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LA RELATION ENTRE LES INVESTISSEMENTS DANS LE CAPITAL INTELLECTUEL ET LE TOTAL DES ACTIFS DE L'ENTREPRISE : LE CAS DES ENTREPRISES FRANCAISES (2008-2016)

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TITLE: RELATIONSHIP BETWEEN INVESTMENTS IN INTELLECTUAL CAPITAL AND COMPANY'S BOOK VALUE: EVIDENCE FROM FRENCH COMPANIES (2008-2016)

ABSTRACT

Objective: Intellectual capital is a strategic resource that plays an important role in the value creation process. Taking into account that the twentieth century is a century of ideas, knowledge, innovations, information and changes, intellectual capital has been an interesting topic over the past few decades. At the same time, the financial market has become influential in the global market, so intellectual capital found a very important role for itself. Most of the research is aimed at identifying the relation between intellectual capital and short-term financial performance, such as profits, market shares, turnovers, or market value. This research aims to fill the gap in the literature that relates to the total book value as a final performance. By improving the total book value of a company and creating new assets through the capitalization of investments in intellectual capital components, a company generates benefits on a long-term basis.

Methodology: We included 498 and 475 French companies in a complex correlation statistical analysis in two main research models respectively. The financial information was obtained from the financial database "Point Risk" for the purpose of addressing the main research question. The model used in the study is the Intellectual Capital Transformation Evaluating Model (ICTEM) developed by Molodchik et al. (2012). This model investigates the process of intellectual capital transformation in the performance of a company.

Findings: Companies transform and capitalize their investments in intellectual capital components into concrete assets in the total book value. The three main intellectual capital components that companies invest in are: human capital, organizational capital and relational capital.

Implications and limitations: The main contribution of our research is the identification of the link between investments in intellectual capital components and a company's total book value as final performance. Until now, the total book value as company final performance has not been used in correlation with intellectual capital and its investments.

There are limitations of the study. One of them is to find adequate financial information about companies that will be used in an analysis and another one is financial information, such as marketing expenses and R&D expenses, which is not always available in the accounts of a company.

Original feature: This study presents the first verification of a positive relationship between investments in intellectual capital components and a company's total book value.

KEYWORDS

Intellectual capital, investments in intellectual capital, IFRS, IAS, knowledge, intangible assets

<u>TITRE:</u> LA RELATION ENTRE LES INVESTISSEMENTS DANS LE CAPITAL INTELLECTUEL ET LE TOTAL DES ACTIFS DE L'ENTREPRISE : LE CAS DES ENTREPRISES FRANCAISES (2008-2016)

RÉSUMÉ

Objectif : Le capital intellectuel est une ressource stratégique qui joue un rôle important dans le processus de création de valeur. L'intérêt pour le capital intellectuel s'est accentué au cours des dernières décennies et s'est accéléré au cours du vingtième et unième siècle, siècle d'idées, de connaissances et d'innovations. Parallèlement, le poids du capital intellectuel joue un rôle de plus en plus important sur le marché financier. La plupart des recherches ont pour but d'identifier le lien entre le capital intellectuel et les performances financières à court terme, telles que le bénéfice, les parts de marché, le chiffres d'affaire ou la valeur boursière. Cette recherche vise à combler les lacunes de la littérature en s'intéressant au contraire à la valeur comptable comme composante essentielle de la valeur totale d'une entreprise. Nous montrons qu'en capitalisant les investissements dans différents composants de capital intellectuel, une entreprise améliore sa valeur comptable totale et de ce fait génère des avantages à long terme.

Méthodologie : Nous avons inclus respectivement 498 entreprises françaises et 475 dans deux modèles de recherche principaux fondés sur une analyse statistique de corrélation complexe. Les informations financières sont extraites de la base de données financières «Point Risk» pour répondre à la question de recherche principale. Le modèle utilisé dans cette étude est le modèle d'évaluation de la transformation du capital intellectuel (ICTEM) développé par Molodchik et al. (2012). Ce modèle étudie comment le capital intellectuel dans se transforme en nouveaux actifs, améliorant ainsi la performance d'une entreprise.

Résultats : Les entreprises transforment et capitalisent leurs investissements dans les composantes du capital intellectuel en actifs concrets de la valeur comptable totale. Les trois principales composantes du capital intellectuel dans lesquelles les entreprises investissent sont: le capital humain, le capital organisationnel et le capital relationnel.

Conséquences et limites : La principale contribution de notre recherche est l'identification du lien entre les investissements dans les composantes du capital intellectuel et la valeur comptable totale de l'entreprise en tant que performance finale. Jusqu'à présent, la valeur comptable totale

de la performance finale d'une entreprise n'était, à notre connaissance, pas utilisée en corrélation avec le capital intellectuel et ses investissements.

Les limites de l'étude sont l'absence d'informations financières adéquates sur les entreprises qui sont utilisées dans notre étude. Les informations financières, telles que les dépenses de marketing et les dépenses de R & D, ne sont pas toujours disponibles dans les comptes des entreprises.

Caractéristique originale: cette étude présente, à notre connaissance, la première vérification de la relation positive entre les investissements dans les composantes du capital intellectuel et la valeur comptable totale de la société.

MOTS CLÉS

Capital intellectuel, investissements dans le capital intellectuel, IFRS, IAS, connaissances, actifs incorporels

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Milos Petkovic
Nice, France, 02.11.2018.

SUMMARY OF CONTENT

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CHAPTER I

INTRODUCTION

SUMMARY:

CHAPTER I – INTRODUCTION

This chapter introduces the background, motivation, encouragement and significance of the study. In the global economy based on knowledge, intangible assets often make up to 80 % of a company's value. The transformation of intangible assets and resources into a tangible result is a new way of thinking for most companies. Based on the study of Volkov and Garanina (2007), only from 6 to 30 % of a company's value belong to tangible assets. Because of the importance of intangible assets, companies invest about 50 % in the sphere of intangible assets only, namely in research and development, personnel development, infrastructure *(Fuller, 2002).* Van Ark et al. (2009) found that investments in intangibles are accounted for about 25% of labor productivity growth in the EU countries over a period from 1995 to 2010. In order to manage intangible assets properly, it is of high importance to measure them in the right way. The treatment of intangible assets in a company's accounts has been changed drastically. The main decision relates to capitalizing investments in intangibles as this can transform knowledge into a concrete value. However, this is where the greatest difficulty lies, because organizations must measure these investments consistently and systematically over time *(Bloom and Van Reenen, 2010; Belo et al., 2014).*

According to Penrose (1959), one company is not only an administrative organization, but also a set of resources: productive and human. Resources should be included in the production process and transformed into products or services. Outputs are functions and results of experience and knowledge a company has. This philosophy started developing in the 1980s and serves as a confirmation of the statement made by Nonaka and Takeuchi (2007) that only those companies that create knowledge can be successful in today's world. Based on the study developed by Marr (2004), a firm's capability is to realize and achieve greater future performance based on the knowledge that lies within a company. What differentiates companies is the specific and unique knowledge. Firms with more knowledge will be more powerful and competitive *(Marr, Schiuma, and Neely, 2004b)*. Knowledge society will be dependent on intellectual capital because knowledge and information have become economy's primary raw material and most important outcome *(Stewart, 1998).* Drucker (1993) thinks that when entering a knowledge society "the basic economic resource is the knowledge" *(see also Nonaka and Takeuchi, 1995; Quinn, 1992; Reich, 1992; Toffler, 1991).*

1.1 Background of Study

Nowadays, intangible assets are playing a key role in company performance. Two major forces have led them to that position over the past few decades: globalization and advanced information technology. In a highly competitive global market, intangible assets are the key success factor because knowledge assets provide a competitive advantage. Understanding the valuation of intangible assets is the basis of management decision processes.

Resources can be presented in three main forms: tangible, financial and intangible which are combined with three ingredients: resources, flows and transformation of resources. From the intangible resource perspective, they do not possess a physical form. On the contrary, their importance can be seen as the hidden wealth of companies and national economies. Drucker (1993) thinks that intangible assets lead to a process of transformation and progress of a society. In a "knowledge society", performance is not achieved by the allocation of labor or capital, but by innovations and ideas. Drucker emphasized three phases of development; the first one when companies used their knowledge only for the purpose of producing their equipment, products and services; the second one, when their knowledge was used to improve labor processes by companies, and the final phase, when companies used knowledge to improve their own knowledge base. Chronologically, these phases tightly followed the industrial revolutions throughout the development of humankind *(Drucker, 1993).*

Today, when the market is global and highly competitive, the life cycle of products and services is becoming shorter, which requires companies to continuously work, stay unique and innovative. What cannot be copied and imitated are knowledge, innovations and new ideas.

There are many studies that prove how important intangible assets are for company performance. Taking into consideration that intellectual capital is not-physical and that it belongs to the people's mind, it is very hard for companies to obtain that value for themselves. Companies usually try to transform that human capital or knowledge into an intangible, formulized and conceptualized asset that is recognized by the international accounting standards (patent, trademark, copyright, prototype, customer list, marketing campaign, etc.). Also, when compared to tangible assets, the growing importance of intangible assets shows that the internet connection is more valuable than the whole computer, or that electronic components are more important than some piece of metal. The management of intangible and tangible assets has also changed because most of the knowledge-based companies cannot present their values in the balance sheet having in mind that they possess enormous added-value and profits on the total market value, which is an external component and income statement (profit and loss account). This is the key proof that ideas, innovations and knowledge drive the performance and lead to a competitive advantage *(Nakamura, 2003; Stewart and Ruckdeschel, 1998)*.

1.2 Significance of Study

During the last two decades, the business and global environment have progressively been transforming into a knowledge-based fast-changing, technology-intensive company in which investments in human resource, information technology and research and development have become essential for the purpose of improving a company's competitive advantage and final performance *(Canibano et al., 2000).* Itami and Roehl (2009) suggested that resources consist of physical, human and monetary resources which are necessary for business operations to take place and information-based resources, such as management skills, technology, consumer information, brand, reputation and corporate culture. Sullivan (2000) thinks that many information technology knowledge companies such as Microsoft, Xerox, Dow Chemical, HP, Eastman Chemicals and others have their marketplace value at a price much higher than their balance sheets accounts. Goldfinger (1997) claimed that a company's value is more than intangible assets, and that the source of its value and wealth is no longer the production of material goods, but the manipulation and creation of its intellectual assets.

The significance of this study is to address the importance that investing in intellectual capital and its components has on the performance of French companies. French companies that are included in the sample belong to different industries and they create different values in the process based on the industry they belong to.

Another significance is to inspire future managers to, first of all, invest in their company's intellectual capital on a long-term basis mainly because it will produce more constant and longer benefits for the company. These kinds of benefits are not possible without capitalization and transformation processes within a company. It is up to managers to make decisions regarding this issue and to capitalize investments because, otherwise, investments will remain only as expenses in a company's accounts.

1.3 Research Motivation

Taking into consideration that we are living in the "New economics era", intellectual resources are of high importance for an entity to compete and survive on the global market. In order to create a new competitive advantage, companies cannot rely completely on traditional financial reporting tools, mainly because they are not reliable enough for top management decision processes. The process of creating values and making decisions is not possible if only traditional financial reporting tools are used. That is why it is highly important for each company today to combine these traditional tools with non-financial performance measurements and this represents the biggest potential challenge that the accounting framework is facing nowadays.

Fierce global competition forces many companies to be more unique and competitive in order to achieve necessary advantages. Potentially reaching a new competitive advantage can be cost-saving for a company in the percentage of no less than 45 %. These results were obtained in 1997 by Goldfinger, (1997) and we can see how the situation started changing at that time. This huge potential is very often not understood enough in the best way because it is up to a company to realize what is fundamental for various markets and their customers, and also for diverse sophisticated technology and integrated processes *(Colotla, Shi, and Gregory, 2003; Dossi, Patelli, and Zoni, 2010; Jacob and Strube, 2008).*

Dynamism and specialization of different disciplines as well as complexity of advanced technology in the current business environment have caused dramatic discrepancies between various functions and departments inside a company. Reaching strategic objectives efficiently is not possible without a total linkage between all departments, organizational levels and functions. A huge lack of coordination between the flow of information, data, products, services, processes across organizational system has become of a major concern *(Wahlers and Cox, 1994).*

In order to remain unique and different on the global market, companies pay more attention to intellectual capital such as skills of employees, know-how, software, patents, brands, databases, customer databases etc. Effective and efficient management of these intellectual resources leads to the production of new values and benefits. Reporting and measuring the whole process has crucial consequences not only for all the members of the company, but also for the general public and investors.

All the above mentioned reasons influenced the research motivation to choose a topic that will not only be, current and modern, but also practically probable. The interest of intangible assets, intellectual capital, investments in intellectual capital, knowledge management, performance measurement is of higher or lower importance in each sector of activities, in each company. It is becoming more and more common for companies to integrate intellectual capital and some of the components of intellectual capital in their official annual reports, which is a sign that companies are paying much more attention to it nowadays. Academics have been exploring these topics intensively through their profession or otherwise during the last two or three decades which is confirmed by a large number of publications from all around the world. Since a lot of academic and empirical work regarding the given topic has been done until now, the development of advanced technology, the Internet, start-ups, intangible assets, etc. comes as no surprise. Academic work has just pointed to the potential that will emerge in the future.

1.4 Encouragement for Research in Intellectual Capital in French Companies

The focus of this part is to further explain my main encouragement to do the research focused on intellectual capital in French companies. The French companies that are used in the sample belong to different industries and are of different sizes. The sample includes companies ranging from start-ups and small companies to large multinational corporations. I tried to emphasize the potential of intellectual capital and investments in intellectual capital in French companies and explain why it is important to understand and invest in it.

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 10th most innovative country in the European Union that invests 1.31 % of GDP in R&D expenditures. According to Boujelbene (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 7th 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.

According to the study done by Barnes and McClure (2009), France has the following intangible to tangible investment ratio:

Table 1: Percentage of output (including intangible investment) for the sector for which intangibles were measured (Barnes and McClure, 2009)

	France – market sector (2004)
Computerized information	1.3
Innovative property	4.7
• Scientific R&D	2.0
• Mineral exploration	0.0
• Copyrights and license costs	0.5
• Other product development, design and research	2.2
Economic competencies	6.6
• Brand equity	1.5
• Firm-specific human capital	2.3
• Organizational capital	2.8
TOTAL	12.6
Intangible to tangible investment ratio	0.9

As we can see, scientific R&D, other product development, 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 measurement indicators, computerized information, innovative property and economic competencies 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)*.

OECD (1998) did a study about the investments in intellectual capital and intangibles based on the French experience. French economy is becoming rapidly intangible, and it includes large investments that are focused on intangibles as well. Intellectual investments are completely opposite from tangible physical investments. Investments in intellectual capital are expenditures of companies that will: a) improve company's production capacities; b) accumulate capital for future utilization; c) have an asset form that is tradable. This is general explanation, whereas practically speaking, investments in intellectual capital in France can be divided into the following four areas:

1) Research and development (R&D);
2) Software;
3) Commercial activities;
4) Training.

1.5 Organization of Thesis

The structure of work is composed of five main chapters. The purpose and importance of the study are described in the first part of this work. The introductory part answers the following two questions: “What is the phenomenon that I observe?” and “Why is this phenomenon relevant today?”. Taking into consideration numerous explored studies in the given field until now, the research study offers a completely unique approach and results that will contribute to the science management in the end. This chapter presents personal motives to discover and explore intellectual capital, investments in intellectual capital and its value creation processes. The observed phenomena are focused on the evidence found in French companies in the given time period. France was used as a sample because of its innovativeness and creativity in economy, large amounts of invested financial resources that are focused on intellectual capital and competitiveness. These reasons encouraged us not only to write a project that will contribute to this topic, but also to present French economy as it really is.

The second chapter presents the main literature which is highly related to the topic in a more detailed way. This chapter answers the question: “Which known and unknown literature deals with this topic?”. We will substantially explore all theoretical material from the most well-known authors in the literature review part of this work. The literature review presents the following key parts: intangible assets, intellectual capital, investments in intellectual capital, knowledge management and performance measurement systems. The following five theoretical topics are organized in the way that will enable an independent reader to explore the subject easily. This exploration will make it possible for a reader to better understanding the main research problem, research questions, research solutions and empirical results. The literature review part presents the main studies, the most important authors in the field that influenced the research philosophy and the latest achievements. Deep understanding of the explored literature allowed me to find the theoretical gap that will present the biggest scientific contribution.

The third chapter presents the main research methodology that shaped the whole work, starting from the defining research problem, theoretical gap, research methodology, conceptual framework, justification of variables, research process plan, research hypotheses, research theories and research models. This chapter answers the following questions: “What is the research question? “How are we going to answer the research question?”, “What is the concept that I made?”. Without precisely defining the research methodology used in the work, the chances to fail are high. This part describes the main theories and models used in the work that inspired and explained the research in a more scientific manner.

The fourth chapter explores the empirical research that explains and proves the whole study. This chapter answers questions such as: “What have I found out from my research?”, “What is the meaning of research results?”, “What contribution to literature do my research results have?”. The findings are organized based on the given variables, starting from the description of a sample coupled with research hypotheses. The proposed variables are statistically tested, which leads to establishing strength among variables in the end. Each variable is determined based on deep justification by only the most relevant literature, by the well-known authors in the field. The empirical part presents data sample used in the observation, movements of each variable, descriptive statistics, Pearson correlation, complex regressions and final discussions about the findings.

Finally, the fifth chapter concludes the dissertation with key findings and results. The conclusion chapter answers the final questions: “Why should we pay attention to the given phenomena and why is this important to us?”. The biggest advantage of the quantitative study is that it is completely practically applicable in every company around the world. The final results would have been unattainable if it had not been for the huge motivation and enthusiasm that guided me till the end. Furthermore, it is very important to highlight not only the biggest research limitations and problems that occurred during the research, but also contributions to science. The conclusion part is a summary of recommendations, directions and ideas for future personal research.

CHAPTER II

LITERATURE REVIEW

SUMMARY:

CHAPTER II - LITERATURE REVIEW

The second chapter of the thesis is focused on the exploration of all the relevant, but closely related well-known articles, books and achievements in the given research areas. The literature review in this chapter is a combination of literature from the well-known authors who contributed to the intellectual capital subjects starting from 1950s until now. This flow of literature is important for each independent reader to follow all the most important theoretical achievements in the field of intellectual capital.

The study starts by exploring intangible resources and intangible assets in the current corporate world: the importance of intangibles nowadays, their roles, main definitions, classification and characteristics, valuation procedures and opportunities for investing in them. It is important to start with intangible assets because intellectual capital and investments in intellectual capital topics stem from them.

After developing the intangible asset part, intellectual capital is explained in a more detailed way followed by the most known authors. The concept of intellectual capital is composed of the main definitions, classifications, measurement methods, reports, investment possibilities and relations with other final performance.

Next section is related to knowledge management. Both knowledge management topic and intellectual capital are two very popular topics nowadays and they cannot be set apart because intellectual capital is seen as a static component of one company, whereas knowledge management is seen as a dynamic one. Knowledge management is the process of creating value, where intellectual capital represents the critical mass that produces a new value.

The final part is focused on the performance measurement systems that are implemented in most of the corporate systems. These systems propose mechanism for following value creation and benefits within a company.

2.1 Intangible Resources in Corporate World

2.1.1 Role of Intangibles

Adam Smith's book of 1776 "The Wealth of Nations" *(see newer edition of Smith, 2009),* which was regarded as a classical school of economic theory, stated that the wealth of a nation comes from tangible or physical assets only, or to be more precise, from production factors such as labor, land and capital.

Nowadays, this theory is no longer meaningful in this modern knowledge-based economy *(Wang, 2008).* Global economy has dramatically changed during the last thirty years. The change in the form of transition from industrial capitalism to knowledge-based capitalism was a revolution in the corporate world. Tangible or physical assets no longer represent the core of knowledge-based economy. Instead, intangible assets are now seen as its core. Even though there is no particular definition of knowledge-based economy, three main structural changes appeared *(MERITUM project, 2002):*

1) Knowledge is seen as an object of potential trade;
2) Interrelation between different knowledge has been improved;
3) Information and Communication Technologies (ICT) enable higher diffusion of knowledge by allowing development of new and sophisticated networks between subjects of knowledge.

These three structural changes completely modified the global business model of companies that was available in the previous industrial revolution. Based on the huge development of the Internet and advanced technology, data, information and knowledge are widely spread and available. In the process of sharing and collecting necessary knowledge, companies improve their businesses much more easily.

Technology that is based on knowledge lies at the core of the development of each company, where information management represents the input and knowledge management represents the production process of the final output. Companies face many difficulties in the process of identification, measurement and recognition of intangible assets. To prevent these problems from arising in the following years, research efforts should be focused on understanding how knowledge is produced and used to generate a future value. In addition, the development of new accounting practices that identify indicators of intangible assets more precisely is necessary in order to improve financial reports regarding a company's intangible assets. In the field of management sciences, the lack of identification of outcomes stemming from intangible assets results in the loss of business opportunities. In that way, managers and decision makers in companies stop investing in intangible assets because it is impossible to follow final performance, and this is a huge mistake *(MERITUM project, 2002).*

Intangible resources can also be analyzed in very dynamic terms. Companies more often take initiatives to acquire or develop internally intangible assets, to improve current ones, and to measure and control them. Undertaken activities are often very costly, so the measurement of performance is not always possible. These dynamic activities that are related to the allocation of these assets or investments are not expressed in financial statements, generally because there are no standardized obligations for companies to do so, so they do not appear in the corporate annual reports. The problem is to follow and monitor the performance of each intangible as well as to evaluate the final results of those connectivity improvements *(Cañibano et al., 1998).*

Our society has dramatically changed due to the global influence of information and technological changes through favoring globalization of economy and innovation as key factors of global competition. It is interesting that, nowadays, the total market value of a company is composed of almost 90 % of intangible assets value, mainly because current accounting frameworks do not provide an adequate system for a company to make long-term decisions. From the agricultural age to industrial age, there were a lot of changes. The best proof for that is the proportion evolution, starting from 1978 when intangible assets constituted only 5 % of total assets, then in 1998 when it was 72 %, and finally recently when this proportion improved even more and the interval is between 75 % and 85 % *(Ciprian et al., 2012).* From s1990s, significant changes happened in the asset composition structure. From 1980s, the book value of companies started changing compared to market value. Between 1982 and 1992, the value of intangible assets increased from 38 % up to 62 % of the market value, but the book value decreased from 62 % down to 38 % *(Lev and Daum, 2004).*

Lev (2001) stated that in the period between 1998 and 2001, the total market value of US Standard and Poors (S&P) 500 biggest companies increased from less than 1 % up to over 5 %, as a result of which more than 80 % of a company's value did not appear in a financial report. Edvinsson and Malone (1997) explained that the limitation of financial statements in presenting a company's value and creating economic value can no longer rely on the production of physical material goods, but on the creation of intellectual capital. Intellectual capital includes human capital and structural capital together with customers, brands, systems, and processes *(Edvinsson and Malone, 1997),* and plays an important role in creating a competitive advantage *(Kaplan and Norton, 2004).* Economic wealth of a company is driven by knowledge or information more than by the production process *(Akpinar and Akdemir, 1999).*

Kaplan and Norton (2004) documented that 75 % of the market value of US companies comes from intangible assets. Intangible assets are fundamentally determined based on two factors: vertical disintegration achieved through the replacement of intangible assets by tangible assets and through investments in intangible assets *(Lev, 2003).* According to Lev (2003), the main figure was described as follows:

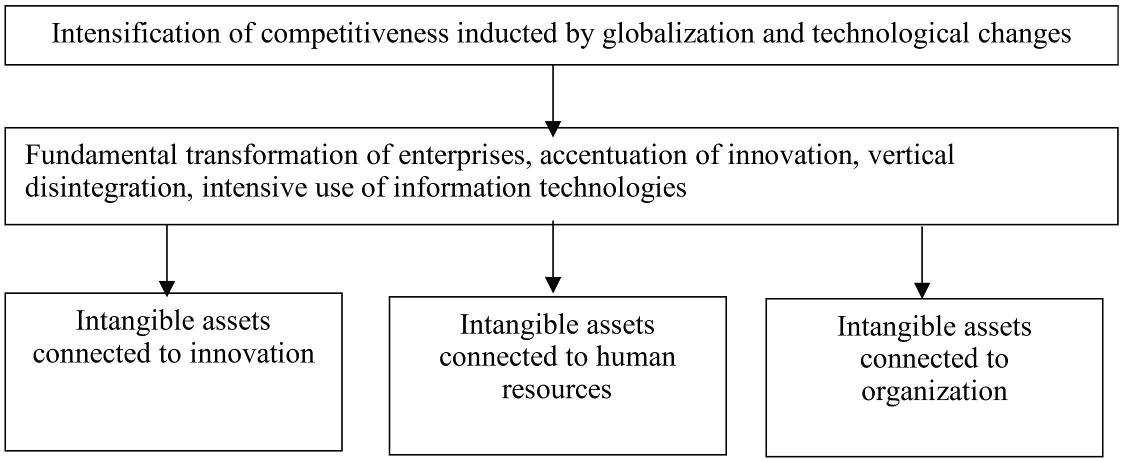

Figure 1: Intangible assets calculation
(Lev, 2003)

As it is presented in the Figure 1 above, there are three types of intangible assets, and those are: intangible assets connected to innovation, intangible assets connected to human resources and intangible assets connected to organization. All of these three types of intangible assets are in the focus of the fundamental transformation of enterprises, accentuation of innovation, vertical disintegration, intensive use of advanced information technologies. The biggest intensification of future competitiveness arising from technological changes and globalization process happens based on these components*(Lev, 2003).*

2.1.1.1 Definitions of Intangible Assets

By the International Accounting Standard 38, intangible assets can be defined as an "identifiable non-monetary asset without physical substance". An asset is a potential resource if it can be adequately controlled based on the past events and based on which future economic benefits are expected to flow into the company *(IAS Standard 38 - Intangible Assets, page 6)*.

