficiency in the use of visible IC disclosed on the balance sheet (Eiag).*

***H3:*** *Efficiency of Intangible Assets indicator (Eiag) together with Capitalized value of Intangible Assets (Iag) determine the achieved level of firm profitability (efficiency) measured by ROA.*

## RESEARCH RESULTS AND DISCUSSION

### Model 1

Following random variables are observed: **Iag** (dependent), **RORC, RII** (independent) and control variables **Size** and **Industry** of companies (also independent). Linear connection between those variables is tested: $\boldsymbol{y = \ln(Iag)}$, $\boldsymbol{x_1 = Rorc}$, $\boldsymbol{x_2 = Rii}$, $\boldsymbol{x_3 = Size}$ and $\boldsymbol{x_4 = Industry}$.

The following multiple regression model is considered:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \varepsilon$$

where ε is white noise. 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

| | $\boldsymbol{\beta_4}$ | $\boldsymbol{\beta_3}$ | $\boldsymbol{\beta_2}$ | $\boldsymbol{\beta_1}$ | $\boldsymbol{\beta_0}$ |
|---|---|---|---|---|---|
| $\beta$ Coefficients | 0.035 | 1.577 | 0.258 | -0.001 | 11.818 |
| $S_{bi}$ errors | 0.099 | 0.128 | 0.054 | 0.001 | 0.404 |
| $R^2$ | 0.742 | | | | |
| F-statistics | 40.193 | 56 | | | |
| SS | 132.522 | 46.159 | -0.131 | -0.119 | -0.657 |
| t-statistics | 0.349 | 12.352 | 4.802 | -1.126 | 29.227 |
| t-critical | 2.003 | | | | |
| F-critical | 2.537 | | | | |

Using the Least Squares method regression coefficients are estimated:

$$y = 11.81797 - 0.00153x_1 + 0.25846x_2 + 1.57679x_3 + 0.03471x_4$$

Model 1 has the starting $\boldsymbol{\beta_0}$ with the coefficient of 11.818. The Model 1 shows that on the Capitalized value of Intangible Assets (Iag) negatively influences Return on Research Capital (RORC) with the coefficient of -0.001. On the other side, positive influences come from Research Intensity Indicator (RII) with the coefficient of 0.259, Size with the coefficient of 1.578, and Industry with the coefficient of 0.035.

Errors in estimating coefficients are: $S_{b_0} = 0.404$, $S_{b_1} = 0.001$, $S_{b_2} = 0.054$, $S_{b_3} = 0.128$, $S_{b_4} = 0.099$. The coefficient of determination of the model is $R^2 = 0.742$.

Realized value of test statistic is $F = 40.193$. The critical area is $c = (2.537, +\infty)$. The value of test statistic is into the critical area, which means that the regression is statistically significant.

Then the following hypotheses are tested $H_{0i}\ coefficient\ b_i\ is\ not\ statistically\ significant$ versus $H_{1i}\ coefficient\ b_i\ is\ statistically\ significant$ $(i = 1, \dots, 4)$.

Realized values of test statistics are: $t_{b_0} = 29.227$, $t_{b_1} = -1.126$, $t_{b_2} = 4.802$, $t_{b_3} = 12.352$, $t_{b_4} = 0.347$.

The critical area is $c = (-\infty, -2.003) \cup (2.003, +\infty)$. Values of test statistics $t_{b_1}$ and $t_{b_4}$ are out of the critical area which means that the null hypotheses $H_{01}$ and $H_{04}$ are accepted while the null hypotheses $H_{00}, H_{02}$ and $H_{03}$ are rejected because values of test statistics $t_{b_0}, t_{b_2}$ and $t_{b_3}$ are into the critical area. Thus, it can be concluded that the coefficients $b_0$, $b_2$ are $b_3$ statistically significant, while coefficients $b_1$ and $b_4$ are not statistically significant.

**Model 2**

Following random variables are observed: **Eiag** (dependent), **Iag** (independent) and control variables **Size** and **Industry** of companies (also independent). Linear connection between those variables is tested. Let it be: $\boldsymbol{y = Eiag}$, $\boldsymbol{x_1 = \ln(Iag)}$, $\boldsymbol{x_2 = Size}$ and $\boldsymbol{x_3 = Industry}$. The following multiple regression model is considered:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon$$

where ε is white noise. 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 3.** Model 2 statistical results

| | $\boldsymbol{\beta_3}$ | $\boldsymbol{\beta_2}$ | $\boldsymbol{\beta_1}$ | $\boldsymbol{\beta_0}$ |
|---|---|---|---|---|
| $\beta$ coefficients | -1.092 | 0.254 | 1.221 | 16.087 |
| $S_{bi}$ errors | 0.189 | 0.166 | 0.336 | 2.399 |
| $R^2$ | 0.388 | | | |
| F-statistics | 12.055 | 57 | | |
| SS | 85.779 | 135.201 | | |
| t-statistics | -5.766 | 1.532 | 3.630 | 6.703 |
| t-critical | 2.002 | | | |
| F-critical | 2.766 | | | |

Using the Least Squares method regression coefficients are estimated:

$$y = 16.087 + 1.221x_1 + 0.254x_2 - 1.092x_3$$

Model 2 has the starting $\boldsymbol{\beta_0}$ with the coefficient of 16.087. The Model 2 shows that on the Efficiency of Intangible Assets indicator (*Eiag)* positively influence Capitalized value of Intangible Assets (*Iag*) and Size with coefficients 1.221 and 0.254, respectively. On the other side, the independent variable Industry negatively influences with the coefficient of -1.092.