According to FASB (2001), an intangible asset is defined as a "non-current, non-financial claims to future benefits that lacks a physical and financial term" *(Financial Accounting Standard Board (FASB), 2001)*.

Based on both previous accounting standards, the control of intangible assets is similarly explained. A company has control over an intangible only if there is a power to obtain future economic benefits stemming from the usage of that asset, and if it can also restrict future benefits at the same time (Zéghal and Maaloul, 2011).

When talking not only about the control over intangible assets, but also about the protection of employees' skills, knowledge and techniques, then the problem very often occurs. Employees' specific skills, techniques or knowledge that they possess and that they bring with them to the company do not belong to the company, even if a company invests in their education or training at certain occasions. The main problem happens when the very worker who was trained leaves the company. All invested trainings remain as company's costs, without precise returns. These investments in intangibles cannot be capitalized because of missing contractual link between a company and an employee, an investment and employee's skill *(Lev, 2003)*.

Entities can very often expand their activities onto new acquisitions, research and development, maintenance, scientific or technical work, implementation of new processes, licenses, intellectual property, market knowledge, trademarks, computer software, customer lists, market shares and rights, etc. If an item based on the definition above does not meet the requirements of definition, expenditures to acquire or all expenses for internal development are seen as an expense. If an item is acquired through a business combination, then it will be recorded partly as the goodwill on the day of the acquisition *(IAS Standard 38 - Intangible Assets, 2001)*.

Until now, there have been many different definitions of intangibles. Intangible can be used both as a noun and an adjective. That is why it is difficult to determine its correct definition *(Cañibano et al., 1998).*

There are dilemmas both in theoretical and professional sphere which relate to the meaning and the main notion of the term “intangible”. The term “intangible” is very often wrongly interpreted as some other non-tangible form, such as intangible investments, intangible capital and intellectual capital. Moreover, the literature review throughout different disciplines emphasizes several other concepts that can be seen as synonymous with the terms “intangible capital”, “intellectual capital”, “immaterial capital”, “knowledge capital” or “goodwill” (Zéghal and Maaloul, 2011).

As presented above, there are several very similar synonyms that explain intangible assets, and they are summarized here: “intellectual capital”, “intangible resources”, “immaterial capital”, “immaterial resources”, “intellectual property”, “invisible assets”, “immaterial values”, “intellectual knowledge”. Based on these different terms, a review of the most important definitions by different authors of intangible assets will be presented in the following table:

Table 2: Table of intangible assets definitions

AUTHORS	INTANGIBLE ASSETS DEFINITIONS
Hall (1992)	Intangible assets represent a generator of advantage that transforms productive resources into property with added value.
Smith (1994)	Intangible assets include all components of business entity that exist with current and non-current assets. Those are components that, together with current assets and non-current assets, allow functioning of a company, and often contribute to the profit of a company. Their existence depends on the presence or expectations of future incomes.
Edvinsson and Malone (1997)	Intangible assets do not possess physical appearance, but they are of great importance to the company.
Cañibano et al. (2000)	Adjective that follows different concepts such as resource and investments.
Granstrand (2000)	Intellectual property is a property that is directly related to creativity, knowledge and identity of an individual.
Brennan and Connell (2000)	Capital based on knowledge in the company.
Harrison and Sullivan (2000)	Knowledge that can be converted into profit.
Lev (2001)	Intangible assets put the rights of future benefits that do not have physical or financial substance.
Gu and Lev (2001)	Intangibility can be defined as a generator of value (research and development, promotions, information technology and capital expenditures and practice in human resources).
Kristandl and Bontis (2007)	Intangible assets represent a company's strategic portfolio of resources that will enable a company to create a sustainable value.
Itami and Roehl (2009)	Intangible assets consist of invisible property that is composed of wide range of activities, such as: technology, clients trust, brands, corporate culture and managerial skills.

There is a further explanation about the difference between intellectual capital and intangible capital. Based on the deep exploration of literature, intellectual capital is always seen just as a subset of intangible capital when "intangible" is related to an asset without physical substance and with certain future economic benefits *(Hunter, Webster, and Wyatt, 2005).*

Based on the book "Unseen Wealth – Report of the Brookings Task Force on Intangibles" published by Blair and Wallman (2001), there is a much more comprehensive distinction between three major categories of intangibles:

1. There are two main sub-categories of intangibles for all intangible assets for which the market already exists and property rights are clear, and those are: first of all, patents, brands, copyrights, and second of all, contracts, data bases, licenses and business agreements;

2. When there are no legal and well-defined rights, a group of intangibles for all intangibles that are controlled by a particular company is composed of: R&D in process, reputational capital, business processes and business secrets;

3. When both market and legal and property rights do not exist or are very difficult to identify for all the other intangibles, a group of intangibles consists of human, structural and relational assets. All of these assets belong to intellectual capital as its main components *(Bontis, 1998).*

Ashton (2005) gives further explanation of the guiding principles for Blair and Wallman's (2001) classification of intangibles. This classification shows the level of difficulty to record them in official financial reports and to treat them properly not only for accounting standard-setters, but also for managements of companies. The last third category causes the biggest problems mainly because there are no accounting standards for them yet, whereas the first and second group of intangibles are already well-determined *(Ashton, 2005).*

One investment in an intangible asset can be recorded in the official financial report if it has the same definition of an intangible asset and meets all accounting criteria. Attention should be more paid here because only few investments can meet all the necessary criteria *(Siegel and Borgia, 2007).*

In certain occasions, a company may not include intangible assets in the balance sheet, even though they meet all the demanded requirements. Based of IAS 38 and FASB, SFAC 5, one of very important requirements is the possibility to "measure asset cost". This requirement raises another accounting problem because this requirement would be easily met if that asset was acquired or obtained from a business combination. In that way, it would be easy to separate it and identify the value. The main problem lies in all intangible assets that are internally developed, such as computer software, brands, patents and results of research and development activities *(Upton, 2001)*.

2.1.1.2 Characteristics of Intangible Assets

Intangible assets have two main characteristics, which, at the same time, differentiate them from tangible and financial assets, and those are *(Warfield, Weygandt, and Kieso, 2008)*:

1. **The lack of physical existence.** Intangible assets possess only legal rights and privileges granted to a company to use them. Based on these rights and privileges, a company generates benefits;

2. **They are not financial instruments.** Financial assets also do not represent physical substance, but when compared to intangibles, financial instruments have the value because they can claim or have the right to receive cash or cash equivalents in the future.

Intangible assets can be **purchased** or **developed internally**. Intangibles bought from another organization are recorder in financial statements as cost. Cost includes all costs of acquisition and expenses necessary to make intangible assets ready for usage. Typical costs are legal fees, purchase price and other expenses. Internally created intangible can be both expensed and capitalized. From the financial accounting perspective, the crucial aspect is to elucidate whether to expense or capitalize. If it is expensed, all the expenses will be recorded in the profit and loss account. If it is capitalized, an item must fulfill several restrictive requirements; notably, it must be separable and reliably measurable. Intangible assets can have **limited life** or **indefinite life**. Limited-life intangibles have a precise period when they can be used. These assets must be amortized or systematically allocated to the costs of intangible assets. After that period, intangible assets must not be used anymore, and should be excluded from the property and annual report of a company. On the other side, indefinite-life intangible assets are all intangible assets without legal, regulatory, contractual or any other factor that limit the useful life cycle.

There is no foreseeable limitation period for these intangible assets over which the asset will provide cash *(Warfield, Weygandt, and Kieso, 2008).*

Items seen as intangible assets are included in the balance sheet together with long-term assets or non-current assets and further explanations are given in the notes of financial statements. However, there are no further explanations even in the notes of financial statements as to how these assets have been produced, made or acquired. There is no evidence of expenses in profit and loss account that is related to some of the intangible asset internal development. There is nothing else inside the balance sheet apart from the intangible assets that already meet all the necessary criteria. So, here is one very problematic part for all those individuals who want to see the efficiency of investing into some of the intangible assets *(Caddy, 2000; Harvey, 1999).*

Based on the study published by the Center for Excellence in Accounting and Security Analysis in 2009, there are two main preliminary points regarding intangible assets *(Penman and May, 2009).*

1) Intangible asset has a speculative characteristic. Intangible assets are not only without physical substance, but they are also not identifiable, such as contracts or customer lists which can help a company generate benefits. Legal rights, patents and copyrights or brands are exceptional because of that. However, the difficulty is seen in "customer relationships", "organizational capital", "human capital", "knowledge assets", and similar because they are not specific and conceptualized enough, which makes it hard for their market to be defined. The market price of these assets is highly speculative, subjective, non-realistic. The market price is usually formed based on the personal perspective of an owner. When a speculative value enters the financial statement, problems happen because a non-realistic value can create imbalance in the reports.

2) Intangible assets are used jointly. Most of the intangible assets generate inflow of cash or cash equivalents, and they do so jointly with some other tangible or intangible assets. Different intangible assets, such as brands, marketing campaigns, distribution networks work together with other assets, and it is impossible to imagine their work independently. For instance, "knowledge capital" works together with productive machines and processes, marketing and management, but the cash flow streams only one cash inflow. Also, "organizational capital" makes it possible for many different company's assets to be used jointly. An organization can be seen as one big asset

composed of these several smaller tangible, intangible and financial assets that coordinate together and that are a source of future value.

According to Lev (2005), intangible assets differ from other types of assets, tangible and financial, in two major aspects: partial excludability and non-marketability *(Lev, 2005).*

When an individual owns a building or share, he/she can completely collect all related benefits from it without any difficulties. On the other side, owners of some intangible assets are in a completely different situation. Even though an individual owns an intangible asset and it expires in 20 years, competitors may explore and develop similar patents or an intangible asset before that. That is problematic from the cash and income perspectives because it is necessary to have stable cash inflows in the company in order to value intangibles. The consequence of unstable cash flows is not tightly regulated property rights over intangibles as they should be.

Most of the tangible and financial assets can be easily traded on a market, which is not the case with intangibles. There are transactions in some of the intangibles, precisely licensing and sales of patents, but generally, these transactions are not transparent and disclosed publicly. The reason for not being publicly presented is seen in not resolved and precisely defined property rights. The non-tradability of intangible assets represents a serious issue for investors and decision-makers because there are no particular valuation methods. The valuation process is only possible when comparing values between highly similar intangible assets, and, even then, it is not correct enough. This characteristic of intangibles created problems to accountants mainly because they cannot be seen as assets in the balance sheet of financial statements.

Taking into consideration that intangible assets are highly risky, with uncertainty in cash incomes, why are they so important today? The answer can be found in two main explanations, and those are: intensity of business competition and commoditization of physical assets. The global market created competition all around the world. Companies from different sectors operate and compete with similar companies throughout the world. In such a global environment, it is of high importance to be continuously innovative. Innovations are allowed and necessary not only in product and service matters, but also in cost-efficiency mechanisms. Necessary level of innovation can be achieved through investments in intangible assets, such as research and development focused on creating a new product, training employees, developing new brands or marketing campaigns, etc. As the competition pressure gets stronger, innovations should get better.

The second answer is commoditization of physical assets. Commoditization of physical assets means that all competitors can allow themselves to have equipment, production machines, tools or advanced technology. Technology and equipment are widely available to all competitors who have the possibility to pay. This is one of the most important differences between intangible and tangible assets. Tangible assets are not so unique today as they used to be in the industrial era when only the biggest companies could afford themselves the most sophisticated tools and equipment. Now, the situation has changed, and they are available more or less to all. The biggest advantage can be achieved through intangibles *(Lev, 2005)*.

The attention to intangible assets and their importance is paid mainly by the following constituencies *(Lev, 2001):*

1) Managers and their shareholders. – Investments in intangible assets are associated with high cost of capital. Managers are interested in alleviating the excess cost of capital.

2) Investors and capital market regulators. – Investors are interested in information obtained from companies' insiders and outsiders.

3) Accounting standard setters. – The lack of accounting standard regarding intangible assets results in financial statements that do not follow changes in the current business environment.

4) Policymakers. – The lack of standards and financial statements demand public policy makers to assess fiscal policy, support innovations, or protect intellectual property.

Lev and Daum (2004) addressed two main issues about intangible assets; first, intangible assets by themselves cannot create value or generate profit. They need to be combined with other production factors. They need efficient support and system in order to create future value. Corporate performance reports must provide much more efficient view that will allow investors and managers to follow the value creation process; second, the value of intangible assets is related to future, not to present. Intangible assets represent possibility for future potential growth and profitability. It is achievable only with a more dynamic system of reporting that will replace the current, traditional performance management system.

2.1.1.3 Classifications of Intangible Assets

The main classification of intangible assets provided by the International Accounting Standard 38 includes *(IAS Standard 38 Intangible Assets, page 33):*

a) Brand names;
b) Mastheads and Publishing titles;
c) Computer software;
d) Licenses and Franchises;
e) Copyrights, Patents and Other Industrial Property Rights;
f) Recipes, Formulae, Models, Designs and Prototypes;
g) Intangible Assets Under Developments.

Some intangible assets remain intangible even under goodwill. Others will find physical intangibility and be recognizable by accounting standards. Even though they are financially tangible, they can be identified and separately valued. These assets can be explained as: “tangible intangibles” *(Vaughan, 2009).* The difference between ascertainable and unascertainable useful life cycle of intangible assets will be described in the following table

Table 3: Intangible assets considered in terms of useful life cycle
(Vaughan, 2009)

Ascertainable Useful Life	Unascertainable Useful Life (Goodwill)
Patents	Copyrights
Patent applications	Trademarks and brands
Franchises	Technical "know-how"
License agreements	Personnel
Noncompetition agreements	Market acceptance
Royalty agreements	Established location
Employment contracts	Secret processes and formulas
Purchase contracts	
Lease agreements	
Design rights	
Technical libraries	
Pending contracts	
Water rights	

As stated in the Table 3 above, in the part of ascertainable useful life of intangible assets, there are all intangible assets recognized by the current international accounting framework. All of them can easily be separable and identified by their real value. This is important because once the useful life cycle of an intangible asset is established, assets can be amortized. This is very common for patents for instance. On the other side, in the part of unascertainable useful life cycle of intangible assets, there are many intangible assets that can belong to some of the components of intellectual capital as well, for instance, all employees' skills, knowledge or techniques in the part of human capital. But, unfortunately, it will remain absolutely inseparable. This is damageable because a lack of precise useful life cycle of an intangible asset will not permit a company to amortize its usage. This is an example which relates to brand names or trademarks because, for them, a company cannot establish reasonable life expectancies, so they stay mostly in the goodwill category.

OECD (2011) classified intangible assets in three main groups:

1) Computerized information (software and databases);

2) Innovative property (scientific and non-scientific R&D, copyrights, designs and trademarks);

3) Economic competencies (brand equity, firm-specific human capital, networks joining people, institutions, organizational know-how and marketing, and advertising).

The following scheme presents the classification of intangible assets by Nevado and Lopez (2002):

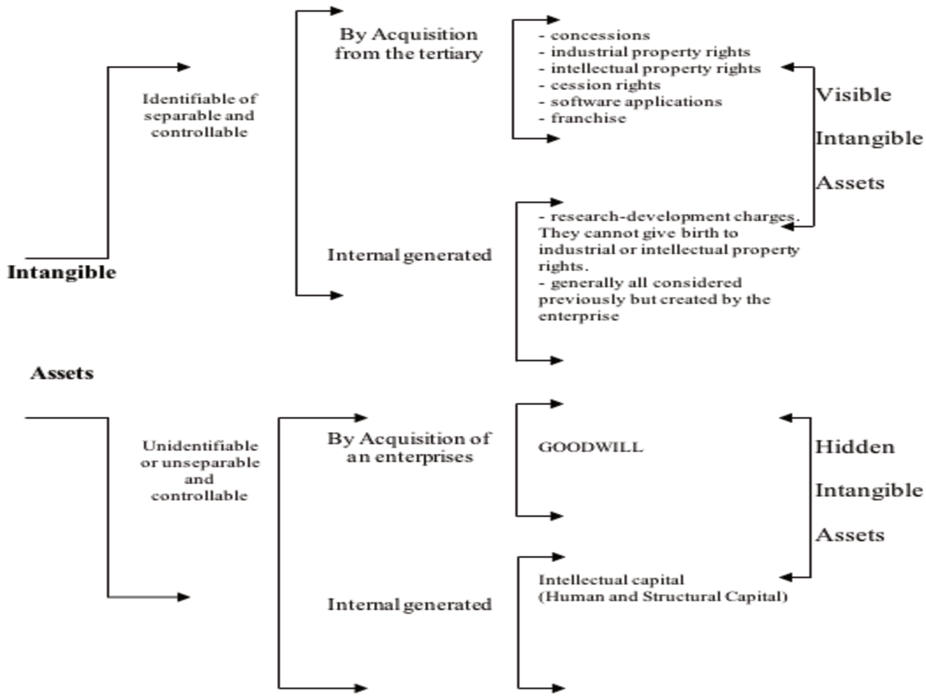

Figure 2: Intangible assets classification
(Nevado and Lopez, 2002)

As described in the Figure 2 above, Nevado and Lopez (2002) classify intangible assets in two main groups: visible and invisible intangible assets. Visible intangible assets are all those intangible assets recognized and visible by the accounting standards. They can be also controlled, purchased or developed internally. Invisible intangible assets or intellectual capital are all those intangible values that are not yet recognized by the accounting standards and that cannot be included in the balance sheet.

Van Wieringen (1997) proposed a classification of intangible assets on the concept of balanced scorecard developed by Kaplan and Norton in *(Norton, 1992; Kaplan and Norton, 1996).* The ten key categories were identified, and those are *(Van Wieringen, 1997);*

1) Research and Development;
2) Acquisition of intellectual property rights and licensing;
3) Acquisition of industrial property rights;
4) Advertising and other marketing;
5) Acquisition and processing of information;
6) Acquisition of software;
7) Reorganization of management in a company;
8) Reorganization of accounting system in a company;
9) Dealing with all changes in legal, governmental, fiscal, social and economic policies;
10) Other investments in the innovation of products or processes in a company.

Based on the book of Warfield et al. (2008), intangible assets are classified in the following six categories:

1. Marketing-related intangible assets are used by a company for marketing purposes or promotion of its products or services. For instance, trademarks or trade names, newspapers, mastheads, non-competition agreements or internet domains are examples of these types of intangible assets;

2. Customer-related intangible assets come from the interactions with external parties. Examples include customer lists, production backlogs, contractual and non-contractual customer relationships;

3. Artistic-related intangible assets are ownership rights to plays, literary works, musical works, photographs and video material. Copyrights protect these ownership rights.

4. Contract-related intangible assets represent the value of contractual arrangements and rights. Examples include franchises and licensing agreements, construction permits, broadcast rights and supply contracts;

5. Technology-related intangible assets are related to innovation and technological advances. Examples of this type of intangible assets are patented technology and trade secrets.

6. Goodwill is an intangible asset that comes when one company purchases another with a premium value. Goodwill is seen as an intangible asset because it does not have a physical component.

2.1.1.4 Valuation of Intangible Assets

The methods of measurement and valuation of intangible assets are a matter of considerable interest to investors, decisions-makers, managers, and accounting-standard setters. Unfortunately, important decisions are not easy to make because of a missing adequate measurement system. Due to the lack of these measurement and valuation tools and increasing importance of intangibles, the performance of one company cannot be evaluated realistically based only on financial performance measurement systems. Calculating the value of intangible resource value as a difference between the total market value and total book value is not sufficient because of two reasons: there is no necessary mispricing in capital and markets and the balance sheet value is historically oriented and limited *(Lev, 2003).* Walliser (1999) explained that there is a disparity between accounting and valuation methods of intangible assets, more precisely of brands. The disparity comes from the doctrinal differences related to brand recognition done by using various valuation methods mainly in three principal European countries, France, Germany and UK.

Sveiby (1997) emphasizes three main reasons why companies do not want to measure intangible assets, and those are:

1) Managers do not understand the importance of intangible assets;
2) Selected indicators can provide too much information for competitors;
3) Lack of rigorous theoretical model for such a type of reporting.

In order to valuate one intangible asset, it is necessary to identify and classify them and this can be practically very difficult. An appraiser has no guidelines or rules to follow. The appraiser must have a rich experience, realistic and objective judgement and common sense. The main difficulty is to identify economic principles of an asset. The first thing that has to be done is to establish the present value that will generate future economic benefits in the form of capital or income, or both. When the present value has been established, it is important to allocate benefits to a particular tangible, intangible or financial asset, and this is where the biggest difficulty lies. In order to facilitate the benefit allocation, there are some recommendations given by Vaughan (2009):

- First, it is important to estimate operating incomes before depreciation, amortization, income taxes or interest charges. In that way, pure and total value of the operating income of a company will be seen;
- Second, allocation of depreciation amount must be done only for fixed assets;
- Third, ascertainable intangible assets must be isolated, and the amortization required to compare it with investment over the remaining value of each asset must be computed. Then it will be necessary to subtract all the annual depreciation and amortization from operating income in order to calculate a return of investment;
- Fourth, result from available income should be subtracted in order to calculate the income assigned only to goodwill;
- Finally, it is required to capitalize the remaining income at an appropriate rate to come to the value of goodwill.

According to Lev (2005), there are three approaches that are used to measure and valuate intangible assets, and those are: <u>benefit allocation</u>, <u>stand-alone valuation</u> and <u>comprehensive valuation of enterprise intangibles</u>.

Benefit allocation approach can be used only when it is easy to allocate benefits to individual intangibles under certain circumstances. It is necessary to evaluate benefits and costs by taking into consideration return on investment. Research and development costs and expenditures on brands are all recorded in financial statements. The question is how the collective cash inflow can be separated and divided into particular and precise intangibles. A brand charges its customers with premium prices. That price will be higher than the competitors' price. Based on that price, a company's revenue can be attributed to that brand, and the rest remains as research and development revenues.

Stand-alone valuation approach is for all those intangible assets with legally protected ownership and pre-specified stream of benefits. These assets can be valued on a stand-alone basis by easily computing the present value of the expected benefit stream.

Comprehensive Valuation of Enterprise Intangibles is the most sophisticated approach because it will place a combined value on all different company intangibles. There is a methodology for such a comprehensive valuation of intangibles *(Gu and Lev, 2003).* The basis of this study is an economic production function, or to be more precise, total earnings related to the assets of a company. All assets are divided into three groups of assets: physical, financial and intangible. The valuation starts with the calculation of "normalized earning" or total earnings of one company. Then it is mandatory to calculate earnings that come from physical and financial assets based on industry-wide data. The rest of the total earnings belongs to intangible-driven earnings that can be discounted in order to produce the final expected stream of intangible-driven earnings.

Study by Chartered Global Management Accountant (CGMA), (2012) proposed three approaches to valuing intangible assets.

1) **Market Approach** – takes into consideration market-based transactions of similar intangible assets recently exchanged on the market. Publicly traded information is usually a market capitalization of a company, not particular intangible asset;

2) **Income Approach** – is applied when an intangible asset produces income or when an asset generates future benefits. This approach converts future benefits to a single, discounted amount as a result of increased turnover or cost savings;

3) Cost Approach – is applied when the cost-based analyses are based on the economic principles to ignore the amount, timing, duration of future economic benefits, and also to avoid performance risk in the competitive environment. Historical cost should be used in order to estimate the real value of a developed asset.

Production of one intangible asset is composed of immaterial resources and components. All these immaterial resources produce internally developed or acquired intangible assets. In order to follow up their efficient performance much more precisely, the increasing efforts appeared to develop suitable measurement tools. Two main measurement tools distinguish themselves *(Arrighetti, Landini, and Lasagni, 2014).* The first one is based on the estimation of expenditures or investments in intangibles, such as research and development expenses, training costs, innovation expenses *(Corrado et al., 2004).* The second one directly links stock values to a particular intangible from the balance sheet and income statement *(Marrocu, Paci, and Pontis, 2012).*

2.1.1.5 Investing in Intangible Assets

Leonardo Nakamura stated that investments in intangible assets in the corporate sector in 2000 were in the amount of $1 trillion. Half of this amount was used for the research and development and software development. The other part was in other intangibles, such as brands, human resources and organizational processes *(Holtham and Youngman, 2003).*

Literary interest in investments in intangible assets has shown an upward trend so far. It is widely accepted that intangible assets are a crucial part of achieving competitive advantage. *(Barney, 1991)* Just a few studies have explored the factors that lead companies to invest in intangibles. In most studies, intangibles have been used as given and already determined, not as explanatory variables. Determining what stimulates companies to invest in intangible assets can be of high importance for both managers and decision-makers, mainly because this can help identify variables that differentiate high from low performing companies. Based on the study produced by Arrighetti (2014), there are three confirmed factors that intensify investments in intangible assets and those are:

- **Size of a company** - Size of a company is a very important factor for investing in intangibles. Regardless of the industry a company belongs to, it is much easier for large companies to exploit economies of scale in intangible asset accumulation than it is for the smaller ones *(Dierickx and Cool, 1989).* Larger companies can protect their intangibles more successfully than smaller companies, which can motivate them more to invest and develop new ones. Also, a large share of investment uncertainty is related to smaller companies rather than to larger companies *(Ghosal and Loungani, 2000);*

- **Human capital** - Several studies confirmed that human capital affects a proportion of amount of investments in intangible assets *(Abramovitz and David, 2000; Galor and Moav, 2004).* Human capital is the formal education that every employee has and brings to the company before hiring. Human capital consists not only of formal education, but also of all skills and techniques that an employee possesses *(Barney, 1991; Nerdrum and Erikson, 2001).* Human capital is composed of all the abilities of an individual that will come in the organization, but will never belong to the organization (Bontis and Fitz-enz, 2002).

- **Past level of intangible capital intensity** - the organizational complexity is another factor that can affect the process of intangible assets accumulation. The stock of intangible assets directly influences the increase of organizational capital *(Bontis, 2001; Kaplan and Norton, 2004; Lev and Radhakrishnan, 2003).*

Intangible assets are inert themselves, they do not generate profits or create value. Investing in training will only lower costs and increase revenues. But, it is possible to have a much more comprehensive result when such improved processes and efficient information systems are combined with other factors. Without these tools, the value of intangibles disappears much quicker than the value of physical assets. With proper information systems and organizational structure, it is possible to transform tangible and intangible assets into bundles of assets that will further realize sustainable competitive advantage and profitability *(Lev, 2002).*

Nakamura (2001) uses three approaches in estimating the corporate sectors' investments in intangible assets:

- First approach is based on investments in research and development (R&D), software, brand development and other intangibles;

- Second approach is focused on salaries and wages paid to "creative workers", who generate company's intangible assets;

- Third approach examines the changes in operating margins of companies. The company's operating margin is the difference between sales and cost of sales.

Investing in intangible assets is in itself a little risky. For instance, when a company invests in employees and their trainings or education, another company very often benefits from it when employees change employers. The knowledge, skills, techniques of an employee stay personal even though this employee has changed the company. The company that invests in an employee cannot limit benefits of other future employers *(Benkraiem, 2008).* That is because companies do not have the means to keep and hold their skills or knowledge. Even in the case of patented inventions, there is a substantial benefit for non-owners which is called "spillovers" *(Lev, 2001*).

2.1.2 Concept of Intellectual Capital

The concept of intellectual capital was revealed for the first time in 1969 by Kenneth Galbraith. Kenneth Galbraith wrote a letter to the economist, Michael Kalecki, where he stated that "*I wonder if you realize how much those of us the world around have owed to the intellectual capital you have provided over these past decades*" *(Hudson, 1993).* Stewart (2001) claimed that the first use of the term 'intellectual capital' dates back to 1959, when he started his study with Itami, who later published the book: "Mobilizing Invisible Assets" in Japan in 1980 *(look at newer edition Itami and Roehl, (2009)).*

Intellectual capital has been interesting since the Fortune magazine's article of Stewart (1991). Twentieth century is a century of ideas, knowledge, innovations, information and changes. Industries that provide services expanded radically. Simultaneously, the financial market became influential in the global market, so "intellectual capital" obtained a very important role for itself. Market value of a company is composed of total book value, everything that is a company's property and intellectual capital *(Pike et al., 2002)*. Cifuentes (2002) thinks that the adjective "intellectual" eliminates the monetary component of capital, focusing much more on the intelligence in the process of producing products and services.

Roos et al. (1997) conceptualized intellectual capital in two different streams – the strategic and measurement stream (Figure 3). The strategic stream is focused on the use of knowledge, interaction between knowledge and value creation and value creation process. The measurement stream tends to develop a new information system that measures non-financial performance indicators.

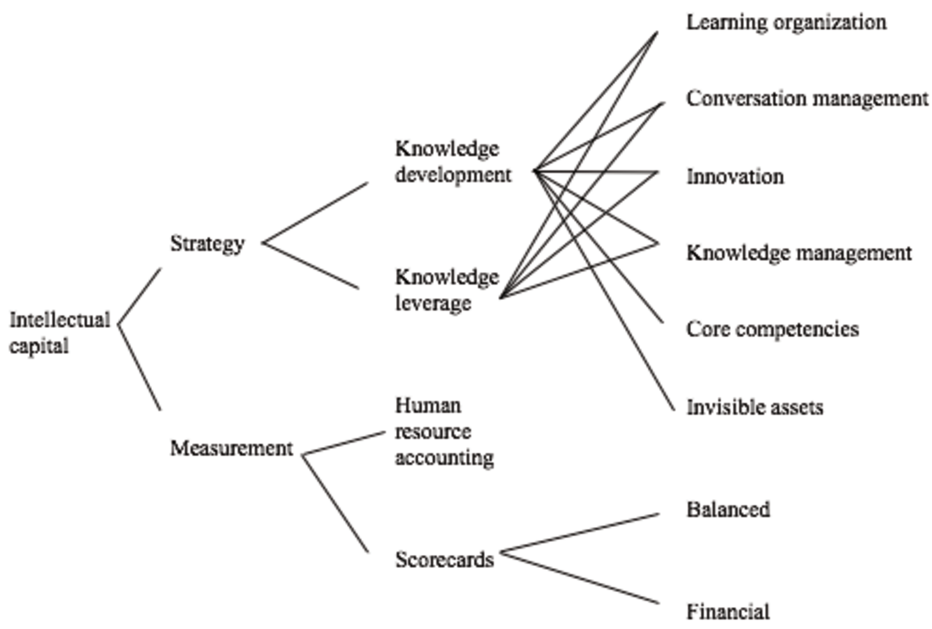

Figure 3: Conceptual Roots of Intellectual Capital (Roos, Edvinsson, and Dragonetti, 1997)

Based on the Figure 3 above, the conceptual roots of intellectual capital start with the two main elements, and those are: strategy and measurement. Strategy further develops company's knowledge and leverage, whereas measurement relates to human resources accounting and scorecard methods. In the first part which focuses on knowledge development and leverage, company pays attention to their invisible assets, core competencies, management of knowledge, innovation, conversation management and learning organization. On the other side, scorecard parts enable the development of balanced scorecard and financial scorecard. The balanced scorecard is different from the financial scorecard only because it includes both financial and non-financial performance of one company *(Roos, Edvinsson, and Dragonetti, 1997)*.

In the knowledge-based economy, it is not enough just to take the traditional and financial measures of a company into account, but it is important to find a way to recognize intellectual capital as well. Traditional measures are highly unsuitable mainly because they are based on conventional accounting principles *(Gan, 2008)*. Knowledge and intellect are highly difficult to measure and quantify but they will without a doubt influence a company's productivity, efficiency or total profitability. The limits in the valuation process are no longer focused on the production of physical products or providing services. Instead, they are focused on the creation of intellectual capital *(Chen, Cheng, and Hwang, 2005a)*.

In the last several years, numerous intensive discussions about intellectual capital and its importance have been initiated. Intellectual capital is seen as a crucial factor for organizational survival and existence in the current global business environment. Because of that, more and more companies present it in the annual reports. In order to develop it internally, companies must possess developed capacities among their employees, organizational departments and levels, stakeholders and top management *(Gogan and Draghici, 2013).*

2.1.2.1 Definitions and Characteristics of Intellectual Capital

According to Lev and Schwartz (1971), all company's intangibles make up its own intellectual capital. Intellectual capital is everything known by everybody in a company, and it brings a necessary competitive advantage to the company *(Serenko and Bontis, 2004; Stewart, 1991).* If a company places importance on intellectual capital, then the company can survive for many years and obtain a competitive advantage and perspective performance. Innovative company's work is described as an individual work that is directed to introducing new and innovative ideas, processes and products *(Mura et al., 2012).* Intellectual capital is in the current center of economic reality and it is produced from knowledge and intelligence, but only when intellectual capital comes to certain financial benefits through precise valuation of intangible assets *(Stewart, 2001).* Intellectual capital is the difference or a gap between the total market of a company and its total book value *(Edvinsson and Malone, 1997).* Unlike physical capital, intellectual capital stimulates growth mainly because the initial cost of creating certain knowledge is not repeated and brings the economies of scale *(Mignon and Walliser, 2015).*

Intellectual capital cannot be seen as a static intangible asset, but as an ideological process. It is a kind of dynamic movement from "having" knowledge and skills, to "using" knowledge and skills *(Chang and Hsieh, 2011).* Hudson (1993) claimed that the main concept of intellectual capital should not be understood only as "intellect as a pure intellect", but rather as "intellect in action". For Dzinkowski (2000), the most important company's intangible asset is intellectual capital that will enhance performance and that is defined as company's knowledge-based equity.

A unique and universal definition of intellectual capital has not been formed yet. Since 1990s, there has been a huge number of studies presented and published by different authors trying to define intellectual capital and propose its valuation method. Explored definitions are listed in the table below:

Table 4: Table of intellectual capital definitions

AUTHORS	INTELLECTUAL CAPITAL DEFINITIONS
Galbraith (1969)	Intellectual capital is the difference between a company's market and book value.
Feiwal (1975)	Intellectual capital is not only a pure intellect, but also a degree of "intellectual action".
Barney (1991)	Intellectual capital is accepted as a corporate strategic asset that generates sustainable competitive advantage and better financial performance.
Stewart (1991)	Intellectual capital is defined as the sum of everything and everybody in one company.
Hall (1992)	Intellectual capital can be classified as particular "assets" and "skills".
Organizationa for Economic Co-operation and Development (OECD) (1999)	Intellectual capital is the economic value of organizational and human capital.
Hudson (1993)	Intellectual capital is defined as a personal asset of individuals and a combination of education, experience and attitude about life and business at the same time.
Edvinsson and Sullivan (1996)	Intellectual capital is knowledge that can be converted into value.
Brooking (1997)	Intellectual capital is composed of market assets, human centered assets, intellectual property assets and infrastructure assets.
Roos and Roos (1997)	Intellectual capital is composed of human capital, business process capital, business renewal and development capital, customer relationship capital.
Roos (1997)	Intellectual capital is composed of thinking part, the human part and a non-thinking part that is structural capital.

Edvinsson and Malone (1997)	Intellectual capital is composed of human capital and structural capital. Intellectual capital is a gap between the total market value and total book value.
Chase (1997)	Intellectual capital is a portfolio of organized knowledge that can be leveraged into wealth-creating processes.
Brooking (1997)	Intellectual capital is composed of market assets, human centered assets, intellectual property assets and infrastructure assets.
Sveiby (1997)	Intellectual capital has three main dimensions: employees' competences, internal structure and external structure.
Stewart (1998)	Intellectual capital is formalized, captured and leveraged to produce a higher-valued asset from the intellectual material.
Nahapiet and Ghoshal (1998)	Intellectual capital is knowledge and potential for learning of one social entity, such as a company, intellectual community or professional organization.
Stewart and Ruckdeschel (1998)	Intellectual capital is knowledge and potential for learning of social entities, such as companies, intellectual communities or professional organizations.
Sofie (1999)	Intellectual capital is the possession of knowledge, applied experience, customer relationship, organizational technology and professional skills that contribute to the improvement of a company's competitive advantage.
Bontis et al. (1999)	Intellectual capital is simply a set of intangible resources and their processes. Intangible resources are any factors that contribute to the value creation process of a company.
Petty and Guthrie (2000)	Intellectual capital is an indicator of economic value of two categories of company's intangible assets (organizational and human capital)
Brennan and Connell (2000)	Intellectual capital is capital based on the company's knowledge.

Sullivan (2000)	Intellectual capital is knowledge that transforms into profit.
Marr and Schiuma (2001)	Intellectual capital is composed of all knowledge-based assets, distinguished between organizational actors and infrastructure.
Bukh et al. (2001)	Intellectual capital is not just one thing, it is a sensitive construction, and it is necessary to continuously support and keep it gathered together with many interrelated elements.
Heisig et al. (2001)	Intellectual capital is value, but invisible.
Lev (2001)	Intellectual capital is the source of a company's future benefits which are generated by innovation, unique organizational designs or human resources practices.
Mouritsen et al. (2001)	Intellectual capital is not a conventional accounting or economic term. It is rather a strategy of one sector or a mathematic formula.
Pablos (2003)	Broader definition of intellectual capital says that it represents the difference between total market value and total book value of a company. Those are resources based on knowledge that contribute to the achievement of a company's competitive advantage.
Rastogi (2003)	Intellectual capital can be seen as a company's holistic ability characterized by coordination, management and utilization of resources based on knowledge with value creation goal.
Andriessen and Stem (2004)	Intellectual capital is all company's intangible resources available to a company that will give a relative advantage and produce future benefits.
Youndt et al. (2004)	Intellectual capital represents a sum of all company's knowledge which a company can leverage in order to gain competitive advantage.
Scholl et al. (2004)	Intellectual capital is valuable, but invisible.

Brown et al. (2005)	Intellectual capital has an increasing monetary value that provides a company competitive advantage and differentiates it from competitors.
Bayburina (2009)	Intellectual capital can be seen as an intangible asset- that has to be kept within a company which created it years before.
Hsu and Fang, (2009)	Intellectual capital represents all capabilities, knowledge, culture, strategy, intellectual property and relational networks of a company that will create value or competitive advantage.
Frykman and Tolleryd (2010)	Intellectual capital represents all non-financial assets that belong to a company, but that are not recorded in the balance sheet.
Tawy and Tollington (2012)	Intellectual capital does not have one unique definition, and its relation to the company's value is indirect.
Gogan and Draghici (2013)	Intellectual capital includes market assets, assets concentrated around human capital, intellectual property and infrastructure.

There are two main directions of intellectual capital implementation in knowledge-intensive companies through organizational culture, processes and structure, and those are: using intellectual capital with maximum efficiency and exploring new and innovative solutions for reducing consumption of a company's resources *(W. Wang and Chang 2005).* The role of each intangible and economic capacity of a company is in its ability to use these potentials to create future performance. As long as investors from the services industry rely on traditional measures, investors from the most-advanced industries will try to use non-traditional measures *(Toffler, 1995).* Rastogi (2002) agrees with the previous definition and adds that intellectual capital is the ability of a company to use the given opportunities and create a future value *(Rastogi, 2002).*

But, most of the studies identify the link between intellectual capital and stocks or resources because they are easy to measure and quantify. The most important, but at the same time the most difficult question is: How much was the value transformed from intellectual capital, and where is the focus within the transformation process? Until now, there has been no correlation between how much you know and how good you are at transforming knowledge into something useful *(Haines and Aller-Stead, 2005; Mellor, 2005).*

Based on the definitions, intellectual capital has the following characteristics *(Lovingsson et al., 2000):*

- It is invisible;
- It is closely related to employees' knowledge and experience, but also to a company's technologies and customers;
- It proposes much better future opportunities for a company;

Dean and Kretschmer (2007) identified the following characteristics of intellectual capital:

- Weightless;
- Tradable;
- Cheap to reproduce;
- Appreciate rather than depreciate its use;
- Multiple and simultaneous application;
- Property rights are limited;
- Transfer cost hard to calibrate;
- Fixed of flexible, both input and output of the value creation process;
- Ownership is central;
- Dominating as a means of production;
- Very closely related to social capital;
- Closely related to knowledge;
- Inexhaustible.

Cabrita and Bontis (2007) provided three main characteristics of intellectual capital from a strategic point of view that is linked to the ability to create the potential of a company's knowledge base:

1) Intangibility;
2) Potential to create value;
3) Growth effect of collective practice and synergies.

Mhedhbi (2013) stated that the importance of intellectual capital came with the importance of the theory of resources. The theory of resources sees a company as a combination of tangible and intangible assets, and not as products or services oriented to the market. The intellectual capital pathway defined by Fitz-enz (2009) compares intellectual capital to a race track that must follow the performance creation. The intellectual capital pathway is presented below:

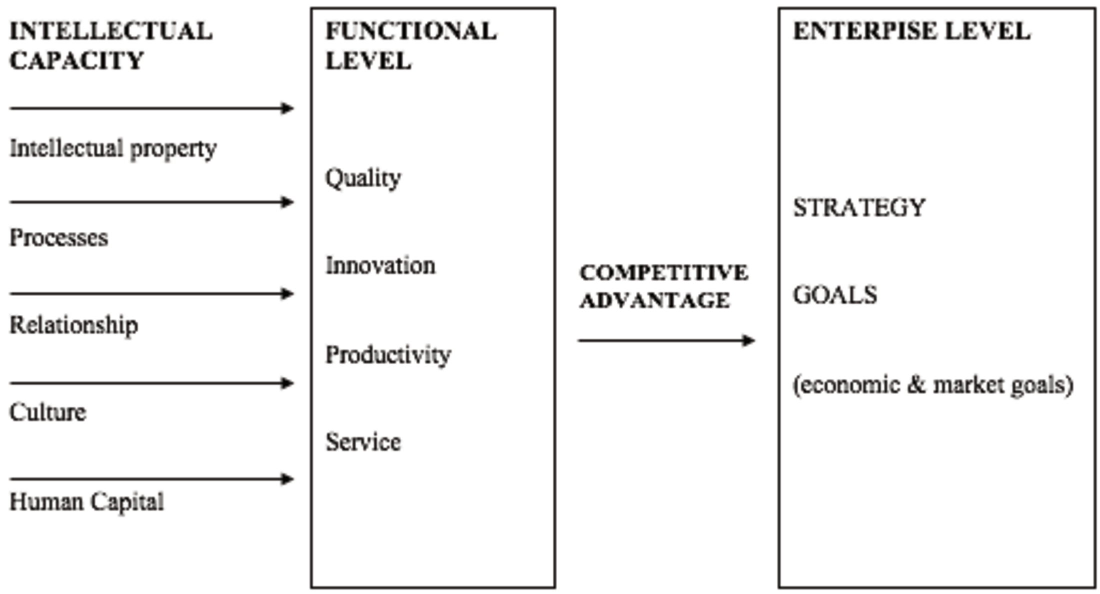

Figure 4: Intellectual capital pathway (Fitz-enz 2009)

Based on the Figure 4 above, the intellectual capital pathway starts with the intellectual capital capacity that includes all its important elements. Those elements are intellectual property, processes, relationship, culture and human capital. Intellectual capacity has a direct influence on the functional level of one company, or to be more precise, it has influence on quality, innovation, productivity and service indicators. Further, this direct influence produces a competitive advantage of a company in terms of strategy or goals *(Fitz-enz, 2009)*.

All companies want to collect and understand intellectual capital because they need to assess knowledge through company, but, generally, intellectual capital is not easily transferable and convertible into financial and recognizable terms *(Fitz-enz, 2009)*. Intangible capital of different companies plays an important role, but its successful allocation faces many difficulties. This is because the accounting policies do not propose adequate association of expenditures and value with different intellectual capital components *(Bessieux-Ollier et al., 2014)*.

2.1.2.2 Classifications of Intellectual Capital

Intellectual capital is not one thing: it is composed of many interrelated elements that have been continuously supported and held together as a whole *(Bukh et al., 2001).* Guthrie et al. (2012) presented the classification of intellectual capital based on the series of studies which determined the dual approach matter:

1) "Stock Approach" which consists of calculating intellectual capital owned by a company;

2) "Flow Approach" which consists of intellectual capital seen through the performance evaluation

Intellectual capital is comprised of human and structural capital *(Bontis, 1996).* Human capital entails employees' experience, competences, motivation and commitment and loyalty, and it is the heart of intellectual capital creation process that will be lost if talented employees left the company *(Bontis et al., 1999).* On the other side, the structural capital belongs to companies *and includes* innovative capital, relations capital and organizational structure *(Bontis et al., 1999)*. Recognizing the value of intellectual capital is consistent with the theory of stakeholder that shows that stakeholder relationships include all the forms of relationships of a company with different stakeholders, employees, suppliers, clients and residents of the community *(Roos et al., 1997).* Roos et al. (1997) defined the structural capital as: "What remains in the company when all employees go home for the night?" Another classification of intellectual capital can be found in: Human Capital, Organizational Capital and Customers Capital *(Brooking, 1997).*

Edvinsson and Sullivan (1996) proposed two main components of intellectual capital: human resources and intellectual assets.

	Human Resources	Intellectual Assets
Definition	Knowledge and know-how that can be converted to value	Specific knowledge to which ownership can be asserted
Examples	• Experience • General Know-How • Skills • Creativity	• Technologies • Inventions • Processes • Data • Publications • Computer Programs
Repository	• People and organizational routines and procedures	• Tangible Forms
Protection Methods	• Umbrella agreements between employer and employee • Contracts	• Patents • Copyrights • Trade secret laws • Semiconductor masks

Figure 5: Two Components of Intellectual Capital (Edvinsson and Sullivan, 1996)

From the Figure 5 above, there are two main components of intellectual capital and those are: human resources and intellectual assets. Human resources are all capabilities, collective experience, skills and general know-how of employees used to solve problems. These resources can generate future value for a company. It would be difficult to generate value for a company without employees. Intellectual assets represent a codified, tangible and physical type of knowledge. This type of knowledge can be defined and codified by noting it into a computer as an intellectual asset with a legal protection. Intellectual assets are the source of innovations that companies can commercialize *(Edvinsson and Sullivan, 1996)*. In the Figure 6 below, there are all different types of intellectual assets.

Intellectual Assets
Commercializable Assets • Products • Processes • Services
Customer-Related Assets • Relationships • Agreements • History
Structure-Related Assets • Plans • Procedures • Processes

Figure 6: Intellectual Assets Focus Areas (Edvinsson and Sullivan, 1996)

Based on the Figure 6 above, there are three main intellectual assets, and those are: commercializable assets, customer-related assets and structure-related assets. Commercializable assets contain products, processes and services. Customer-related assets contain different types of relationships, agreements and history. Finally, Structure-related assets contain plans, procedures and processes *(Edvinsson and Sullivan, 1996)*.

Edvinsson's (1997) model of intellectual capital is presented in the *Figure 7* below. This model divided Intellectual capital into Human and Structural. The main difference is between Human and Structural capital, which can be further divided into Customer and Organizational capital. This classification will be more deeply explained in the part of the Scorecard methods.

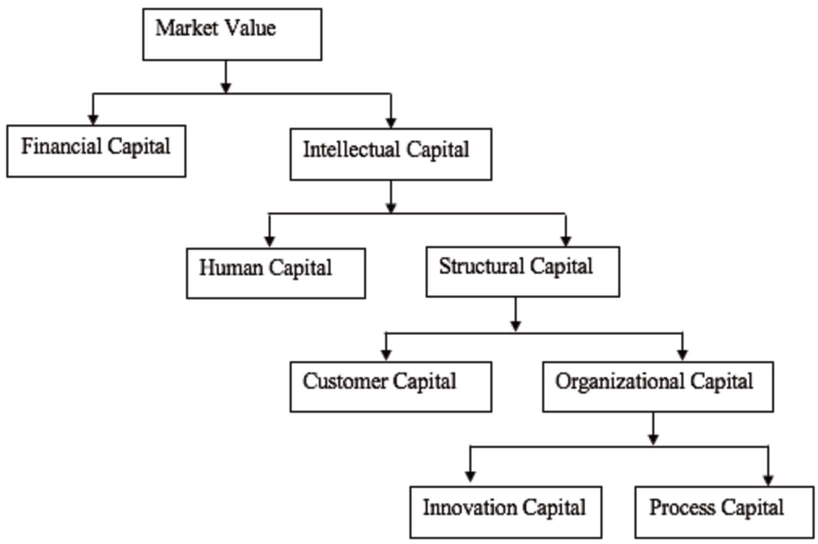

Figure 7: Skandia Navigator (Edvinsson, 1997)

Sveiby (1997) proposed the model of intellectual capital presented below where intellectual capital is composed of three components, and those are: employee competence, internal structure, external structure. Relations with customers and suppliers are included in the external structure. Organizational management, legal structure, manual systems, research and development and software are included in the internal structure. Finally, all employees' education and experience are included in the individual competences.

<table>
<tr><td rowspan="2">Visible Equity

(Book value)

Tangible assets minus visible debt</td><td colspan="3">Intangible Assets

(stock price premium)</td></tr>
<tr><td>External structure

(brands, customer and supplier relations)</td><td>Internal structure

(the organization, management, legal structure, manual systems, R&D, software)</td><td>Individual competence

(education, experience)</td></tr>
</table>

Figure 8: Sveiby (1997)'s model of intellectual capital

Bayburina and Golovko (2009) explained that intellectual capital includes the following components:

- Human Capital;
- Process Capital;
- Client Capital;
- Innovation Capital;
- Network Capital.