Errors in estimating coefficients are: $S_{b_0} = 2.399$, $S_{b_1} = 0.336$, $S_{b_2} = 0.166$, $S_{b_3} = 0.189$. The coefficient of determination of the model is $R^2 = 0.388$. Realized value of test statistic is $F = 12.055$. The critical area is $c = (2.766, +\infty)$. The value of test statistic is into the critical area, which means that the regression is statistically significant.

Then the following hypotheses are tested: $H_{0i}\ coefficient\ b_i\ is\ not\ statically\ significant$ versus $H_{1i}\ coefficient\ b_i\ is\ statistically\ significant$ $(i = 1,2,3)$. Realized values of test statistics are: $t_{b_0} = 6.703$, $t_{b_1} = 3.630$, $t_{b_2} = 1.532$, $t_{b_3} = -5.766$. The critical area is $c = (-\infty, -2.002) \cup (2.002, +\infty)$. Value of test statistic $t_{b_2}$ is out of the critical area which means that the null hypothesis $H_{02}$ is accepted while the null hypotheses $H_{00}, H_{01}$ and $H_{03}$ are rejected because values of test statistics $t_{b_0}, t_{b_1}$ and $t_{b_3}$ are into the critical area. Thus, it can be concluded that the coefficients $b_0$, $b_1$ and $b_3$ are statistically significant, while coefficient $b_2$ is not statistically significant.

**Model 3**

Following random variables are observed: **ROA** (dependent), **Iag, Eiag** (independent) and control variables **Size** and **Industry** of companies (also independent). Linear connection between those variables is tested. Let it be: $\boldsymbol{y = ROA}$, $\boldsymbol{x_1 = \ln(Iag)}$, $\boldsymbol{x_2 = Eiag}$, $\boldsymbol{x_3 = Size}$ and $\boldsymbol{x_4 = Industry}$. The following multiple regression model is considered:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \varepsilon$$

where ε is white noise. 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 3 statistical results

| | $\boldsymbol{\beta_4}$ | $\boldsymbol{\beta_3}$ | $\boldsymbol{\beta_2}$ | $\boldsymbol{\beta_1}$ | $\boldsymbol{\beta_0}$ |
|---|---|---|---|---|---|
| $\beta$ coefficients | 0.013 | 0.009 | -0.001 | -0.002 | -0.119 |
| Sbi errors | 0.007 | 0.013 | 0.009 | 0.021 | 0.182 |
| $R^2$ | 0.057 | | | | |
| F-statistics | 0.026 | 0.427 | | | |
| SS | 1.699 | 0.643 | -0.131 | -0.119 | -0.657 |
| t-statistics | 2.003 | | | | |
| t-critical | 2.537 | | | | |

Using the Least Squares method regression coefficients are estimated:

$$y = -0.119 - 0.002x_1 - 0.001x_2 + 0.009x_3 + 0.013x_4$$

Model 3 has the starting $\boldsymbol{\beta_0}$ with the coefficient of -0.119. The Model 3 shows that on the Return on Assets (ROA) negatively influence Capitalized Value of Intangible Assets (Iag) with the coefficient of -0.0025, and Efficiency of Intangible Assets indicator (Eiag) with the coefficient of -0.001. On the other side, positive influences come from Size and Industry with coefficients 0.009 and 0.013 respectively.

Errors in estimating coefficients are: $S_{b_0} = 0.182$, $S_{b_1} = 0.021$, $S_{b_2} = 0.009$, $S_{b_3} = 0.013$, $S_{b_4} = 0.008$. The coefficient of determination of the model is $R^2 = 0.057$. Realized value of test statistic is $F = 0.845$. The critical area is $c = (2.537, +\infty)$. The value of test statistic is into the critical area, which means that the regression is not statistically significant which means that observed variables are not linearly related.

The study results confirm that intellectual capital investments influence on economic benefits, with a certain delay. The effects of intellectual capital investments depend on the types of investments and type of profits expected. The same results were confirmed by the authors Vaisanen et al. (2007). The studies published by Bontis (1998), Seggie et al. (2007), Seleim et al. (2004), Sharabati et al. (2010), and Wang and Chang (2005) confirmed also highly positive relationship between investments in intellectual capital, and its components and final company's performance.

**CONCLUSION**

IC is the main strategic driver of company value. In order to improve company value and performance, managements and decisions-makers invest in IC components. The purpose of our study was to examine IC investments on the high-innovative sample of French companies.

The research covered in total 61 French companies over the period from 2008 to 2016. For the purpose of this study three regression models were developed in an attempt to provide the empirical investigation of the impact of investments in IC on the company profitability.

Results from this research confirm that R&D expenditures influence positively on the value creation, in our context in creation of intangible assets within company value. This value creation process comes from an eight-year period of investments. Once created the intangible assets value impacts the efficiency of intangible assets, whereas the impact on the final company profitability immediately in the next year is not determined. The increase in company profitability does not come immediately after the new intangible assets value is created. These findings add value to managers, who put their daily efforts to stay competitive in a fast growing and turbulent French market, as it is at the moment.

Limitations from this research fall to the sample size that was limited due to the number of companies that had available data and operate in France, as well as an availability of financial information from company official accounts. The focus on future research will be on following the economic benefits and improvements of financial performance in the upcoming years, instead of only on immediate results. Also, the research would be extended on observing different industries and different samples of companies in order to propose the most intellectual-capital intensive and appropriate sectors for long-term investments, such as investments in intellectual capital.

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