The competitive advantage of a company lies in the complexity of these types of intellectual capital. Success of a company depends on the strategic management of the selected components of intellectual capital *(Bayburina and Golovko, 2009).*

According to a synthesis from extant literature, intellectual capital is classified into three components *(Bassi and Laurie,1997; Cascio, 1998; Edvinsson and Stenfelt, 1999; Edvinsson and Sullivan, 1996; Marr and Moustaghfir, 2005; Martínez-Torres, 2006; Bontis, 1996; Roos and Roos, 1997; Saintonge, 1999; Stewart, 1995; Subramaniam and Youndt, 2005; Sveiby, 1997):*

1) **Human Capital** - Human capital represents employees' knowledge, competencies and education;

2) **Customer Capital** - Customer capital represents all relations with customers, suppliers, distributors and other stakeholders. Customer capital is a very important type of

intellectual capital for every company mainly because a company is not an isolated entity. It is an organization that continuously interacts with its business environment. Business environment, and its customers and clients represent a source of knowledge regarding advantages or disadvantages of a company's products or services, new ideas, organizational practices, etc.;

3) **Structural Capital** - Structural capital refers to organizational systems, culture, practices, processes and business routines *(Marr and Moustaghfir, 2005).* Structural capital is an organizational structure value of a company and knowledge that is stored in manuals, products concepts, information systems and organizational value *(Chatzkel, 2002).*

Garanina and Pavlova (2011) think that there is a positive interaction between human capital, structural capital and relational capital. The interaction between three main components of intellectual capital, human capital, structural capital and relational capital stimulates value creation in a company *(Bayburina and Golovko, 2009; Hermans and Kauranen, 2005).*

Bontis et al. (2000) expanded the previous classification and added three more intellectual capital components:

1) **Human Capital** – Human Capital is education, people's experience and attitude of employees *(Hashim, Osman, and Alhabshi, 2015).* Human can be considered as a very important asset of a company *(Khan, Farooq, and Hussain 2010).* Human capital represents employees skills, knowledge and experience that is shared with their company in order to add value *(Baron, 2011);*

2) **Customer Capital** – Customer Capital is also known as Relational Capital or External Capital and it consists of the relationships with customers and suppliers, the government or related industrial associations, brand names, trademarks and reputations *(Hashim, Osman, and Alhabshi, 2015).* According to Akpinar and Akdemir (1999), customer capital is an organization's relationship and network that are associated with loyalty to the company;

3) **Structural Capital** – Structural Capital is composed of concepts, models, patents, computers, and systems developed by employees, owned by a company *(Akpinar and*

Akdemir, 1999). A company exists because of the combination of employees and internal structure and organization *(Hashim, Osman, and Alhabshi, 2015).* Good company's structure coupled with skilled employees can provide efficient and quality service as well as improvement in company performance *(Amrizah and Nawal, 2013);*

4) **Social Capital** – Social Capital refers to institutions, relationships and norms that shape the quality and quantity of a company's relations among people and contribute to the economic society *(Grootaert and Bastelaer, 2001).* According to Hassan (2014), social capital has a very important role in managing limitations of financial, human and natural capital. Social capital can be a set of horizontal links between employees, together with social networks and associated norms that will affect company's productivity *(Hashim, Osman, and Alhabshi, 2015);*

5) **Technological Capital** – Technological capital is composed of informational technology (IT), research and development (R&D) and innovations *(Hashim, Osman, and Alhabshi, 2015)*. According to the study by Lu et al. (2010), there is a strong link between innovation and IT and company performance;

6) **Spiritual Capital** – Spiritual Capital represents the effects of spiritual and religious practices, beliefs and institutions that have a measurable impact on people, communities and societies *(Urban, 2005).* Marques (2008) found that spiritual behavior improves company performance and advantages for multiple stakeholders.

This study determines the association among all these six types of intellectual capital and company performance *(Bontis, Chua Chong Keow, and Richardson, 2000).* Youndt et al. (2004) state that all intellectual capital components should be treated at once and all together because forgetting one them will result in losing sight of the whole, intellectual capital.

2.1.2.2.1 Human Capital (HC)

Different studies proved that human capital (HC) is the most valuable asset of a company *(Backhuis et al., 1999; Johanson et al., 1998; Miller et al., 1999).* The money spent on human resources has been traditionally seen as a cost rather than as an investment with potential future benefit expectations *(Johanson et al., 1998; Roselender, 1997).* Baldwin and Johnson (1996) found that when more innovative and successful companies offer more formal and informal continuous trainings and educations for their employees this results in comprehensive competitive advantage. This is also the case even when a company relies intensively on knowledge and skills of its employees to generate better earnings and productivity *(Westphalen, 1999).* Better understanding of importance of human capital may lead to gaining substantial benefits *(Sackman et al., 1989).* Human capital is the main type of intellectual capital that positively influences financial company performance. The information about importance of human capital within a company might allow for human resources to be more effectively allocated, which would then enable the identification of gaps in skills and abilities of employees. This sense gives much better image to current and potential investors *(Lank, 1997).* Improved ways of measuring and reporting human resources motivates decision-makers within a company to invest more in education and trainings *(Boudreau and Ramstad, 1997; Johanson et al., 1998; Olsson, 1999).* Human capital makes reference to tacit and explicit knowledge that all employees possess and that can generate a future value *(Martín-de-Castro et al., 2011).*

Human Capital (HC) comprises skills, education, competences, experience and intellectual abilities of employees *(Brooking, 1997; Edvinsson and Malone, 1997; Roos and Roos, 1997; Stewart, 2001; Sullivan, 2000).* Hsu and Fang (2009) stated that human capital contains all business capital that lies in employees and that is not owned by a company. This capital can be taken out of a company and it includes employees' and managers' competences, skills, knowledge, attitudes, wisdom and commitment.

Based on the work of Ulrich (1998), intellectual capital is seen as the commitment and competence of workers. This work puts an emphasis on the following questions: How do employees think? How do they work? How does a company develop policies and systems to organize and finish the work? These questions have been critical because of the next six reasons:

1) Intellectual capital is the only company's appreciable asset. All other assets are depreciable since the moment they are acquired. The responsibility of the management is to make knowledge productive, and to transform intellectual capital into a customer value;

2) Knowledge work increases, it does not decrease because relationships come from workers' competences and commitments;

3) Employees with the most intellectual capital work voluntarily, whereas the best employees find job opportunities in many different places. Volunteers do not work because of financial reasons, whereas other best employees do, and they can leave a company easily;

4) Managers do not pay a lot of attention to intellectual capital. They ignore or depreciate intellectual capital;

5) Employees with the highest intellect are mostly the ones who are less appreciated; Investments in intellectual capital are misdirected.

Ab (1996) shows how Swedish National Telecommunication Company (Telia) practically applied intellectual capital in order to improve human capital category in Sweden. Since 1990, Telia has published the human capital statement of resources with many key ratios and indicators. Some of the indicators were numbers of employees, personnel mobility, industrial injuries, and remuneration. Also, Telia published the human resource balance sheet and human resource income statement *(Ab, 1996).*

Companies do not tend to publish or present their indicators of human capital externally because of a high risk of losing talented employees to competitors *(Miller et al., 1999).* Managers in companies are more focused on usefulness of human and customer (relational) capital, than structural (organizational) capital indicators *(Miller et al., 1999).* Based on the work of Martín-de-Castro et al. (2011) human capital has its three dimensions, together with included variables:

1) **Knowledge** – Includes the following variables: formal education, specific training, experience and personal development;

2) **Abilities** – Include type of knowledge related to know-how: individual learning, collaboration-team work, communication and leadership;

3) **Behavior** – Includes knowledge that leads individuals to do their tasks: having a sense of belonging and commitment, self-motivation, job-satisfaction, friendships, flexibility and creativity.

Through education and training, professionals can understand how people can learn, share their knowledge and work together in different working environments. At the same time, professionals can understand how organizational culture can influence learning initiatives *(Bassi, 1997).* Learning will be realized through the intensive use of advanced technologies that will help in the work. Learning will be a basic workplace skill *(Plott and Humphrey, 1996).* Bessieux-Ollier et al. (2006) emphasized that even though the data on the Human capital are published in the annual reports of companies, in the part of historical costs, they do not provide a more realistic image of the company, in particular of value creating elements on the long-term. Also, due to the fact that accounting recognition of intellectual capital is missing, there are difficulties to implement different managerial tools for measuring, describing and presenting intangibles.

2.1.2.2.2 Structural Capital (SC)

Structural Capital (SC) refers to the value of what is left when all company's employees go home *(Skandia, 1996)*. Structural Capital consists of processes, systems, structures, brands, intellectual property and other intangibles owned by a company that do not appear in the company's balance sheet *(Brooking, 1997; Edvinsson and Malone, 1997; Roos and Roos, 1997; Stewart, 2001).*

According to Bontis et al. (2000) structural capital represents all databases, organizational charts, process manuals, strategies, routines and all non-human storehouses of knowledge within a company. Human capital and structural capital together are the main company's indicators for future value creation and better financial results generation.

Structural capital is a company's abilities to meet all market demands. It involves a company's structures and organizational levels that enable employees to demonstrate stable intellectual performance. One employee can possess a high level of intellect, but if a company does not have developed systems and procedures, the overall intellectual capital will not come up to the highest extents *(Bontis, 1996).*

Figure 9: Subcomponents of Structural Capital (Bramson, 1981)

The Figure 9 above shows two main subcomponents of structural capital that are related to patents, trademarks, copyrights, exclusive licenses and foreign rights on one side, and management, philosophy, organizational capital, management process, network systems and financial relations on the other. Structural capital is like a skeleton of a company, where there is a constant interaction with other factors which makes it possible for a company's business to achieve its goals *(Bramson, 1981).*

According to Van Buren and Mark (1999), structural capital is composed of innovation capital and process capital. Innovation capital is a company's ability to innovate and create new products and services, whereas process capital is a company's processes, techniques, systems and other tools. The structural capital is composed of four elements *(Saint-Onge, 1999):*

1) **Systems** – the way in which company's inputs and outputs are processed;

2) **Structure** – the organization or responsibilities and accountabilities that specify precise position and relationship among the members within a company;

3) **Strategy** – the main company's goals;

4) **Culture** – the set of individual opinions, values and norms.

Structural capital consists of a company's strategies, internal networks, systems, databases and files, as well as legal rights to a company's advanced technologies, processes, inventions, trademarks, trade secrets, brands and licenses. When a company invests in technology and develops new sophisticated processes and other internal initiatives, structural capital improves *(Knight, 1999)*.

Based on the work of Martín-de-Castro et al. (2011), structural capital has its two dimensions, together with variables included:

1) **Technological capital** – Includes the following variables: efforts in research and development, technological infrastructure including the purchase of advanced technology and intellectual and industry property;

2) **Organizational capital** – Includes the following indicators: organizational culture, values and attitude, information and telecommunications capabilities and organizational structure;

2.1.2.2.3 Customer (Relational) Capital

Customer (Relational) capital represents all connections with internal and external stakeholders *(Roos, Edvinsson, and Dragonetti, 1997)*. Customer capital refers to company's relationships or networks with their stakeholders. It includes knowledge of a company's market channels, customer and supplier relationships, industry associations and connections with governmental institutions. A lot of managers do not see the importance of customer capital and advantages of potential profitability. Better and deeper understanding of what precisely customers want and demand is what makes someone a business and market leader. Customer and supplier loyalty, longevity of business relationships, target marketing are all measurable elements of customer capital *(Bontis, 1996)*.

Customer capital has its own five components *(Knight, 1999):*

1) Supplier capital;
2) Alliance capital;
3) Community capital;
4) Regulatory capital;
5) Competitor capital.

Table 5: Customer Capital Elements (Knight, 1999)

Customer Capital Elements	Theme
Supplier Capital	The mutual trust, commitment, and creativity of key suppliers
Alliance Capital	Reliable and beneficial partners
Community Capital	An organization’s capabilities and reputation in its surrounding community
Regulatory Capital	Knowledge of laws and regulations as well as lobbying skills and contacts
Competitor Capital	Critical understanding and intelligence about competitors

From the Table 5 above, there are five main customer capital elements, and those are: supplier capital, alliance capital, community capital, regulatory capital and competitor capital. Supplier capital represents all mutual trust, commitments and creativity of key suppliers. Alliance capital is related to all reliable and beneficial partners. Community capital stands for company’s capabilities and reputation in its surrounding community and environment. Regulatory capital includes knowledge of laws and regulations as well as lobbying skills, contacts and networks. Finally, the competitor capital presupposes critical understanding and intelligence of competitors *(Knight, 1999)*.

Customer capital is one of the most important capitals among intellectual capital factors. The importance of customer capital can be monitored easily through financial indicators *(T. A. Stewart, 1998)*.

Norton and Kaplan (1992) provided variables for Relational capital seen from customers’ perspective, and those are: corporate reputation and image, quality of customer relationships, product/service attributes, market share, customer loyalty and customer satisfaction. Edvinsson and Malone (1997) gave a set of variables of Relational capital: customer typology, customer loyalty and longevity of relationships, customer support and customer relationships.

CIC, (2003) divided Relational capital into Business Relational Capital and Relational Social Capital. The following indicators can be found in Business Relational Capital: relationships with suppliers, shareholders, institutions and investors, allies, business competitors, and quality institutions. On the other side, relationships with public administrations, mass media and corporate image, green agents, social agents, and corporate reputation can be found in Relational Social Capital.

2.1.2.3 Intellectual Capital Measurement Methods

Lord Kelvin (1883) once said: "*If you cannot measure it, you cannot improve it*." The further explanation was:

> *"When you can measure and express it in numbers, you know something about it, but when you cannot measure it, when you cannot express it in real numbers, your knowledge is of an unsatisfactory basis. It may be the beginnings of knowledge, but you have scarcely advanced to the stage of a science (Lord Kelvin, 1883, pages 80 and 81)."*

In order to measure and quantify intellectual capital, it is necessary to respect several principles *(Stewart and Ruckdeschel, 1998):*

- Companies should promote teamwork, develop network and communities of practice if they want to create and develop their own intellectual capital;
- Companies should find talented employees, motivate them, invest in them and propose the measures for their preservation if they want to create wealth;
- Structural capital should be used to develop those intangible assets that will result in realizing competitive advantage;
- Companies must change the way of collecting future and potential knowledge;
- Companies must pay attention to using collected knowledge;
- Companies must allow natural flow of information through departments and teams;
-

Kontic and Cabrilo (2009) argue that "the best to measure the intellectual capital is just to consider all risks of not measuring it". Labor shortages, low productivity, skills mismatches or talents going to competitors are some of the few consequences of not evaluating intellectual capital within a company.

The key reasons why intellectual capital should be measured are as follows *(Marr, Gray, and Neely, 2003):*

- To help companies to define their main strategy;
- To evaluate success of strategy execution;
- To assist in the company's diversification and expansion decisions;
- To use it as future basis of management compensation;

- To communicate with company's external shareholders.

Holmen (2005) presented his five key reasons for measuring intellectual capital:

1) Help organizations to formulate business strategy;
2) Lead development of main performance indicators;
3) Help in acquisitions and mergers;
4) Link to higher salaries and wages;
5) Communicate with external entities.

Until now, there have been many possibilities to use intellectual capital in the creation of value process of an organization. Based on the work of Luthy (1998), Sveiby categorized measurement methods in the following four groups:

I) Direct Intellectual Capital Methods (DIC) – estimate the value of intangible asset by identifying their main components. In this group, there are:

   - Technology Broker;
   - Citation-Weighted Patents;
   - Value Explorer;
   - Intellectual Asset Valuation;
   - Total Value Creation;

II) Market Capitalization Methods (MCM) – calculate the intellectual capital value by differentiating between a company's total market value and its stockholders' equity. In this group, there are:

   - Tobin's Q Ratio;
   - Market to Book value;
   - Investor Assigned Market Value;

III) Return on Assets Methods (ROA) – estimate a company's ROA that is compared based on the industry's average. In this group, there are:

- Economic Value Added (EVA™);
- Market Value Added (MVA™);
- Value Added Intellectual Coefficient (VAIC™);
- Human Resource Accounting (HRA);
- Calculated Intangible Value (CIV);
- Knowledge Capital Earnings (KCE);

IV) Scorecard Methods (SC) – identify various indicators of intellectual capital components that are generated in scorecards or graphs. In this group, there are:

- Balanced Scorecard;
- Intellectual Capital index;
- Intangible Assets Monitor;
- Skandia Navigator;
- “Tableau de Bord”;
- Knowledge Assets Map

Table 6: Strengths and Weaknesses overview of intellectual capital measurement methods *(Gogan, 2014)*

Method	Type	Strengths	Weaknesses
DIC	Monetary	Allows separate measuring of the components of IC. Provides a comprehensive picture of an organization's intellectual wealth. Measurements are based on events	This method is specific for a particular category of organizations, and the comparison is difficult. Not appropriate for benchmarking or comparisons. Limited number of components.
MCM	Monetary	Allows comparison of organizations in a particular field. Provides a monetary value of intellectual capital. Appropriate for benchmarking and comparisons.	It is not suitable for an overview of the development. A purely economic focus limits the perspective.
ROA	Monetary	Appropriate for benchmarking and comparisons. The method is suitable for comparing different organizations in the same sector. It is based on traditional accounting rules.	It is characterized by a lack of information constituting IC. A purely economic focus limits the perspective.
SC	Non-Monetary	Provides a more comprehensive examination of intellectual capital and performance than methods based on monetary measurement do.	Sensitive to the changes of the context. The amount of resulting information may be hard to analyze; it is difficult to obtain a numeric result.

Regarding Direct Intellectual capital methods (DIC) which represent a monetary type, the main strength is related to allowing the measurement of intellectual capital and providing a more comprehensive picture of a company's intellectual wealth. The main weakness of this method is that it is not possible to use it for benchmarking or comparison with other competitors and companies. Regarding Market capitalization method (MCM) which is a monetary method in general, the main strengths are allowing comparison with other companies and allowing benchmarking that was not possible with the previous group of methods. Regarding the Return on assets method (ROA) which is a monetary group of methods, the major strength is that these methods are suitable for comparing different companies in the same sector of activities. On the other side, the main weakness is characterized by the lack of information constituting intellectual capital. The final group of methods is scorecard method, which is a non-monetary type of measuring intellectual capital. The main strength is that it provides a comprehensive examination of intellectual capital and its final performance. The biggest weakness is that it is highly sensitive to the changes of the context *(Gogan 2014).*

As presented above, each method has its own strengths and weaknesses, so it is very hard to distinguish one from the other mainly because they overlap *(Jurczak, 2008; Lev and Zambon, 2003; Mouritsen, 2003).*

Companies try to rely more on non-financial measures that are focused on reputation, know-how, knowledge, information technology, corporate culture, and databases *(Stivers et al., 1997).* Measuring non-financial indicators can be seen more as an art, rather than as a science, because the produced results can affect performance substantially *(Roos, Edvinsson, and Dragonetti, 1997).* The measurement of intellectual capital is very important because senior executives manage what has been measured *(Roos and Roos, 1997)* and company becomes what can be measured after some time *(Hauser and Katz, 1998).*

Based on the work of Abeysekera (2003), non-financial indicators have several limitations:

- First, non-financial indicators models are independent of organizational level indicators;
- Second, non-financial indicators are independent of the traditional accounting system except in Intangible Assets Monitor;
- Third, non-financial indicators should be directly or indirectly linked to the fair value of a company.

2.1.2.3.1 Direct Intellectual Capital Methods (DIC)

The first group of intellectual capital measurement methods are Direct Intellectual Capital Methods (DIC). They are characteristic because they estimate the value of particular intangible asset components in money. After identifying all the components of intangible assets, it is necessary to calculate the aggregate or total value of components that present the total value of intangible assets of a company. Direct methods are very useful mainly because they show the total image or feasibility of intangibles of a company, or of organizational levels within a company *(Roos et al., 2005).*

Technology Broker

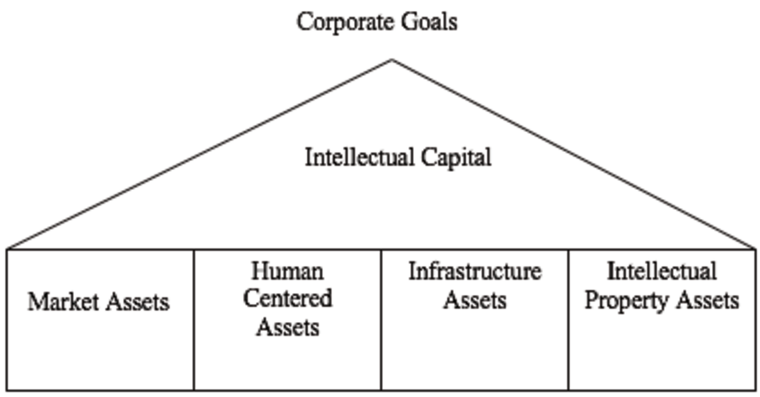

Figure 10: Technology Broker -The Components of Intellectual Capital (Brooking, 1997)

Technology Broker was developed by Brooking (1997). The model is composed of four components: market assets, human centered assets, infrastructure assets and intellectual property assets. Market assets are focused on achieving a competitive advantage in a specific market. Brands, market positioning, customer base, company's name, distributions channels, and others, are all market assets. Human centered assets are all assets related to employees' skills and education. For instance, collective expertise, creative problem solving, leadership, managerial skills are all employees' potentials. These skills are inside each employee, and they are available to the employing company. Infrastructure assets are organizational values, organizational systems, technology, culture, philosophy. Intellectual property assets are all legally protected assets such as patents, licenses, copyrights, trademarks, design rights and trade secrets. The Technology Broker evaluates the potential value of intellectual capital based on 20 diagnostic questions covering all four given intellectual capital components. The answers are 'true' or 'false' and they show the necessity to strengthen intellectual capital. After that, the model breaks into thirty-four lower components *(Jurczak, 2008; Lev and Zambon, 2003; Mouritsen, 2003).*

Citation-Weighted Patents

Citation-Weighted Patent method was developed by the company Dow Chemical. Dow Chemical was a well-known company for utilizing a number of legally-protected patents as indicators of total intangible asset value size. Gordon Petrash, a former director of the intangible asset management system proposed the following five steps;[1]

1) Defining the role of knowledge in a company;
2) Analyzing competitors' strategy and intangible resources;
3) Classifying intangible resources of a company;
4) Estimating the value of intangible resources that are prepared for further storage, development, sales or excluding;
5) Forming new knowledge portfolio and repeating the whole process.

Citation-Weighted Patent method can be seen as one of the most transparent methods mainly because it is very easy for understanding and following. The development process is highly difficult, but visible and transparent. The development of one patent based on this method entails following research and development costs, potential market value and certain individual legal rights and potential benefits. Following only traditional accounting is not sufficient because it will be used only in situations when one patent should be sold/bought at which point it is necessary to estimate the historic cost. Dow Chemical published the report of intangible assets, together with other official financial statements in 1996 for the first time *(Bontis, 2001)*.

Value Explorer

Value Explorer method was developed by the Knowledge Advisory Services department of KPMG Netherlands *(Andriesson, 2005)*. The Knowledge Advisory Services department was focused on: formulating strategy based on knowledge, improving exchange of knowledge and measuring and reporting about intangible assets. This method was based on emphasizing core competencies or identifying the strategically most important intangible assets. This method was based on the following five steps:

1) Identifying company's intangible assets on key competencies;
2) Estimating value by analyzing characteristics of key competencies through added value, competition, potential, sustainability and robustness;

[1] The institution that provides information about the number of citations per patent is Loet Leydesforff – Communication and Innovation in the Dynamics of Science and Technology, University of Amsterdam, the Netherlands (Amsterdam School of Communication Research (ASCoR)).
The site: https://www.leydesdorff.net/indicators/lesson5.htm entered at 19:35 on Thursday 26th of July 2018

3) Financial estimation of intangible assets by allocation of expected future benefits;
4) Developing managerial plan based on the previous phase by providing the management with suggestions which relate to the best way of adding intangible asset value;
5) Management reporting the *value dashboard* together.

Intellectual Asset Valuation

The Intellectual Asset Valuation method was developed by Sullivan (2000). The basis of this method is measuring the total market value of a company which is further used to calculate the total intangible asset values. The calculation of the total intangible asset values is based on the principle *going concern*. Total market value of a company or market capitalization is the value that shows the market value of a company and potential value of that company's assets. Total market value is a sum of total book value and discounted cash inflows activities. If total market values are presented from the intangible asset perspective, then a total market value is a sum of structural capital and intellectual capital. If we compare these two formulas than an intellectual capital value is equal to the discounted cash inflow activities *(Sullivan 2000).*

Total Value Creation

The Total Value Creation method was developed by the Canadian Institute of Chartered Accountants (CICA), Anderson and McLean. This method is based on discounting cash inflows of events, not business transactions. This was a huge change because most of the calculations considered business transactions as discount value. This method has four main elements *(Andersen and McLean, 2000):*

1) Strategy for developing and realizing a company's value;
2) Discounting cash flows based on future value events;
3) Report about a company's capacity to generate future values;
4) Report focused on the owners of capital that is presented in financial and non-financial measurements;

2.1.2.3.2 Market Capitalization Methods (MCM)

Market Capitalization Methods (MCM) are based on the financial information of a company. Financial statements present a clear value of tangible assets, such as equipment, buildings, cash or stocks. The attention is not so much paid to intangible assets, such as brand, marketing campaigns or patents. These methods start from the basic formula of calculating the total value of a company:

Total Book Value = Total Obligations + Total Equity

Total Equity = Total Book Value – Total Obligations

By the unwritten rule, the Total Book Value is never completely equal to the Total Equity, and there are usually some company's obligations. On the other side, the Total Market Value of a company is also a very important indicator that shows how investors see the company and how much they trust their investments.

Tobin's Q ratio

Tobin's Q ratio was developed by James Tobin. This ratio is comparison between total market value of a company and its cost of replacement. If the coefficient is greater than 1, than it is a good sign that shows that investors will invest in the company with a value greater than its cost of replacement. On the other side, if the coefficient is smaller than 1, than it is not a good signal for investors. This ratio is used for intangible assets analysis which shows that if a q coefficient is getting higher, than it is a signal that a company is investing more and more in technology or human capital. This ratio shows us why intangible assets are so important. To obtain machines, tools or techniques is not so difficult nowadays. Nearly all competitive companies possess almost the same or very similar tangible assets, but what differs them from each other are intangible assets. Intangible assets will generate future higher or lower benefits to a company that is called the Tobin's Q ratio. This ratio is very useful in comparison to companies from the same industry, eliminating different methods of amortization of tangible assets *(Stewart and Ruckdeschel, 1998).* The formula of the Tobin's Q ratio looks like this:

$$\text{Tobin's Q} = \frac{\textbf{Total Market Value}}{\textbf{Costs of Replacement of Capital}}$$

Investor Assigned Market Value

The Investor Assigned Market Value method was developed by Standfield in 1998 *(Standfield, 1998).* This method equals the total market value to the total market capitalization value. The main formula is:

Total Market Value = Material Assets + Realized Intangible Assets + Erosion of Intangible Assets + Sustainable Competitive Advantage

Material Assets Value is the Total Book Value of a company. Realized Intangible Asset is focused on effects realized within certain categories of intangible assets, such as patents, licenses, franchises, and similar. Erosion of Intangible Assets is a lost value of particular categories of these assets. Sustainable Competitive Advantage is the core of competitiveness of a company. Beside material assets, elements of this formula are also hard to collect, which makes the calculation problematic.

Market to Book Value (MB)

The Market to Book Value method was developed by two authors, Stewart and Ruckdeschel, (1998) and Luthy (1998). This method compares Total Market Value and Total Book Value of a company. If this coefficient is greater than 1, then it shows than there are some hidden, extra values between these two values that are not recorder in the financial statements. Potential hidden values can be produced only by the intangible assets of that company. This coefficient can show that total market value is sometimes several times bigger than total book value. When the coefficient is lower than 1, then it shows that the effect and influence of the intangible assets is negative, which is not a good sign *(Luthy, 1998; Stewart and Ruckdeschel, 1998).*

Unfortunately, this method has several drawbacks. First of all, all methods that use total market value as an element are not adequate because of big dynamism and instability of that value from the market. Then, all companies that are not publicly listed cannot use this method. Also, it is not possible to calculate a particular intangible value. There can only be a discussion about the effects of intangible assets that have an indirect influence because a direct relation cannot be identified.

2.1.2.3.3 Return on Assets Methods (ROA)

The Return on Assets Methods is 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.

Economic Value Added (EVA)™

Economic Value Added method is calculated as a difference between net income and costs of capital. EVA™ method can be calculated for each business entity of the large corporation as well as for the whole company without a problem,. It is possible to calculate the Economic Value Added method™ if the following financial information is available: net income before income taxes, level of invested capital and average price of all sources of capital. This method is very useful mainly because it shows the results through time and if the total net income covers the costs of capital. This method was officially founded in 1982 by the Stern Stewart & Co, headquarters in New York, which became Stern Value Management in 2013. The EVA™ was founded by Merton H. Miller and Franco Modigliani. Even though the company started working officially in 1982, the roots of the work dated in 1950's with a common research work of both founders *(Modigliani and Miller, 1958)*. Stern Value Management developed the EVA™ concept in 1983 as a model for successful maximization of a company's value that can provide incentives at all levels of the company ("Stern Value Management" 2018). The EVA™ calculation formulas are presented below:

$$EVA = NOPAT - CC = NOPAT - IC*WACC$$

Where:
CC is cost of capital; CC = WACC*IC
IC = invested capital;

WACC = Weighted Average Cost of Capital;
EVA = Economic Value Added;
NOPAT = Net Operating Profit After Tax;
ROIC = Return on Invested Capital;

The EVA™ concept is highly useful because it summarizes both operational business and capital market perspectives. The main purpose is to value generation for its owners. Parallelly with that, capital market generates value for its investors though risk bearing financial assets. This method brought great flexibility in the financial analyses procedures *(Girotra and Yadav, 2001).*

Market Value Added (MVA)™

MVA™ is calculated as a difference between the total market value of a company and the economic capital *(Reily and Brown, 2003)*. From the investor's point of view, it is the best final indicator of performance of a company's value *(de Wet and Hall, 2004)*. Market value added concept presents the value creation for a company's shareholders. This value can be named also as invested capital: *(Firer, 1995)*

Market Value Added = Market Value of Company – Capital Employed

By simplifying the first formula that used the market and book value, the second formula will be: *(Mäkeläinen, 1998)*

Market Value Added = Market Value of Equity – Book Value of Equity

Maximizing market value added should be a priority goal for every company interested in its shareholders' welfare *(Dierks and Patel, 1997).* The relation between EVA™ and MVA™ is very strong and important because Market Value Added is equal to present values of all future EVA™ *(Ehrbar, 1999; Stewart, 1991):*

$$\text{Market Value Added} = \sum_{i-1}^{n} \frac{EVA}{\left(1+c\right)}$$

MVA™ is a result of present and planned projects of a company, or to be more precise, it shows the way the market values the performance of a company, as a set of projects. If it is necessary to analyze value created on the level of particular, individual business units, then it is important to calculate EVA™ and it should achieve value higher than expected *(Bontis et al. 1999).*

Value Added Intellectual Coefficient (VAIC™)

Value Added Intellectual Coefficient (VAIC™) is a method developed by Pulic (2000). This method calculates intellectual capital based on the accounting information that is possible to be found in financial statements. This method provides the value creation efficiency and produces added value to the company based on intellectual capital or intellectual resources (Ståhle, Ståhle, and Aho, 2011).

- Human Capital (HC) is presented as employee expenses. Human Capital Efficiency (HCE) is calculated by diving Value Added (VA) by Human Capital (HC);

- Structural Capital (SC) is a difference between produced Added Value (VA) and Human Capital (HC). Structural Capital Efficiency (SCE) is calculated by dividing Structural Capital (SC) by Added Value (VA);

- Capital Employed (CE) is interpreted as Financial Capital. Capital Employed Efficiency (CEE) is calculated by dividing Added Value (VA) by Capital Employed (CE);
- Value Added Intellectual Coefficient VAIC™ is a sum of HCE, SCE and CEE.

VAIC™ measures how much of the new value was created from invested monetary unit. Capital Employed Efficiency (CEE) shows how much of the new value was created from investments in capital employed. Human Capital Efficiency (HCE) shows how much value was added by one unit invested in employees. Structural Capital Efficiency (SCE) shows the value added efficiency of structural capital *(Gan, 2008).* VAIC™ is an easy method for calculations. It is standardized and very consistent, and enables effective comparative analyses across different companies and countries *(Firer and Williams, 2003).*

Human Resources Accounting (HRA)

Human Resources Accounting method is developed by Flamholtz (1971) and it is based on quantification of contribution of human resources in the value creation process of a company. Human resources are seen as a part of a company's assets. Human Resources Accounting model is first of all a tool. The biggest advantage of this approach is the increase in the quality of management of human resources based on certain quantitative and qualitative measurements *(Flamholtz, Bullen, and Hua, 2002).* Flamholtz (1971) proposed three steps for defining the value of an employee by estimating present value of future benefits based on his/her expected work in a company:

The first step is estimating the expected period of working of a single employee in a company that depends on several factors, such as: expected length of life of an employee, employee's health, pension policy and employee's mobility;

The second step is the identification of monetary or financial equivalent of expected services of an employee. This measurement is calculated based on the estimation of absolute value of provided services in the future, and relative contribution of performance improvement of a company;

The third step is discounting identified value of the second step which results in the present value. If a company wants to know value of an employee, it is necessary to calculate the starting, basic value. Flamholtz (1971) suggested here: historic cost, costs of replacement, measurement of performance or costs of salaries.

Calculated Intangible Value (CIV)

Calculated Intangible Value (CIV) method was developed by Stewart (1998). This method estimates the value of intangible assets that will interest owners of capital to invest in a company that is focused on knowledge creation. Based on the same study, the hypothesis is that a company will achieve only limited performance if it depends only on material or tangible assets. This method has three main steps:

The first step is calculating the income of total assets, as a relation between average value of net income before taxation and total assets of a company;

The second step is comparing income of total assets value with the average income of total assets of the industry where a company belongs;
The third step is comparing the value from the second step with the Weighted Average Cost of Capital (WACC).

This method has not been used very often until now. There are only a few empirical studies tested that used Calculated Intangible Value (CIV) method as a method for calculating, following and analyzing the total intangible assets of a company *(Kujansivu and Lönnqvist, 2007).*

Knowledge Capital Earnings (KCE)

Knowledge Capital Earnings (KCE) method was developed by Lev (2001). This method starts with estimating average expected annual income of a company. The method suggests including last three financial years. When the value of expected annual income is calculated, then the income from intellectual capital is based on the principle of remaining value – residual calculation. Based on the Knowledge Capital Earnings method, average expected incomes for all companies, beside industry or level of risks, are 7 % for tangible assets and 4,5 % for financial assets.

The next step is calculating the expected income from intangible assets only. However, this income is developed from tangible and financial assets. The value that remains after subtracting the total estimated expected income of the whole company from the expected incomes from tangible and financial assets is the expected income from intangible assets only. It is problematic to find the precise average level of income for intangible assets because it is highly dynamic and unstable *(Lev, 2001).*

2.1.2.3.4 Scorecard Methods (SC)

Scorecard methods are methods based on the identification of financial and non-financial indicators. These methods take into consideration different elements of intangible assets or intellectual capital in their report as a graph *(Morady, 2013)*. There are many similarities with the direct intellectual capital methods, and their only difference is in the inability to produce final results in monetary values. These methods just present values and indicators as they are. This is one of the biggest disadvantage of these method *(Jurczak, 2008; Roos et al., 2005).*

Balanced Scorecard

The Balanced Scorecard was developed by Kaplan and Norton (1992, 1996). Through the study financed by the Harvard Business School, Harvard and Kaplan developed the measurement method called "Balanced Scorecard". This measurement system is a multi-dimensional system that represents a combination of financial and non-financial factors at the same time. That is why it was named Balanced Scorecard because it has a perfect balance between financial and non-financial indicators. From the development of Balanced Scorecard, until now, its purpose has been changed to a strategy implementation tool. It is composed of a set of different indicators for each of the main four perspectives. The main four perspectives are *(Jurczak, 2008):*

1) Financial measures: how does our financial performance look to our shareholders;

2) Customer measures: how does our pricing compared with the competitors and products ratings look to our customers;

3) Internal process measures: what can a company improve and how can it create value in terms of length of time cycle and waste level;

4) Learning and growth measures: how can a company improve and create value from percentage of sales derived from new products.

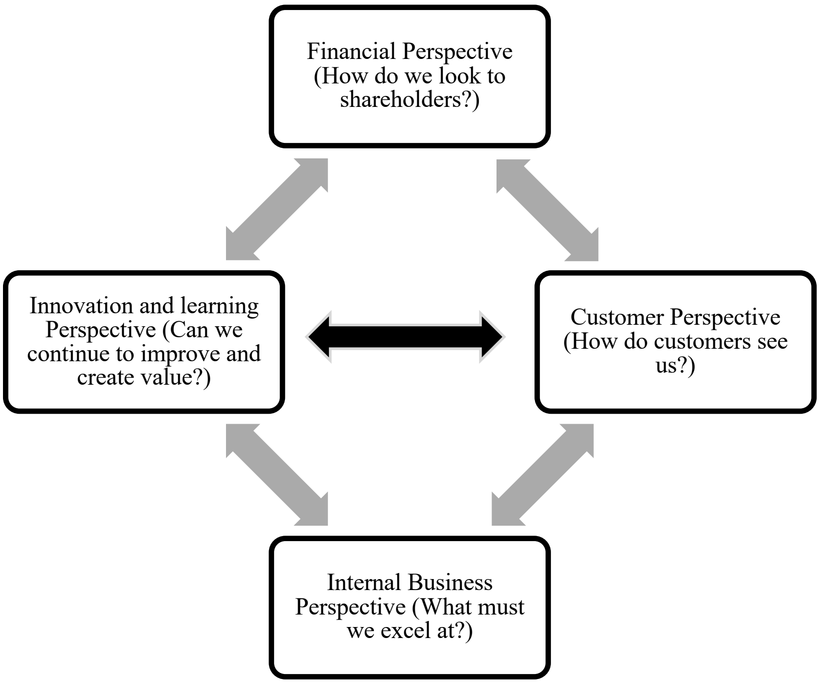

Figure 11: Balanced Scorecard concept (Kaplan and Norton, 1992)

Balanced Scorecard allows each company to choose their own indicators that they will use in a particular perspective. This is an essential measurement tool that visualizes an organization's strategy and processes and systems *(Jurczak, 2008)*.

Kaplan and Norton (2001) emphasized two main reasons why Balanced Scorecard found such a big practical implementation within companies: first, Balanced Scorecard established a clear link between strategy of some non-financial measures and measurement systems; second, Balanced Scorecard welcomed the increasing importance of advanced technology and competitive advantage. According to the literature, it has been proposed that Balanced Scorecard should develop techniques that will provide sustainable intellectual capital *(Bontis et al. 1999; Johanson, Mårtensson, and Skoog, 2001; Mouritsen, Thorsgaard Larsen, and Bukh, 2005).*

Intellectual Capital Index

After developing the Skandia Navigator by Edvinsson and Malone, the Intellectual Capital Index was formed. As described in the Figure below, the models attempt to explain intangible resources and their flows. The models want to gather all different intellectual capital measures in one single index. In this way, the model will provide much greater picture of a company's intellectual capital value, which will be of high importance for future decision-making processes *(Roos et al., 1998).*

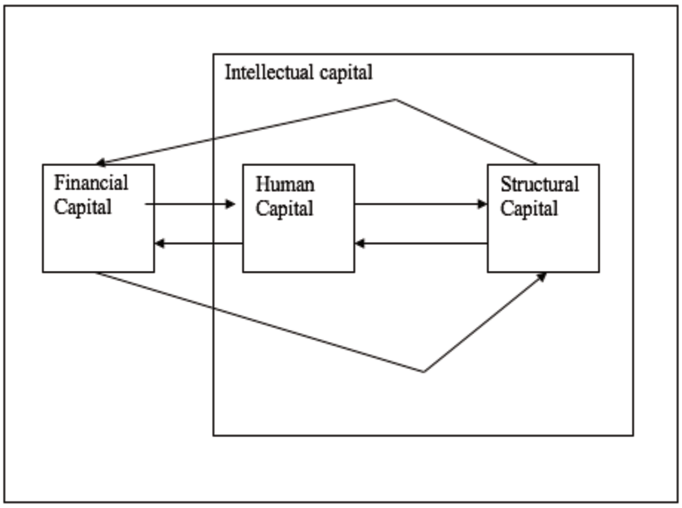

Figure 12: Intellectual Capital Index and the Internal Flows of Intellectual Capital (Roos et al., 1998)

From the Figure 12 above, the intellectual capital index presents the relation between financial capital, human capital and structural capital. Human capital and structural capital are found in the core of intellectual capital.

Intangible Asset Monitor

The Intangible Asset Monitor was founded by (Bontis et al., 1999; Johanson et al., 2001; Mouritsen et al., 2005) and it is a non-financial measurement system for intellectual capital based on the concept of knowledge organization. The main indicators of intangible assets are grouped into three large groups: representing individual competence, internal structure and external structure. They correspond to human, organizational and relationship capital. Individual abilities are knowledge, skills, experience, value judgements and social networks of employees. Internal structure is composed of legal structure, research and development, software, routines and processes. The external component includes brands, customer and supplier relations. Which indicators will be selected mainly depends on a company's strategy? The purpose of the model is not to provide a full and comprehensive picture of a company's intellectual capital because it is not possible. The attempt is just to estimate the most realistic market value *(Sveiby, 1997)*.

Visible Assets	Intangible Assets (and sample measure)		
Tangible assets minus tangible liabilities	Competence of Personnel • **Growth/Renewal** (education, training, turnover) • **Efficiency** (proportion of professionals, leverage etc.) • **Stability** (age, seniority, etc.)	Internal Structure • **Growth/Renewal** (investment in IT, contribution from customers to the internal structure, etc.) • **Efficiency** (values and attitudes, proportion of support staff etc.) • **Stability** (age of the organizations, staff turnover, novice ratio etc.)	External Structure • **Growth/Renewal** (organic growth, customer profitability etc.) • **Efficiency** (customer satisfaction, customer perceived quality etc.) • **Stability** (customer loyalty, customer longevity, repeat orders, etc.)

Figure 13: Intangible Asset Monitor (Sveiby, 1997)

Based on the Figure 13 above, the intangible asset monitor is composed of three main intangible assets, and those are: competence of personnel, internal structure and external structure. All of those three intangible assets are compared with the same indicators' growth or renewal, efficiency and stability *(Sveiby, 1997)*.

Skandia Navigator

The interest in measuring intellectual capital started from the second half of the twentieth century. Different scientists, researchers and authors tried to find an adequate method, but the problem was in very limited information and resource and in finding the suitable one. The first model was developed by Edvinsson called Skandia Navigator. The next Figure presents the Skandia Navigator method:

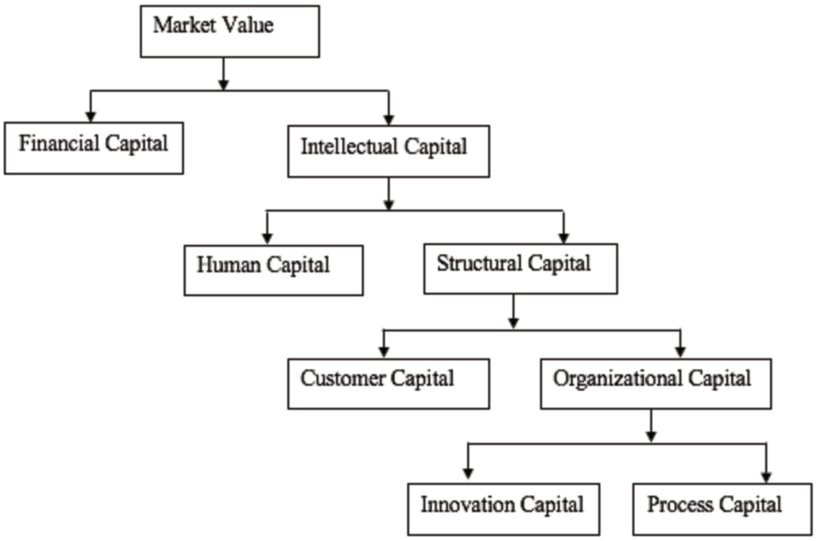

Figure 14: Skandia Navigator (Edvinsson, 1997)

Skandia Navigator is one of the first models for measuring and identifying intellectual capital in a company. The total market value of a company is a sum of financial and intellectual capital. Further on, intellectual capital is composed of human and structural capital, structural capital of customer and organizational capital, and finally, organizational capital is composed of innovation and process capital. The model offers 111 indicators to measure 5 different components: financial, human, customer, innovation and process. But, the developers of this model, Edvinsson and Malone suggest the use of a different set of attributes if necessary *(Edvinsson and Malone, 1997).*

“Tableau de Bord”

Tableau de Bord was developed by Epstein and Manzoni (1998). The Tableau de Bord has existed in France for the last 50 years and it is a performance management system. It was first developed by engineers who tried to find a way to improve their production processes by comparing the cost-effect relationship. The same logic was then used in all spheres at the top management levels in order to give senior managers a set of key indicators that will show them final performance. Tableau de Bord must be used for one unit only. It is not possible to use it for the whole company at once *(Epstein and Manzoni, 1998).* The development of Tableau de Bord demands translation of the company’s main mission and vision into particular objectives,

objectives into Key Success Factors (KSF), and Key Success Factors into Key Performance Indicators (KPI) *(Epstein and Manzoni, 1998).*

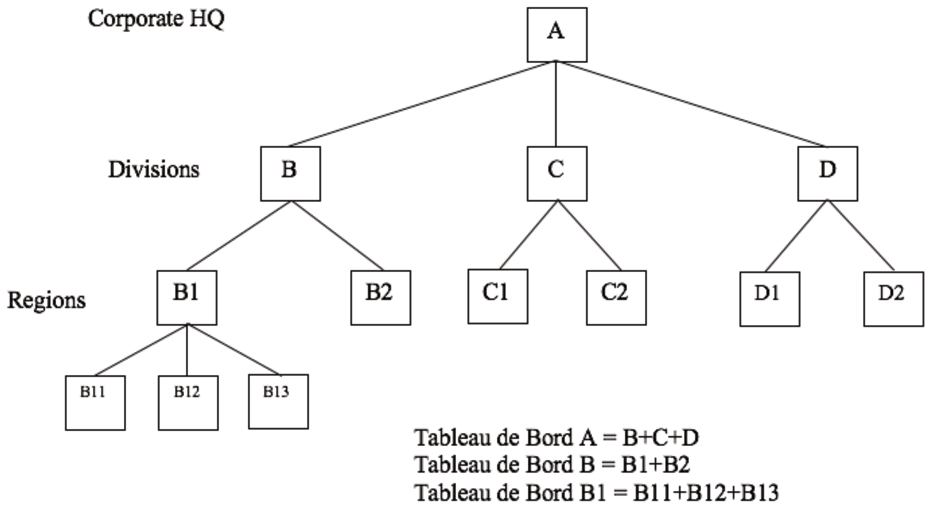

Figure 15: Principles for implementation of Tableau de Bord (de Guerny et al., 1990)

Based on the Figure 15 above, the main principles of implementation of Tableau de Bord are that different companies, or sub-organizational units are taken into consideration, but the interrelation between them is not observed and included. Different regions, divisions are included, but the interrelations between divisions B, C and D do not exist *(de Guerny et al., 1990)*.

<u>Knowledge Assets Map</u>

Knowledge Management System that is based on providing a broader framework of organizational knowledge for managers from both external and internal perspective is called Knowledge Assets Map *(Marr and Schiuma, 2001).* Knowledge Assets Map is forming a framework for identifying the critical knowledge areas of a company. Knowledge Assets Map classifies different knowledge assets and helps managers of a company to better understand the structure and hierarchy. The Figure 16 presents the classification of knowledge assets: *(Marr, Schiuma, and Neely, 2004b)*

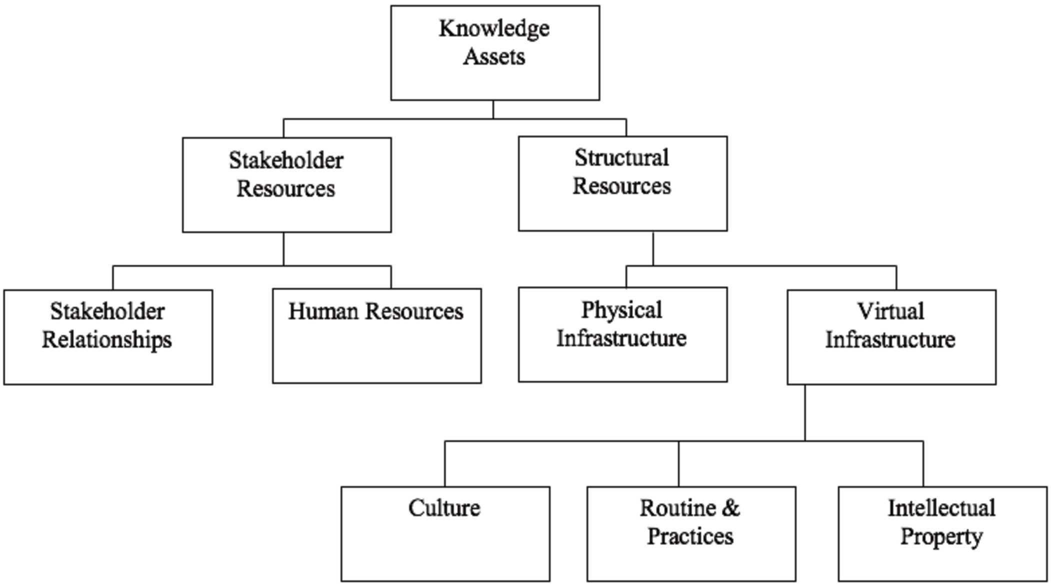

Figure 16: Knowledge Assets Map (Marr, Schiuma, and Neely, 2004b)

After measuring knowledge assets, it is important to visualize interactions and flows of knowledge assets. This can be done in a mapping process, where a precise place in a company will be identified for each knowledge asset. how knowledge assets interact and create future value will also be identified *(Marr, Schiuma, and Neely, 2004b)*. This can be done with strategy maps *(Kaplan and Norton, 2000),* success maps *(Neely, Adams, and Kennerley, 2002)* or the Navigation model developed by Roos et al. *(Chatzkel, 2002).*

2.1.2.4 Intellectual Capital Report

To get a clearer idea on how intellectual capital works, it is interesting to see how intellectual capital is put to work *(Bukh et al., 2001)*. Until now, not so many companies have published intellectual capital statements, which is a formal document that accompanies all the other financial statements *(Johanson et al., 1998; Johnson et al., 1999; Larsen et al., 1999; Mouritsen, 1998).* There are also other types of reporting, such as social accounting statements, stakeholder statements *(Epstein and Birchard, 1999; Gray, Owen, and Adams, 1996),* or additional statements about intellectual capital coming from the balanced scorecard *(Kaplan and Norton, 1996; Olve, Roy, and Wetter, 2000).*

The intellectual capital statement appeared in the mid-1980s for the first time, when some professionals in the service industry in Sweden proposed additional statements to the official set of financial statements *(Bukh et al., 2001).* Sveiby and Riebling (1986) created a template for a new annual report for 'know-how' companies. 'Know-how' companies were the companies with highly educated and skillful employees. According to Konrad Group *(Sveiby et al., 1990),* it was necessary to differentiate between know-how companies and knowledge-intensive companies. Sveiby (1997) generalized his ideas to cover all range of 'knowledge organizations'. Based on the book by Sveiby et al. (1990) 'the invisible balance sheet' was included in the annual report based on the recommendation from the Swedish Association of Employers in Service Industry in 1993 *(TjaKnesteforbundet, 1993).* Together with Leif Edvinsson and some consulting companies, Swedish consulting company SIFO[2], Karl Erik Sveiby was the prime initiator of launching the intellectual capital movement *(Bukh et al., 2001).*

Based on the work of Bukh et al. (2001), the main ideas about the importance of having the intellectual capital statement explored are presented by Bukh et al. (2001). The study is based on questionnaires developed on a five-point Likert scale together with specific reasons proposed. This questionnaire was completed for the years 1998 and 1999. The results proved that the key reasons were associated with intellectual capital and relations between people, knowledge, organizational routines and inter-organizational relations.

Based on the work of Bukh et al. (2001) there are several reasons for working and creating intellectual capital statement. The reasons are ordered based on the priority and importance coming from the research results for 1998 and 1999 years. The reasons are presented below:

1) Support Strategy;
2) Show Innovation;
3) Create Innovation;
4) Knowledge as an Asset;
5) Attract Employees;
6) Show Human Resources;
7) Customer Relations;
8) Knowledge Updating;

[2] The SIFO group was as a consultant group of the management control methods for intangibles *(Johanson, U. et al. 1998).*

9) Carrier Planning;
10) Retain Employees;
11) Supplier Relations;
12) Training;
13) Attract Investors;
14) Banking Loans.

According to Carl Bro Group (2001), intellectual capital accounts and measurement methods develop intelligent solutions that improve final performance.

Based on the study of Ordoñez de Pablos (2001a, 2001b, 2002), there are three major areas of intellectual capital report, and those are: Human capital area, Relational capital area and Structural capital area.

- Human capital area is composed of six basic sections: employee profile, education, training, commitment and motivation, staff turnover and results.

- Structural capital area is divided into six major sections: general infrastructure, knowledge-based infrastructure, innovation, quality and improvement projects, customer support and administrative processes.

- Final area is a relational area and it is composed of four sections: client profile, customers (image and stakeholders), diffusion and networking, and intensity, collaboration and connectivity.

Mouritsen and Larsen (2005) proposed the key elements of the intellectual capital statement in the Figure 17 below:

Elements of an intellectual capital statement
1. Knowledge narrative: A narrative about the firm’s ambition to create (use) value for its users and the required types of knowledge resources to accomplish this: • What product or service does the company provide? • How does it make a difference for the user? • What knowledge resources are necessary to be able to supply the product or service? • How does the constellation of knowledge resources produce a service/product? 2. Management challenges: The durable challenges posed by the role of knowledge resources in the firm’s business model: • How are the knowledge resources related? • Which existing knowledge resources should be strengthened? • What new knowledge resources are needed? 3. Efforts: The initiatives to compose, develop and procure knowledge resources? • What initiatives, actual and potential, can be identified? • What initiatives should be given priority? 4. Indicators: The mechanisms of monitoring the portfolio, development and effects of knowledge resources: • Effects – how do activities work? • Activities – what does the firm do to upgrade knowledge resources? • Resource mix – what is the composition of knowledge resources?

Figure 17: Elements of intellectual capital statement (Mouritsen and Larsen, 2005)

This statement is composed of four main parts, and those are: knowledge narrative, management challenges, efforts and indicators of success.

Based on the RICARDIS project (2006), an initiative to implement an intellectual capital measurement system was proposed in order to standardize the process of creating harmonized Intellectual Capital Statement based on the good practices from Europe, Australia, Denmark, France, Sweden and other countries.

2.1.3 Investments in Intellectual Capital

The OECD Member countries have the rising awareness about the highly important part of their investments in the business sector that is focused on “investment products”, such as research and development, software, training, marketing, etc. The financial data still remains very scarce for research and exploration *(Kaplan, 1987; OECD, 1992).* In knowledge-based economy, successful innovations demand various kinds of investments in intangibles that will further produce intellectual capital. Intellectual capital is all about future earning potential that will be obtained from investments in different elements of Intellectual Capital and tangible assets at the same time. It is not enough to invest only in R&D and innovations, but also in other forms of intellectual capital *(RICARDIS project, 2006).*

Investing in intellectual capital is highly important for companies that want to realize their strategies operationally and perform well (Riahi-Belkaoui, 2003a). Companies that are market-driven require investments in tangible assets (logistics, information systems, distribution, etc.) and intangible assets (trainings, product development, brand, marketing, etc.) both at the same time *(Day 1994; Vorhies, Harker, and Rao, 1999).* When one company invests in its intellectual capital, the hidden value and invisible results will appear and exceed the cost of saving. The beneficial results will appear in the form of customer satisfaction increase, improvement of internal processes and improved company final performance. What remains hidden are values of human resources, information systems, customer relationships, research and development, creativity and competence basis *(Chen, 2002).*

Investing in knowledge is crucial for their opportunity to create value and create high value products and services *(Chang and Hsieh, 2011).* Rodriguez-Castellanos et al. (2011) proved that companies which invest in intellectual capital have a better economic result than those that do not. For Malone (2000), the biggest challenge for a company is how to convert intangible assets into market value. Edvinsson (2002) thinks that in the knowledge economy, the present value can change and be different from the value of yesterday or tomorrow. For example, companies very often disclose financial information about “innovation revenues” in France. Those are the revenues that come from the recently introduced and developed products. Such revenues are the proof that French companies have abilities to innovate and very quickly launch products or services on the market. This kind of financial information has been proven to be very valuable for investors to predict the future growth or productivity of companies in the upcoming years *(Lev, 2003).* The progress of company performance through technical improvements, innovation and quality of human, structural and human capital will stem from investments in knowledge, education, research and development *(Seleim, Ashour, and Bontis, 2004)*.

Investments in intellectual capital 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, Rodríguez-Castellanos, and García-Merino, 2018).* Results from investments in intellectual capital components vary from each other. For instance, studies by Awano et al. (2010) and Whittard al., (2009) proved that investments in intellectual capital produce results after 3-5 years regarding training, reputation & branding, and 4-7 years regarding R&D and software. Previous research proved that a period of 2 years is necessary for investments in R&D to be capitalized *(Leonard 1971; Hirschey and Weygandt, 1985)* to seven years *(Ballester et al., 2003; Sougiannis, 1994).*

Investments in intangibles produce intangible capital, long-lasting rights or assets with or without physical substance that will generate future economic benefits for a company. Investments are an inflow of financial resources into the stock of intangibles (*OECD, 1998).*

2.1.3.1 Definitions of Investments in Intellectual Capital

The investment product has its main ability to make contributions to more than one production cycle. The investment process leads to the accumulation in the form of an asset. Investments in intangibles include current and capital expenses for tangible and intangible products that will remain in use for more than one year *(OECD, 1998).* The biggest task is the collection and separation of operating costs from capital costs because intangible investments very rarely relate to services *(Berends-Balast, 1987).* In practice, expenses related to intangible products are recorded in company's accounts within non-capital part or operating part *(OECD, 1998)*.

A unique definition of intellectual capital investments has not been found until now because it mainly depends on the purpose of a study. On one side, investments are seen as expenditures for intellectual capital components. On the other side, some researchers see investments in intellectual capital as intangible investments, knowledge based investments, intangible activities, etc. *(Lentjushenkova and Lapina, 2014).* Many researchers see intellectual capital investments as the key-drivers of financial company performance. The definition of "investments" is not only focused on financial performance, but also on non-financial performance such as productivity, quality and improvement *(Lentjushenkova and Lapina, 2014)*. One investment in a company's intellectual capital is based on the intellectual capital creation *(Gaponenko and Orlova, 2008)*. Corrado et al. (2006) defined investment as any use of resources that are not used for the current consumption, but that are used to increase and create long-term benefits. Most of the researchers link intellectual capital investments to R&D expenses *(Bandeira and Afonso, 2010; Coombs and Bierly, 2006; Liebowitz and Suen, 2000)*. Based on the literature, intellectual capital investments are linked to value factors *(Chen, Cheng, and Hwang, 2005a; Dumay, 2012)*. Youndt et al. (2004) examined investments in intellectual capital components and how those components coexist. To be more precise, the investments were made in Human resource management (HRM), Information technology (IT) and research and development (R&D). The results of this study were that HRM and IT investments tended to be more important than R&D investments across intellectual capital components *(Youndt et al, 2004)*.

Lentjushenkova and Lapina (2014) found that the concept of intellectual capital can be divided into four main steps:

1) Changing from the "resource-based" to "knowledge-based" view;
2) Developing and determining the components of intellectual capital;
3) Identifying the creation of intellectual capital measurement methods;
4) Developing the definitions of intellectual capital investments.

All explored intellectual capital investment definitions are presented in the following table:

Table 7: Table of definitions of intellectual capital investments

Authors	**The interpretations of the definition of intellectual capital investments**
Andriessen and Stam (2005)	Values of intellectual capital are used as the intellectual capital future perspectives that will give insight into the future power of a company.
Awano et al. (2010)	Investments in intellectual capital are defined as expenditures for software, training, reputations, R&D, design and brand, and business process improvement.
Bandeira and Afonso (2010)	R&D expenditures are used as synonyms for intangible capital investments.
Canibano et al. (2000)	Investments in intellectual capital are seen as intangible activities. They are simply allocation of resources focused on: 1) Acquiring new or developing internally intangible resources; 2) Increasing the value; 3) Monitoring and evaluating the results of the previous two steps;
Corrado et al. (2006)	Expenditures related to economic competencies, innovative property and software are all used as intellectual capital investments.
Corrado et al. (2012)	Intellectual capital investments are defined as intangible activities for a strategic goal in a company.
Hall et al. (1986)	Strategic expenditures must be seen as investments in strategic assets.
Klock and Megna (2000)	Advertising expenditures represent measurement for the intellectual capital investments.
Piekkola (2011)	Intellectual capital investments are company's capital formation expenditures.
RICARDIS project (2006)	Investments in intellectual capital or innovative expenditures consist of internal and external R&D expenditures, acquisition of machinery, training and license.

Roos et al. (2001)	Investments in intellectual capital are a company's expenditures for intellectual capital components that will result in a company's growth in the future.
Molodchik et al. (2012)	Intellectual capital investments are the intellectual capital part focused on improving a company's competitive advantage and performance that will cause the increase in a company's value.
Zéghal and Maaloul (2011)	The main value creators are intangible investments.

Lentjushenkova and Lapina (2014) developed the following Figure that is related to intellectual capital investments and all potential company performance. Pribac (2010) proposed the following features of investments in intellectual capital:

- Heterogeneity;
- Human corporation;
- Social and collective character;
- Lifespan of intellectual capital investment depends on its diverse use;
- Recovering of intellectual capital investment is shorter than the material investment;
- Effects of investments in intellectual capital are multiple.

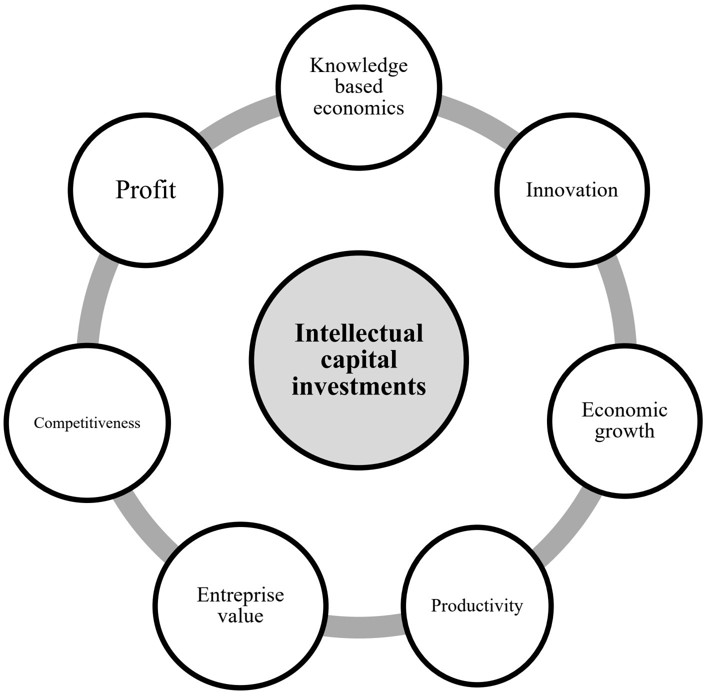

Figure 18: Concepts related to the intellectual capital investments potential outputs (Lentjushenkova and Lapina, 2014)

Based on the Figure 18 above, there are seven main intellectual capital investments potential outputs that can come from intellectual capital investments, and those are knowledge-based economics, profit, innovation, competitiveness, economic growth, enterprise value and productivity *(Lentjushenkova and Lapina, 2014)*.

Researchers define investments in intellectual capital 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)*.

Based on the study developed by Lentjushenkova and Lapina (2014), the following conclusions were made: Intellectual capital investments influence financial and non-financial company performance; Intellectual capital investment influences a company's market value positively; Company's expenditures can be seen as intellectual capital investments only if they can be reflected in accountancy; Intellectual capital investments are often very risky because of an unpredictable outcome; Expenditures are more often used in research than investments that will further on influence the value or performance of a company and the most used terms for intellectual capital investments are: human capital investments, R&D expenditures, IT expenditures, labor costs and training costs;

2.1.3.2 Classifications of Investments in Intellectual Capital

A unique classification of investments in intellectual capital hasn't been found until now. The structure of investments and their direction has radically changed in the last decades. For instance, in the US between 1972 and 2011, investments in tangible assets decreased from 12% to 8%, whereas investments in intangible assets increased from 8% up to 15% *(Lentjushenkova and Lapina, 2014).* The situation changed also in Europe. For instance, most of the companies in France, Finland, Sweden and Netherlands made investments in intangible assets *(OECD, 2013).*

Big contribution to the literature was made by Corrado et al. (2005), who grouped investments in intangible capital into three main groups. This study was used later on as the main framework and applied in many studies related to intangible assets (*Department for Business Innovation*

& Skills, 2012). The following three groups of investments in intangible capital proposed by Corrado et al. (2005) are:

I) **Computerized information** that comprises costs in knowledge related to computer software for the purpose of their development, purchase or customization for a company's use, or computerized databases;

II) **Scientific and creative property** covers scientific efforts of a company to develop patents, licenses and unpatented know-how and mineral reserves. Also, it refers to different expenses on commercial copyrights, licenses and designs that are concentrated on the development of industrial products, architectural and engineering designs and different research related to social sciences and humanities;

III) **Economic competencies** are all costs and values related to human capital in order to develop an organizational structure of a company and all expenses regarding marketing and market research oriented toward a company's brand.

This classification was used in the study produced by OECD (2013) for knowledge economy development. Also, Marrano et al. (2007) used the classification of investments in intellectual capital developed by Corrado et al. (2005) to explore the amount of investments in intellectual capital in the UK companies, and they reached the conclusion that only some types of investments are included as investments, such as computerized information or software.

Awano et al. (2010) did a study that included 838 responses from UK companies. The purpose of the study was to identify results of investments in intellectual capital in UK companies. Beside six different investments in intellectual capital, the study measured the life span of investments. The survey is focused on the following six categories of investments in intellectual capital:

1) Employees' training;
2) Software;
3) Reputation and branding;
4) R&D
5) Design;
6) Business process improvement.

The sample of the same study by Awano et al. (2010) showed that most of the companies are from service industries, rather than production industries. Most of the expenses are in-house, except for Reputation and branding, and R&D.

The investments in intangible capital have the following main components *(OECD, 1998)*:

- Research and development (R&D);
- Education and training;
- Software;
- Marketing;
- Mineral explorations;
- Licenses, brands, copyrights,
- Patents.

Additional components of investments in intangibles are *(OECD, 1998)*:

- Development of the organization;
- Engineering and design;
- Construction and use of databases;
- Remuneration for innovative ideas;
- Other human resource development (training excluded).

The Figure 19 shows the core components of possible investments in intangible capital by Alison Young from OECD secretariat (1998).

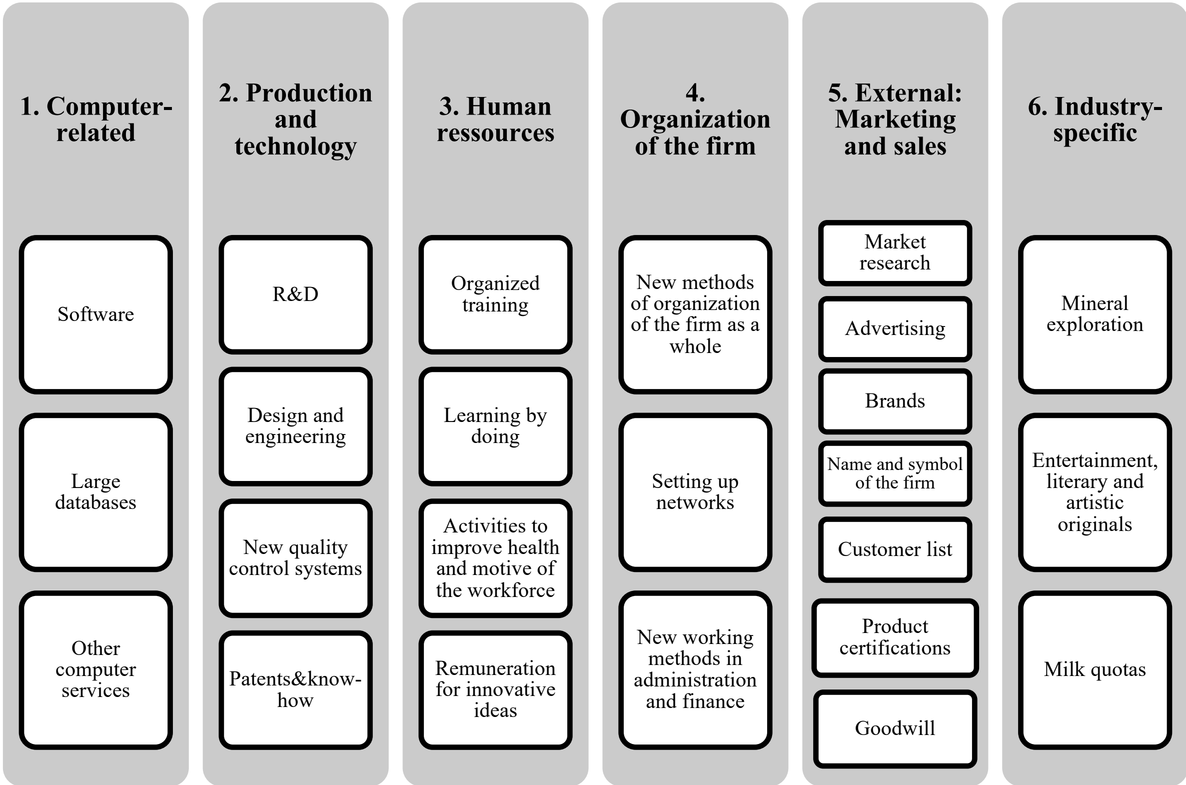

Figure 19: Possible components of investments in intangible capital (OECD secretariat, author Alison Young 1998)

Lentjushenkova and Lapina (2014) proposed the classification of intellectual capital investments based on time and different functional sphere characteristics of a company. The authors grouped the investments in intellectual capital into the following groups:

1) Creation investments;
2) Development investments;
3) Maintaining investments.

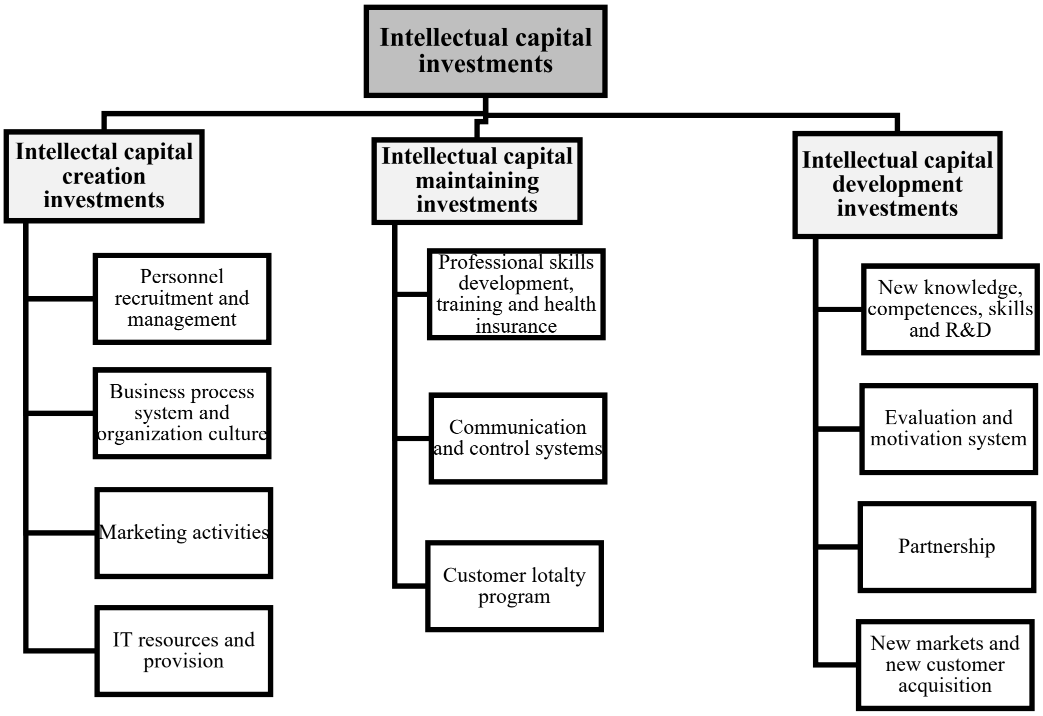

Figure 20: Intellectual capital investments classification (Lentjushenkova and Lapina, 2014)

The Figure 20 above presents three main intellectual capital investments, and those are intellectual capital creation investments, intellectual capital maintaining investments and intellectual capital development investments. Intellectual capital creation investments include personnel recruitment management, business process system and organizational culture, different marketing and commercial activities and advanced information technology resources. The second intellectual capital investment represents intellectual capital maintaining investments, and this investment includes professional skills development, training and health insurance, communication and control systems and different customer loyalty program. The final intellectual capital investment is the intellectual capital development investment, and this investment includes new knowledge, competences and research and development, evaluation and motivation system, partnership and new undeveloped markets and new customer acquisitions *(Lentjushenkova and Lapina, 2014)*.

Making a decision to invest in a company's intellectual capital requires setting a company's goal and estimating the amount of necessary financial resources. For instance, if a company decides to invest in its R&D, that 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)*.

2.1.3.3 Investments in Human Capital (HC)

Different definitions of human capital investments could be found in the study published by *(Ballester, Garcia-Ayuso, and Livnat, 2003)*. Sweetland (1996) and Mincer (1970) claim that according to the human capital theory, investing in people will result in economic benefits not only for individuals, but also for companies and society. Edvinsson and Malone (1997) claim that investing in employees' competences fosters human capital, organizational knowledge, as well as a company's intellectual capital. Maximum use of human capital will create and develop both companies' future intellectual capital and total market value simultaneously *(Lev, 2004).* Companies' intangible assets cannot create a future value by itself, they need to be complemented with training programs to create a value *(Kaplan and Norton, 2004).* According to the McKinsey quarterly research study published by Desmet et al. (2010), companies all around the world spend 100 billions of dollars on training human resources.

Ballester et al. (2002) and Lajili and Zeghal (2005) define labor costs as human capital investments. Bontis and Fitz-enz (2002) see training and development expenditures as indicators of measurement of human capital investments. According to Kim and Lee (2007), employees obtain experience and knowledge while working in a company. Knowledge and experience can be seen as investments in human capital accumulation because 20% of the working time is included in this type of investment.

Investment in employees' training is seen as the main variable for the investment in Human capital *(Bukowitz and Petrash, 1997; Koch and McGrath, 1996).* Training includes all different processes, formal and informal that enable employees to gain workforce skills. Forms of trainings differ from highly structured educational type to learning-by-doing *(OECD, 1998).*

García-Zambrano et al. (2018) took Spanish companies as a sample in their study. They are quoted on the IBEX-35 stock exchange and they compared investments in Human capital and Tobin's Q ratio. A positive relationship between investments in Human capital and Tobin's Q ratio was proven. Investments in Human capital generate improvements in the future company's market value. García-Zambrano et al. (2018) took expenditures on training as the main indicator of investments in Human capital.

2.1.3.4 Investments in Structural Capital (SC)

Bandeira and Afonso (2010) think that market treats R&D expenses as investments in intellectual capital, more precisely in structural capital.

As mentioned in the part 2.1.2.2.2 Structural capital given by Martín-de-Castro et al. (2011), is composed of Technological and Organizational Capital.

1) **Technological capital** – Includes the following variables: efforts in research and development, technological infrastructure including the purchase of advanced technology and intellectual and industry property;

2) **Organizational capital** – Includes the following indicators: organizational culture, values and attitude, information and telecommunication capabilities and organizational structure;

According to the definition of Frascati Manual (OECD, 1994), research and development includes creative work with a systematic basis aimed at increasing the stock of knowledge. The three main activities are covered:

1) **Basic research**: theoretical and experimental work with a purpose to acquire new knowledge about observable facts;

2) **Applied research**: original investigation focused on realizing a specific aim or objective in order to acquire new knowledge;

3) **Experimental development**: systematic research based on existing knowledge focused on producing new products, materials, services, systems and processes.

There is a general consensus about the investment in R&D because the results of this investment are related to generating new knowledge and applications that will serve on a long-term basis *(OECD 1989).*

According to the study of OECD (1998), investing in software is defined as a series of activities for digital operations that includes the development of system software, hardware and application software subdivided in standard software and custom software. Information about investments in software is hard to collect because they are linked to costs of software engineering or sales of software in almost all cases.

2.1.3.4.1 Investment in Research and Development (R&D)

Most studies proved that research and development (R&D) positively influence productivity, profits, sales and employment growth of a company *(Lentjushenkova and Lapina, 2014).* While many methods provide convenient measures for company's intellectual capital, its measures for the structural capital may be incomplete. For instance, R&D expenses and marketing expenses are expensed as they are incurred. Both R&D expenses and marketing expenses play a significantly important role in business performance nowadays *(Chen, Cheng, and Hwang, 2005a).* Lev and Sougiannis (1996) used a sample of 1975-1991 US public companies and proved a significant relationship between company's R&D capital and subsequent stock returns. Chauvin and Hirschey (1993) also found 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) stated 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.

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

According to the Statement of Financial Accounting Standards No.2 – Accounting for Research and Development Costs in the United States, all R&D expenses must be expensed. Expensing means that all annual R&D expenses must be subtracted from the annual revenues (sales) in the process of net income calculation. The main characteristics of immediate expensing is that there are no future benefits. Immediate expensing alternative is capitalization – recognition process of R&D expenses as an asset in the balance sheet. The impact of capitalization of R&D has two sides: one is when R&D expenses are capitalized as an asset in the balance sheet, and the other is when that asset must be amortized. The amortization amount is also expense that appears in the profit and loss account *(Deng and Lev, 2006)*. On average, investors make a decision to capitalize and amortize R&D expenses, rather than to expense *(Deng and Lev, 2006)*.

The R&D expenses are related to the following *(Warfield, Weygandt, and Kieso, 2008):*

1. Materials, Equipment and Facilities;
2. Personnel;
3. Purchased Intangibles;
4. Contract Services;
5. Indirect Costs.

Based on the book published by Warfield et al. (2008), there are 14 different R&D costs with the accounting treatment presented in the table below:

Table 8: Table of Types of expenditures and accounting treatments of research and development expense Warfield et al. (2008)

Type of Expenditure	Accounting Treatment
1. Construction of long-range research facility for the use on current or future project.	Capitalize and depreciate as R&D expense
2. Acquisition of R&D equipment for the use on current project only.	Expense recorded immediately as R&D.
3. Acquisition of machinery to be used on current and future R&D projects.	Capitalize and depreciate as R&D expense.
4. Purchase of materials to be used on current and future R&D projects.	Expense recorded immediately as R&D.
5. Salaries of research staff.	Expense recorded immediately as R&D.
6. Research costs incurred under contractual obligation.	Record as a receivable.
7. Material, labor and costs of prototypes.	Expense recorded immediately as R&D.
8. Costs of testing prototype and design modifications.	Expense recorded immediately as R&D.
9. Legal fees to obtain new patent.	Capitalize as a patent and amortize.
10. Executive salaries.	Expense as operating expense.
11. Costs of marketing research.	Expense as operating expense.
12. Engineering costs incurred to advance the new research equipment.	Expense recorded immediately as R&D.
13. Costs of successfully defending a patent.	Capitalize as a patent and amortize.
14. Commission to sales staff marketing.	Expense as operating expense.

Chang and Hsieh (2011) tested the relationship between research & development (R&D) investment and operating, financial and market performance of a company. The association between these variables showed and proved a positively significant impact. This was a proof that an R&D investment is used as a source of "value creation" based on the Taiwanese example *(Chang and Hsieh, 2011).*

Investments in R&D have three main arguments *(RICARDIS project, 2006)*:

- Investments in Intellectual Capital (including R&D) are important components of those resources owned by the company;

- The success of investment in R&D depends on the interaction with other intangible resources or intellectual capital components, and those are: Information and organizational capital, marketing and distribution capital, and relational capital;

- The companies' managements are interested in creating immediate value, as well as in the intangible resources that can be derived from the interaction with other resources.

Megna and Klock (1993) stated that an investment in research and development is directly related to the number of patents, or, to be more precise, directly related to increasing a company's book value. Lev (2004) mentioned the investment in research and development of the textile company DuPont in the period from 1985 to 2000. The investment has influence on two thirds of the increase in the value generated within a company.

Teece (2002) thinks that investments in R&D alone are not sufficient. To be successful, investments in R&D must produce a complementary asset that will be packed into products or services to yield value. He distinguished three types of complementary assets:

- **Generic Assets** need to be tailored according to the innovation, such as generalized equipment and skills;

- **Specialized Assets** with unilateral dependence, such as marketing and distribution channels;

- **Co-Specialized Assets** with bilateral dependence, such as repair facilities and machines.

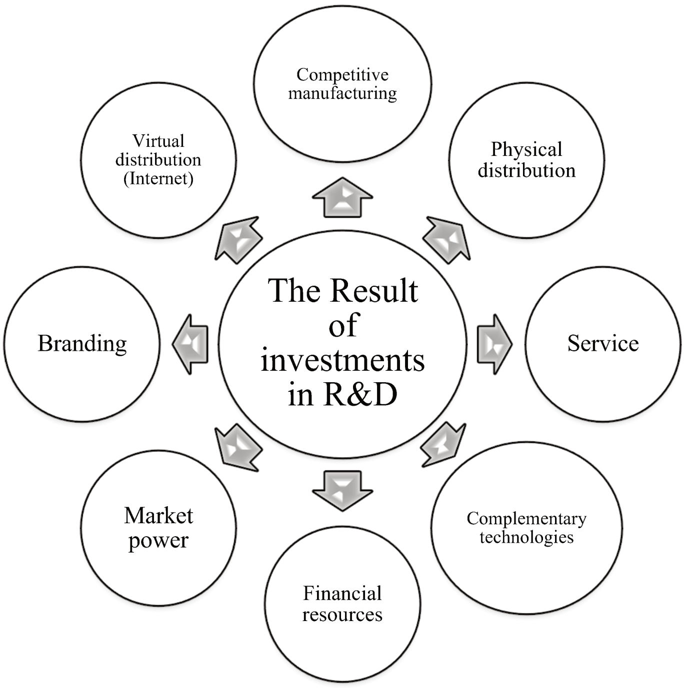

Figure 21: Possible complementary assets produced from the investments in R&D (Teece, 2002)

The Figure 21 above presents potential and possible complementary assets that can be produced, capitalized and developed when investing in R&D. There are eight potential types of complementary assets and those are: competitive manufacturing, physical distribution, service, complementary technologies, financial resources, market power, branding and virtual distribution *(adapted from Teece, 2002)*.

Taking into consideration all advantages and benefits of investments in R&D, there are also limitations grouped in four areas *(European Commission, 2003):*

I. **Financial Resources** – There are many reasons why it is difficult to raise money from banks, financial institutions or investors to prove a suitable business proposition. This is because the investments in research and development are highly risky and it is very often difficult to predict the final result. Raising money is a much more difficult task for start-up companies than it is for large corporations that will easily find a way to generate profits;

II. **Knowledge** – A combination of external and internal knowledge is necessary when introducing new innovations onto the market. In order to be innovative, it is highly important to take a broader knowledge base than the one from the past. External and internal knowledge sources must be managed properly;

III. **Human Capital** – Skilled and talented people are a very important element in the whole research and development process. Developing and managing human capital is a highly important part for successful, highly innovative companies. Michie (1999) thinks that the skill-shortage is a serious obstacle in the research process.

IV. **Management Competences** – The lack of management competences in the part of marketing, organization and innovation is another key reason why companies do not invest more in R&D. The lack of management competences makes it difficult to plan and implement R&D in a successful manner.

2.1.3.4.2 Development of Research Asset

Damodaran (2009) explored the importance of research and development expenses for the success of a company. He thinks that all expenses focused on providing benefits over multiple periods must be seen as capital expenses, and these expenses are depreciated over a certain period of time. Damodaran argues that R&D expenses must be capitalized expenses, and not operating expenses because they bring long-term benefits, such as cash flow and growth in valuation. For instance, operating costs are expenses that provide benefits only for the current period. The cost of labor and materials belong to the group of operating costs. Operating expenses do not create any asset and do not influence a company's capital. They do so only through indirect influence on retained earnings. On the other side, capital expenses are expenses that will last for a longer period, but they bring and generate benefits over multiple periods. The cost of purchasing a land or buildings belongs to the group of capital expenses. Capital expenses can create an asset and affect a company's capital. Taking into account everything previously mentioned, investments in land, plant, research and development, training, software, marketing must be treated as capital expenses. The core of interest is the capitalization and recognition of these capital expenses inside the balance sheet of a company that will generate benefits for the future. The main question is related to the results and effects of an investment in research and development. In order to capitalized R&D expenses, it is necessary to accumulate all R&D expenses and to create a **research asset.** A company's equity and assets increase together with the development of the research asset. The number of years necessary to develop one research asset depends on the industry that a company belongs to. This period of development of a research asset is called useful life.

The following formula presents the value of the research asset calculation given by Damodaran (2009):

$$\text{Value of the Research Asset} = \sum_{t=-(n-1)}^{t=0} R\&D_t \frac{(n+1)}{n}$$

Damodaran (2009) gave an example of calculation of a research asset on Boeing over the last 10 years:

Table 9: Table of calculation of research asset by Damodaran (2009)

Year	R&D	Unamortized Portion	Unamortized Value
1988	$ 751	0.10	$ 75
1989	$ 754	0.20	$ 151
1990	$ 827	0.30	$ 248
1991	$ 1,417	0.40	$ 567
1992	$ 1,846	0.50	$ 923
1993	$ 1,661	0.60	$ 997
1994	$ 1,704	0.70	$ 1,193
1995	$ 1,300	0.80	$ 1,040
1996	$ 1,633	0.90	$ 1,470
1997	$ 1,924	1.00	$ 1,924
Capitalized Value of R&D Expenses			**$ 8,587**

Damodaran (2009) further explored and found that the capitalized value of R&D is seen as the value of a research asset. Now, the recognized research asset will directly increase the value of a company's equity and book value of asset up to $8,587. At the same time, a research asset increases a company's operating income because what remains after the capitalization of R&D expenses is only the amortization of a research asset. There will no longer be R&D expenses with that character. R&D expenses are usually higher than amortization of a research asset and that is why a company's operating income increases after the capitalization of R&D expenses.

2.1.3.5 Investments in Customer (Relational) Capital

According to Chen et al. (2005), Miles (2011) stated that investments in Relational capital have the highest impact on business results. Studies by Corrado et al. (2006), Cohen and Kaimenakis (2006) and Allen and Wilburn (2002) proved that an investment in advertising is the main variable that represents an investment in Relational capital. In order to achieve a better market and financial position, companies strive to attract more and more customers *(Aaker, 1992).* Canibano et al. (2000) found that marketing and advertising expenses are seen as investments in intellectual capital.

The study by García-Zambrano et al. (2018) also proved that a positive link between the investments in Relational capital and Tobin's Q ratio results in the improvement of a company's market value. An indicator for collecting investments in Relational capital are all expenditures in advertising from the same study. Authors such as Allen and Wilburn (2002), Charles (1999), Rucci et al. (1998), Vavra (1997) and Wiley (1996) proved a direct positive link between customer satisfaction and loyalty indicators regarding market and financial performance.

Study by OECD (1998) explained the investments in marketing. The following activities are involved in marketing:

- Market introduction (market research, design, etc.);
- Sales (services);
- Advertising (advertisements sponsoring, promotions, public relations, etc.)
- Logistics (storage, transport, etc.)

2.1.3.6 Collection of Investments in Intellectual Capital

Sichel (2008) proposed three approaches for intellectual capital investment measurements – financial market valuation, other performance measures and direct expenditure data.

I. The first approach was explored in depth by Brynjolfsson and Yang, (1999), Brynjolfsson et al. (2000) and Brynjolfsson et al. (2002) who identified a link between intangible investments and investments in computers in the US. Each dollar of investment in computers in a company is linked with between five and ten dollars of market value. This is explained as a huge interrelation between computer investments and existing intangibles in a company. Webster (2000) stated that every missing explanation about the market value of a company not explained by the existing balance sheet of tangible assets, must be explained by intangible assets;

II. The second approach uses other performance measurements, productivity or earnings *(Barnes and McClure, 2009).* McGrattan and Prescott (2005) concluded that the portion of the value of intangible capital, corporate profits, return of tangible assets and after-tax returns to tangible and intangible assets are between 31 % and 76 % of the US GDP. Webster (2000) found that 2.8 % per year for the last 25 years in Australia is the growth of intangible investments by using the proportion of labor force in jobs that produce intellectual capital. Lev and Radhakrishnan (2003) developed a measure of organizational capital by modelling sales of organizational capital (all expenses related to sales, general and administrative activities because they are within the organizational capital) and obtained the results that the productivity of a company's organizational capital is between 0.4 % and 0.6 % of average sales in the US companies. Cummins (2005) urged that the first two approaches can face problems and errors in measurement;

III. The third approach tries to link expenses directly to produced intangible capital *(Barnes and McClure, 2009)*. This approach can also face measurement errors and data limitations, like the previous two approaches *(Barnes and McClure, 2009).* Nakamura (2001, 1999) measured investments in intellectual capital by collecting all expenses in R&D, software, advertising and marketing, wages and salaries of employees. He obtained the results that trillions of dollars were invested in the US, with intellectual capital in the amount of 5 trillion dollars. Corrado et al. (2006) expanded Nakamura's work (2001, 1999) and gave measurement indicators for the previous study by Corrado et al. (2005):

- **Computerized information**: Investments in computer software and computer databases available in national accounts;

- **Innovative property:** Scientific R&D and Social sciences R&D are expenditures on R&D; mineral exploration is the investment in mineral exploration available in national accounts; copyright and license costs are investments available in national accounts;

New product development in financial industry and new architectural and engineering designs are organized in 20 % and 50 % respectively regarding all the purchases by Finance industry and sales of architectural and consulting engineering services;

- **Economic competencies:** advertising is advertising expenditure; market research is available from sales of market research services; human capital represents all direct costs and wage costs of employees in training; organizational capital is 80 % and 20 % respectively regarding sales of management consulting services and salaries of managers and administrators;

Schreyer (2007) proved that the concept of Corrado et al. (2005) is more practical than regular measurement of a company's intangible assets. Regarding measurement, it is doubtful whether measurement should be expenditure-based or value-based *(Lev, 2001; Bosworth and Webster, 2006; Hunter et al., 2005).*

Barnes and McClure (2009) emphasized four main measurement steps and challenges involved in investments in intangibles:

1. Collect relevant financial data for expenditures on each intangible asset;
2. Apply time series of nominal expenses;
3. Determine the percentage of expenditures share that will be seen and treated as an investment;
4. Choose appropriate deflator to calculate the value;

2.1.3.7 Capitalization and Recognition of Intellectual Capital Investments in Company's Value

Capitalizing is the process of treating expenditures as an investment and accumulating capital within a company on a long-term basis *(Barnes and McClure, 2009)*. The capitalization of R&D expenses has always been a controversial issue. Supporters of capitalization of R&D expenses claim that a long-standing asset has a positive impact on future profitability *(Ballester et al., 2003; Bublitz and Ettredge, 1989; Sougiannis, 1994).* Various studies proved that R&D expenses enhance a company's growth *(McConnell 1985; Smith and Watts 1992; Ho,* *Tjahjapranata, and Yap 2006),* improve benefits *(Connolly and Hirschey, 1984; Sougiannis, 1994),* productivity *(Aboody and Lev, 1998; Ding and Stolowy, 2007; Sougiannis, 1994),* and stock performance *(Griliches, 1981; Hirschey, 1982).*

If a company wants to have a recognized and capitalized developed intangible asset, it must have substantial research and development expenses accepted by International Accounting Standard (IAS) 38 to create an intangible. Based on the IAS 38 in the development phase, there are six main conditions that should be met if a company wants to capitalize and include an intangible asset inside the balance sheet *(IAS Standard 38 - Intangible Assets, 2001):*

I) Technical feasibility of building intangible assets, so that it will be ready for usage or sales;

II) Intention to build intangible assets for usage or sales;

III) Ability to use or sell intangible assets;

IV) Possibility to generate future economic benefits based on the existence of market demand;

V) Availability of adequate technical, financial and other resources to complete the development of intangible assets;

VI) Ability to precisely measure all expenditures attributable to that intangible asset.

According to the paper of Ding et al. (2004), the capitalization process of R&D expenses is possible in France, but under certain conditions. This study proved that the capitalization of R&D is a risky process, in the sense that they belong to the group of high technology industries, or have higher beta coefficient, which is related to tax of rentability on the market.

Triki-Damak and Halioui (2013) explained that in the French setting, it is up to the management to decide whether to expense or capitalize. If the conditions from the IAS 38 are met, then the capitalization process is certain. The only difference between IFRS/IAS and GAAP is the obligation to capitalize R&D expenses. GAAP does not accept the capitalization of R&D expenses, whereas IFRS/IAS allows it under certain conditions.

Nelson et al. (2003) estimated that management decision whether to capitalize or expense is linked to a company's earning management strategies. When a company has lower operating profitability in a certain year, capitalization process will commence. On the other side, when the year is more profitable, the company will then decide to expense their R&D expenditures.

Based on the French evidence, Cazavan-Jeny et al. (2011) established that, after controlling the industry effect, companies that make decisions to capitalize R&D expenditures spend less on R&D, have much more volatile R&D efforts, are smaller and more leveraged than companies that expense their R&D expenditures. The decision to capitalize R&D expenses influences a company's financial statements, such as balance sheet, income statement, cash flow and all related ratios, not only in the current business year, but also in the future accounting periods. Zhao (2002) established that the value relevance of R&D expenses in France, Germany, USA and UK from 1990 to 1999 confirmed that the reported R&D expenses increased the overall value relevance. The decision to capitalize R&D may increase value for all financial statements *users (Aboody and Lev, 1998; Healy et al., 2002; Lev and Sougiannis, 1996).*

Nixon (1997) argued that proponents of immediate expensing of R&D explain that a capitalization process eliminates the choice to capitalize costs of projects with much lower probability of success. Furthermore, the same author presented three main reasons why some managers are against the capitalization process:

a. it increases chances to manipulate reported numbers;
b. it is a subjective judgment decision;
c. it is consistent with shortening the life-cycle of a product.

Several studies proved that expensing research and development expenses motivate managers to underinvest in R&D to meet their performance goals *(Baber et al., 1991; Bushee, 1998; Cooper and Selto, 1991).* On the other side, the study by Seybert (2010) proved that managers who initiate an R&D project very often over-invest when R&D expenses are capitalized. If an R&D project leads to over-investment, then the decision whether to capitalize and expense will result in a similar decline in earning management.

Based on the literature review of Lentjushenkova et al. (2016), different authors found the following potential outcomes of intellectual capital investments:

- Profit growth, return increase, future cost reduction (Bontis and Fitz-enz, 2002; Lajili and Zéghal, 2009)*;*
- Market share growth *(Sydler et al., 2013);*
- Productivity growth *(Almeida and Carneiro, 2009);*
- Business value increase *(Zabala et al., 2005; Dumay, 2012);*
- Customer and staff loyalty improvement *(Corrado, Hulten, and Sichel, 2009);*
- Improvement in employees' qualifications *(Bontis and Fitz-enz, 2002; Jalava, 2007);*
- Customer satisfaction growth *(Sullivan, 1998).*

2.1.3.7.1 Intellectual Capital Value Transformation (ICTEM) Model

Molodchik et al. (2012) developed the Intellectual Capital Transformation Evaluating Model (ICTEM) that investigates the process of intellectual capital transformation in company performance. The ICTEM also takes into consideration internal and external factors that influence the transformation process. The value-based view must be applied to reveal intellectual capital outcome of intellectual capital investments *(Molodchik et al., 2012)*.

The Figure 22 above presents the framework of the Intellectual Capital Transformation Evaluating Model (ICTEM). The quality and quantity of intellectual capital resources are presented as inputs in the Figure 22 below.

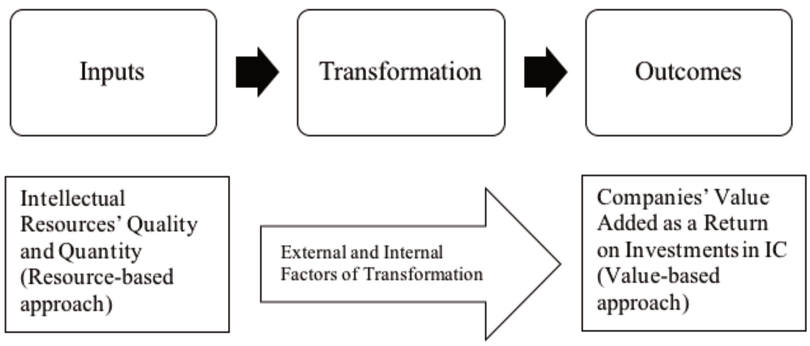

Figure 22: Framework for Intellectual Capital Transformation Evaluating Model (Molodchik et al., 2012)

Figure 22 describes what the intellectual capital transformation process looks like. On one side, we have inputs that are different intellectual capital resource quality and quality (based strictly on the resource-based approach). These inputs will be further transformed based on different external and internal factors of transformation. In the end, outcomes are company's value added as a return on investments in intellectual capital *(Molodchik et al., 2012)*.

The Figure below presents the Intellectual Capital transformation scheme:

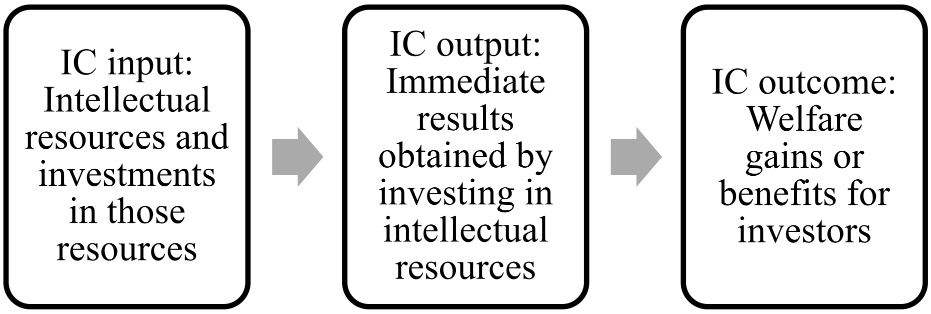

Figure 23: Intellectual Capital Transformation scheme (Molodchik et al., 2012):

The Figure 23 shows that after the input of intellectual capital in the form of different intellectual capital resources and investments in those resources, there are immediate, short-term results obtained from investing in those intellectual capital resources and there is an intellectual capital outcome which stems from intellectual capital investments that will bring welfare gains or benefits for investors. The final outcomes will depend on the quality and quantity of intellectual resources. The inputs transform into companies' benefits which are the result of investments in intellectual capital. The value creation is the key checkpoint for successful investments *(Molodchik et al., 2012).*

Molodchik et al. (2012) presented potential internal and external factors in the intellectual capital transformation process:

Table 10: Table of transformational factors and indicators by Molodchik et al. (2012)

Transformational Factors	**ICTEM Indicators**
Internal Factors	Company age
	Company size
	Global market orientation
External Factors	Industry
	Country
	Developed market
	Sub-indexes of Knowledge Economy
	Location in the state (or region) capital
	Location in a megapolis

Table 10 presents the main external and internal factors that are observed and included in the transformation process and that will result in producing intellectual capital outcomes explained earlier. Internal factors include company's size, company's age and global market orientation. External factors include industry they belong to, country where they are headquartered, level of market development, sub-indexes of knowledge economy, location in the state of capital and location in a megapolis *(Molodchik et al., 2012)*.

Table 11 below is composed of definitions, examples of indicators and ICTEM Input Indicators based on the work of Molodchik et al. (2012):

Table 11: Table of components in ICTEM Model by Molodchik et al. (2012)

Components	**Definition**	**Example of Indicators**	**ICTEM Input Indicators**
Human Capital	What a particular employee brings into the value creation process in a company?	Revenue generated per employee, training spent per employee, value added per employee, new ideas generated by staff.	Share of wages in costs, costs of employees, earnings per employee
Structural Capital	How good are the relations between the people in a company, how well are they related and what remains when all employees go home?	Income per R&D expense, number of patents, individual links to database, number of new products.	R&D investment, intangible assets, patents, licenses, trademarks, ERP systems implementation, stable turnover growth

Relational Capital	A company's relations with its stakeholders.	Growth in sales, revenues per customer, brand loyalty, reputation of a company.	Commercial expenses share, well-known brand, foreign capital employed, participation in business associations

Table 11 presents and explains the meanings of intellectual capital transformation model indicators. There are three main components of intellectual capital observed here as well, and those are: human capital, structural capital and relational capital. Examples of human capital are different revenues generated per employee, training spent per employee and new ideas generated by staff. Examples for structural capital are incomes coming from the R&D expenses, number of patents and number of new products. Examples of relational capital are growth in sales, revenue per customer and reputation of a company. At the end of the Table 3, there are precise indicators for each type of intellectual capital component *(Molodchik et al., 2012)*.

Work of Molodchik et al. (2012) proposed some key points for better understanding of a transformation process:

- Companies' efforts on intellectual capital management are effective in developed markets and in knowledge-based economies.
- Human capital is relevant only in long-term returns.
- Structural capital's factors such as strategy, innovation behaviors, company's network do not play the most important role in the value creation process.
- Relational capital's effects differ depending on a particular asset and business moment. For instance, brand generates profits at the beginning, and a company's web site generates them later.

2.1.4 Relation between Intellectual Capital and Performance

There are many studies that prove a strong positive relationship between intellectual capital and organizational performance *(Bontis, 1998; Bontis et al., 2000; Kamukama et al., 2010; Cabrita and Bontis, 2007; Seggie et al., 2007; Seleim et al., 2004; Sharabati et al., 2010; Wang and Chang, 2005)*. Because of that, there should be causal relationship between intellectual capital and organizational performance *(Marr, 2005)*. Developing such a relationship depends on transferring intellectual capital into innovation. It is possible to successfully manage company performance in that case *(Narvekar and Jain, 2006).*

If an organization wants to achieve its performance, it is not possible without the existence of intellectual capital *(Sydler, Haefliger, and Pruksa, 2014).* Pucci et al. (2015) show that there is a positive link between company performance and intellectual capital. Based on the study published by Bontis et al. (2000), it was proven that intellectual capital is a significant contributor to company performance despite different types of industries.

Intellectual capital plays an important role in the value creation process of a company *(Powell, 2003).* Even though intellectual capital is not found in the balance sheet, it influences company performance without a doubt *(Brooking 1997).*

In the last few decades, the gap between market and book value has radically increased which drew the attention of many authors and researchers who started exploring the invisible value omitted from financial statements *(Lev, 2001; Lev and Radhakrishnan, 2003; Lev and Zarowin, 1999).* Taking into consideration the increasing gap between market and book value, researchers' attention was drawn to exploring how to measure a company's intellectual capital and whether capital market is efficient with intellectual capital *(Tseng and Goo, 2005; Wang, 2008).*
Lev and Radhakrishnan (2003) created a model of sales as a function of a company's organizational capital, net fixed assets, number of employees and R&D capital and developed a firm-specific measure of organizational capital. With a sample of 250 companies, Lev and Radhakrishnan (2003) proved the significant relationship between organizational capital and market values of companies. Results also *(Tseng and Goo, 2005; Wang, 2008)* proved positive relationship between intellectual capital and company's market value. There is an evidence that intellectual capital positively directs a company's price shares *(Rocca et al., 2002; Wu and Wang, 2004).*

Based on the study of Chen et al. (2005) and by using data from Taiwanese listed companies, it can be concluded that intellectual capital is increasingly important and seen as a major drive of corporate value *(Chen, Cheng, and Hwang, 2005a).* Intellectual capital components have positive effects on financial company performance *(Chang, 2013).* The results of the study of Sumedrea (2013) showed that a company's crisis in development can be exceeded by a company's human and structural capitals. Human capital alone cannot positively influence company performance *(Hashim, Osman, and Alhabshi, 2015).* Human capital must be combined with other organizational capitals *(Bontis, Chua Chong Keow, and Richardson, 2000).* Muhammad and Ismail (2009) proved that Human capital and Structural capital separately cannot significantly influence company performance.

Kamaluddin and Rahman (2013) proved that companies must possess all intellectual capital components that are more balanced and have more strength to compete with other companies that possess only one intellectual capital component. Companies with balanced human, structural and relational capital can have better financial and market performance *(Hashim, Osman, and Alhabshi 2015).* Until now, many studies have proven a positive relationship between Human Capital and performance *(Bontis and Fitz-enz, 2002; Guerrero and Sire, 2001; Hermans and Kauranen, 2005; Rodriguez-Castellanos, A. et al., 2011).* Human capital has a positive impact on a company's profitability and productivity, whereas structural capital has a positive effect on return on equity (Komnenic and Pokrajčić 2012). Maditinos et al. (2011) found significant human capital and structural capital efficiency and financial company performance. Diez et al. (2010) tried to examine the influence of human capital and structural capital on the creation of business value of Spanish companies which have 25 or more employees. The study confirmed a positive relationship between the use of human and structural capital and value creation that comes from sales growth. Bollen et al. (2005) found that all intellectual capital components greatly influence intellectual property. Also, intellectual property has a significant direct positive relationship with financial performance.

Lu et al. (2014) found that a company's intellectual capital is positively associated with a company's operating success. Research by Sydler et al. (2014) proved a great positive link between a company's intellectual capital and return on assets over time. The fact that there is a positive link between a company's intellectual capital and financial performance was also proven by the study of Tanideh (2013). Based on Liang and Yao (2005), net income is the most important capability of the market value of Taiwanese information technology companies based on the examined intangible assets, intellectual capital and balanced scorecard. Bassi and Buren (1999) compared intellectual capital investment and financial performance of 500 US companies and found significant positive relationship between them *(Bassi and Buren, 1999).* Niswah (2013) proved a positive link between intellectual capital and financial company performance, as measured by the profitability of a company, return on assets, return on equity and revenue growth.

Firer and Williams (2003) adopted the VAIC method and collected data from 75 South African publicly listed companies in order to prove the relationship between intellectual capital and a company's traditional measures, such as profitability, productivity and market value. After deep and comprehensive study, except finding a slight positive relationship between capital employed efficiency and market value, they did not succeed in finding any relationship between a company's intellectual capital and profitability and productivity *(Firer and Williams, 2003).*

Many previous studies proved a positive relationship between intellectual capital and a company's financial performance by using the VAIC method *(Kamath, 2008; Chen et al., 2005b; Joshi et al., 2013; Chu et al., 2011; Pal and Soriya, 2012; Tan et al., 2007; Pulic, 1998, 2000; Tseng and James, 2005; Yalama and Coskun, 2007; Zéghal and Maaloul, 2010).* Wang (2013) proved a significant positive relationship between intellectual capital VAIC™ method and Tobin's Q ratio of relationship between a company's market and book value.

On the other side, there are studies that proved no relationships between intellectual capital and performance of a company. The study by Mehralian et al. (2012) also failed to find any relationship between a company's intellectual capital and market value.

Muhammad and Ismail (2009) found that there is no significant relationship between human and structural capital, and company performance.

There are studies that proved no link between intellectual capital, VAIC™ and company performance, but the components of VAIC™ showed different results *(Clarke et al., 2011; Chu et al., 2011; Gan, 2008).* Huang and Hsueh (2007) proved that there are different strengths of relationship among intellectual capital components, where structural and relational capital have better performance, whereas human capital has the poorest performance.

2.1.4.1 Intellectual Capital and Total Book Value as Company performance

During the previous several decades, companies have been trying to encode and store their intangible capital, including their knowledge and experience *(Chu et al., 2006).* Many companies around the world agreed that knowledge assets are becoming a more important part of a company's corporate value creation than physical production factors *(Ali et al., 2008).* Lev et al. (2005) think that intellectual capital is an intangible asset and that it must be integrated in a company's balance sheet and must present companies' realistic market value.

Some previous research showed that intellectual capital can have influence on corporate value *(Lee et al., 2005; Ali et al., 2008; Wu and Wang, 2004).* Tanideh (2013) proved that there is no relationship between a company's intellectual capital and corporate value and that there is a significant positive relationship between a company's intellectual capital and financial performance. The same article provided a proof that there is no significant relationship between the innovation capital and corporate value, whereas there is a significant negative direct link between the innovation capital and financial performance. Study by Daryaee et al. (2011) proved a positive relationship between a company's value and intellectual capital.

Based on the work of ICM Group, Inc. (1998) dealing with what companies measure with respect to intellectual capital, the following indicators were found in the section of "Value Extraction":

- Profits;
- Return on Net Assets value;
- **Total Assets;**
- Revenues resulting from new business operations;
- Market Value;
- Patents pending;
- Return on Nets Assets resulting from new business operations.

Edvinsson and Malone (1997) together published the "Universal Intellectual Capital Report" with a major set of intellectual capital measures. The key metrics of financial focus are:

- **Total Assets;**
- Total Assets/Employee;
- Revenues/Total Assets;
- Profits/Total Assets;
- Revenues resulting from new business operations;
- Revenues/Employee;
- Customer time/Employee Attendance;
- Profits/Employee;

- Lost business revenues compared to market average;
- Market Value;
- Return on Net Assets Value;
- Return on Net Asset resulting from new business operations;
- Value added/Employee;
- Value added/IT employees;
- Investments in IT;
- Value added/Customer.

2.1.4.2 Investments in Intellectual Capital and Company performance

Lentjushenkova and Lapina (2014) explored the influence of investments on intellectual capital and company performance. The core of intellectual capital is human capital because it influences other components of intellectual capital and stimulates transformation of intellectual capital. The results of the study were: positive changes in profit and productivity.

One of the most important indicators of success of investments in intellectual capital is return on investment *(Lentjushenkova and Lapina, 2014).* Almeida and Carneiro (2009) explored the link between investments in human capital and productivity. They concluded that the increase in investments in trainings of 10 hours per year per employee increases company productivity by 0.6 %. At the same time, if a company does not invest in human capital, productivity automatically decreases. The increase in productivity after investing in human capital varies between 17 % and 24 %. Joshi et al. (2013) made a conclusion that insufficient management of intellectual capital decreases the success of investments in intellectual capital.

2.2 Knowledge Management

Knowledge management has emerged in the last 20 years as a tendency to create, acquire and communicate knowledge and improve its utilization because of the fact that individuals themselves cannot use full potentials of their knowledge. At the same time, organizations cannot fully utilize the knowledge they possess as well, so knowledge management organizations try to acquire and create useful knowledge that can be maximally used to enhance organizational performance *(King 2009).* Nowadays, companies must be innovative in the highly competitive global market. Considering all challenges that they face, it is of high importance to continuously capture competitive advantage. Hesitant customers, harsh competitors, advanced technology and new business models are all elements that shape their business environment and force companies to rethink their business and operations, including knowledge management *(Nowacki and Bachnik, 2016).*

In the knowledge-based economy, many companies try to apply some of the knowledge management strategies mainly because knowledge is a core intangible resource *(Skrzypek, 2004).* Because of that, companies implement different knowledge management processes that play a very important role in the whole management system *(Bitkowska, 2010; Drucker, 2003).*

2.2.1 Term and Importance of Knowledge

Knowledge is very often defined as justified personal belief *(King, 2009).* The importance of knowledge completely surpasses traditional resources such as labor, land and financial capital. Knowledge can help a company to achieve a competitive advantage *(Nonaka, 2000; Quast, 2012; Wu and Wang, 2006).* Knowledge is interpreted as information with an applied interpretation process *(Davenport and Prusak, 2010; Liebowitz and Wright, 1999; Penrose, 1959).* The biggest attention is paid to different features of knowledge that will be available for managers to implement knowledge in management processes *(Albino et al., 2001; Spender, 1996; Winter, 1987).* Knowledge has become one of the most important strategic resources for all types of companies, from start-ups and small-medium size business, up to multi-national corporations *(Holsapple and Joshi, 2000).*

A review of the literature proved that traditional performance measurements have paid little attention to the importance of knowledge. Financial performance measurements were heavily criticized *(Johnson and Kaplan, 1987; Kaplan, 1983; Thiel and Leeuw, 2002).* In the last years, management science literature has paid attention to the role of knowledge in global competitiveness. It is recognized as a durable and more sustainable strategic resource which is necessary to obtain a competitive advantage *(Barney, 1991; Drucker, 1988; Grant, 1991).* Organizational capabilities are based on knowledge because knowledge is a resource that forms the foundation of a company’s capabilities *(Prahalad and Hamel, 1990).*

A company's final performance is a result of both individual and organizational activities. At the individual level, it includes personal knowledge and individual skills and talents, whereas at the organizational level, there is infrastructure, networking, technologies, routines, systems, trade secrets and organizational culture *(Bontis et al., 1999).*The capacity of a company to create value is based on knowledge and competences of its employees *(Savage and Savage, 1996).* Many companies try to transform themselves into learning organizations that will pursue their objectives of continuous improvement in their knowledge assets *(Senge, 2006).* Knowledge assets are fundamental strategic levers that manage business performance and enable continuous innovations of a company *(Boisot, 1999; Marr and Schiuma, 2001; Mouritsen et al., 2002; Quinn, 1992).*

2.2.2 Different Types of Knowledge

Literature proposes many different typologies of knowledge, such as scientific and practical *(Hayek, 1945),* objective and based on previous experience *(Penrose, 1959),* procedural *(Winter, 1987),* incorporated *(Zuboff, 1988),* migratory and embedded *(Badaracco, 1991),* and codified *(Blacker,1993).*

One of the most used distinction of knowledge is the distinction between tacit and explicit knowledge *(Nonaka, 1991; Nonaka and Takeuchi, 1995; Polanyi and Nye, 2015; Prusak, 1997; Polanyi, 1966).* Polanyi (1958) wrote about personal and tacit types of knowledge, but at that time, he did not talk about knowledge as an object that needs to be managed. After two decades, his theory of knowledge became a central inspiration to Nonaka's theory of knowledge distribution *(Nonaka, 1994).* Edvinsson and Sullivan (1996) proposed different types of knowledge in the Figure below. According to Edvinsson and Sullivan (1996), knowledge can be divided into two types: codified and tacit. Knowledge that is codified can be written down, transferred and shared with others. Codified knowledge is definable and protected by the legal systems and rights.

If it is not protected adequately by the intellectual property law, it is very often copied and imitated. Tacit knowledge or know-how is difficult to transfer, define and describe. It can be rarely codified. This type of knowledge can be only demonstrated through presentations or on-the-job trainings. The Figure 24 below presents the comparison between tacit and codified knowledge *(Edvinsson and Sullivan, 1996)*.

Industrial Knowledge		
	Tacit	**Codified**
Definition	Knowledge which is difficult to articulate & may be embedded in ways of doing things.	Knowledge which is written down in some medium.
Ownership	Ownership resides with the holder of the know-how; difficult to copy and/or transfer	Technology easier to protect using the mechanism of the law; yet also easier to transfer
Examples	Experience Lore Group skills	Blueprints Code Formulae Computer programs

Figure 24: Types of Knowledge (Edvinsson and Sullivan 1996)

The Figure 24 explains the meaning of different types of knowledge. There are two types of knowledge: tacit and codified. Tacit knowledge is difficult to articulate and may be embedded in ways of doing things. On the other side, codified knowledge is knowledge that is written down in some existing document. The ownership of tacit knowledge is difficult to copy or transfer, whereas the ownership of codified knowledge is much easier to copy and it is possible to transfer, protect and use it *(Edvinsson and Sullivan, 1996)*.

Edvinsson and Sullivan (1996) also proposed three dimensions of knowledge. The first dimension is whether knowledge can be visualized or not. The second dimension is the distinction between complexity and simplicity of knowledge. The final dimension is whether knowledge can stand alone or whether it has value only when embedded in some kind of an integrated system.

Some knowledge is possible to convert into repositories through different sets of management and technological procedures, whereas on the other hand, some knowledge forever remains in employees' heads only. Winter (1987) differentiated tacit and explicit knowledge by comparing the following five dimensions in the Table 12 below:

Table 12: Dimensions of knowledge assets (Winter, 1987)

Tacit	Explicit
• Not teachable	• Articulable
• Not articulated	• Teachable
• Not observable in use	• Articulated
• Complex	• Observable in use
• An element of a system	• Simple/independent

Successfully managing tacit knowledge is a very difficult task for a company, but many companies also struggle with explicit knowledge as well. An example is an intranet. An intranet is a phenomenal sharing-knowledge tool, but it often remains unused. This is because it is necessary for a company to develop an adequate organizational structure and stimulation among employees to achieve that point *(Starovic and Marr, 2004)*.

Knowledge can be acquired through different modes. The following modes are developed by Srivastava (2001):

1. **Acquisition**: Knowledge can be acquired by buying, leasing and renting from individuals or organizations;

2. **Dedicated Resource**: Forming R&D units within a company and transferring R&D results;

3. **Fusion**: Developing new synergies by bringing new people with different perspective to work together in the same place;

4. **Adaptation**: Using the existing internal resources in new ways;

5. **Knowledge Networking**: Formal and informal networking.

Most of a company's knowledge is tacit *(Cook and Yanow, 1993)*. It is accumulated through daily working experience, when employees show the ability to develop networks for sharing. The continuous objective of a company is the creation of tacit knowledge that is characterized as analogical quality, whereas explicit knowledge is characterized as digital quality of knowledge *(Bateson, 1973)*.

King (2009) differentiates three levels of knowledge as follows:

1) "know what" knowledge explains what action to take in certain occasions;

2) "know how" knowledge explains how to decide on a certain response to a stimulus;

3) "know why" knowledge is the highest level of knowledge, where there is the deepest understanding of causal relationship with observed stimulus.

Different types of tacit knowledge, particularly know-how and know-who are more difficult to codify and measure because companies cannot store employees' unique potentials and skills in their internal bases *(Lundvall and Johnson, 1994).* The accumulation of tacit knowledge can be done together with information technologies through learning *(OECD 1996).*

2.2.3 Definitions of Knowledge Management

Knowledge management is the process within a company that plans, organizes, motivates and controls people in order to ensure the improvement and effective use of knowledge assets. Knowledge-related assets are all printed documents, such as patents, licenses, manuals, knowledge kept in electronic bases, knowledge related to the best ways to do jobs, knowledge related to team work and knowledge stored in company products, processes and relationships *(King, 2009).*

Knowledge management is a rapidly improving field that is made up of the collision of several others – human resources, organizational development, change management brand and reputation, information technology, valuation and performance measurement *(Bueno, 2002; Bukowitz and Williams, 2000; Pablos, 2003).* Knowledge management produces intellectual capital because intellectual capital is seen as knowledge that is of a value to a company *(Bassi, 1997).* Knowledge management is defined as an art of creating value from intangible assets of a company *(Sveiby, 1997).* Success of a company cannot be imagined without knowledge management. If a company does not implement its own knowledge management system, it may miss all possible opportunities. One of the most important factors in any company's business is knowledge management *(Krogh, 2009).* The main goal of knowledge management is a successful utilization of company knowledge assets to ensure better knowledge practices, improved organizational behaviors, better decisions and an improved company performance

(King, 2009). Knowledge management is focused on intellectual capital and human resource strategies that motivate employees to be innovative and creative *(Van Beveren, 2002)*.

Many studies proved that successful knowledge management has a positive impact on company performance, such as knowledge management and process performance *(Armistead, 1999),* knowledge management and innovativeness *(Carneiro, 2000),* knowledge management and business performance *(Carlucci, Marr, and Schiuma, 2004),* knowledge management and company performance *(Carmeli and Tishler, 2004; Zack, McKeen, and Singh, 2009),* knowledge management and value creation *(Schiuma et al., 2007),* knowledge management and a company's effectiveness *(Zack, McKeen, and Singh, 2009)* and knowledge management and firm performance *(Liao, 2011)*.

Knowledge management is the process of capturing and collecting knowledge of a company and using it to increase innovations through organizational learning *(Krogh and Grand, 2000; Nonaka, 1994, 1991; Nonaka and Reinmoller, 2000; Nonaka and Takeuchi, 1995; Pablos, 2003; Wiig, 1995, 1993; Wiig et al., 2000)*. The biggest challenge of a company is how to codify and transfer explicit and tact knowledge inside a company, among employees and departments *(Lin, 2011)*. Koskinen (2004) maintains that differentiating between explicit and implicit knowledge inside a company is especially relevant and important. This study shows an important role of knowledge management because of a trust between company's employees and members.

Knowledge management has passed through three phases of development until now: (Ordóñez de Pablos, 2003).

- **The first phase** lasted between 1985 and 1990 according to Sveiby (1997). In this phase, researchers and scientists found the inspiration in the works of Wittgenstein and Polanyi. They explored the value created by leveraging the competences and skills of people and knowledge creation more deeply.

- **The second phase** lasted between 1991-1997. This was the period of information technology (IT) and Internet expansion and evolution. This period was characterized by using the existing knowledge. Here, knowledge management and intellectual capital became a field of interest to many researchers around the world.

- **The third phase** has lasted from 1998 until now. The hot topics are organizational knowledge creation and innovation knowledge management. Employees feel that it is important to have a suitable environment where they can be comfortable, creative and able to share their knowledge *(Sveiby, 1997).*

Demarest (1997) stated that knowledge management consists of five processes: construction, embodiment, dissemination, use and management. According to Miller (1999) knowledge management refers to the acquisition and application of knowledge. Armistead (1999) divides knowledge management into three processes: knowledge creation, knowledge transfer and knowledge embedding. Based on the study by Darroch (2005), knowledge management process is composed of three processes: knowledge acquisition, knowledge dissemination and knowledge utilization.
Knowledge of a company is created when tacit knowledge is converted into explicit knowledge. The matrix in the Figure 25 shows four potential types of relations and interrelation processes between tacit and explicit knowledge *(Nonaka, 1994).*

Tacit knowledge To Explicit knowledge

Tacit	Socialization	Externalization
Explicit	International	Combination

Figure 25: Knowledge processes (Nonaka, 1994)

A company should be seen as a human community that is capable of using the existing information in different sufficient and successful ways in a combination with technological systems. Companies should motivate greater proactive involvement and interactions among employees, their imagination and creativity in order to recognize people's tacit knowledge. Furthermore, companies should apply new and advanced technological systems that will establish formal and informal networks of internal and external individuals to share their information, concerns, achievements and interests *(Srivastava, 2001)*. All activities that are linked with knowledge management will identify and explore the existing knowledge assets, acquire knowledge assets and develop new business chances *(Jarrar, 2002)*. Probst et al. (2002) proposed the following main knowledge management processes:

1) Localizing;
2) Acquiring;
3) Developing (Creating);
4) Sharing;
5) Disseminating;
6) Leveraging;
7) Storing

The following knowledge management processes emphasize the interrelation between internal and external processes within a company which means that every employee knows what kind of knowledge lies in which part of the company and that every employee must be involved in knowledge management processes *(Probst et al., 2002)*. Knowledge management processes are important for one company because they leverage workforce to collaborate on new information, share data and process them according to the organizational needs. Smart knowledge management process may recognize the upcoming trends, gain new skills and partners, reduce risks and streamline company's operations. Taking into consideration these benefits, companies will make a decision to experiment with new approaches of knowledge management *(Beckman and Barry, 2007; Brown and Katz, 2009; Martin, 2009)*. The success of knowledge of a company depends on the following three factors: changes that enable a company to internalize knowledge, relationships between employees and organization-driven development *(Skyrme and Arnindon, 1997)*.

Nonaka (1994) explained what the knowledge management processes cycle looks like in the Figure 26 below:

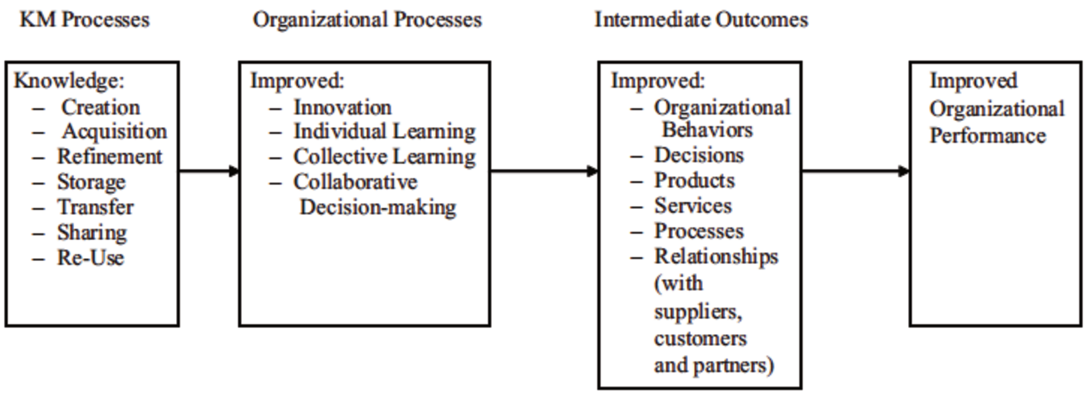

Figure 26: Knowledge management in Organization (Nonaka, 1994)

The Figure 26 explains what the whole knowledge management process looks like. It starts with the key knowledge management process with knowledge at its core. The key characteristics of knowledge are creation, acquisition, refinement, storage, transfer, sharing and re-use. Knowledge phase is followed by organizational processes that should be improved with innovation, individual learning, collective learning and collaborative decision-making process. The third phase represents intermediate outcomes that should come from organizational behaviors, different decisions, products, services, processes and relationships. In the end, the whole knowledge management must result in an improved company performance *(Nonaka, 1994)*.

In order to have a company that is successful as much as it is possible and that is oriented towards knowledge management and creation, it is necessary to establish one of the two defined knowledge management strategies – "codification" or "personalization" *(Hansen et al., 1999)*. Codification strategy is implemented in the form of electronic documents that store and codify knowledge for re-usage. Personalization strategy is focused on developing different networks in order to enhance sharing and transferring people's knowledge *(Hansen et al., 1999)*.

Earl (2001) described two knowledge management strategies in a more detailed way based on their reliance on the codification or personalization approach:

Codification Sub-Strategies – Earl's codification sub-strategies are:

1) Systems;
2) Process;
3) Commercial;
4) Strategic;

Personalization Sub-Strategies – Earl's personalization sub-strategies are:

1) Cartographic;
2) Organizational;
3) Social.

2.2.4 Knowledge Management Systems

Taking into consideration the importance of knowledge in a company, many companies make decision to implement knowledge management systems (KMS) in order to improve their company's knowledge management activities. Knowledge management systems are powerful tools of a competitive advantage. Knowledge management systems are different from the traditional enterprise information systems mainly because the implementation of these systems is highly risky, highly technologically innovative and very often unstructured *(Y.-M. Wang and Wang, 2016)*.

Knowledge management systems (KMS) represent software or applications of company's computer-based communications and information systems to support different knowledge management processes *(King, 2009)*. Knowledge management systems are information systems that are focused on capturing organizational knowledge and making it available to employees *(Damodaran and Olphert, 2000)*. Because the early stages entail capturing knowledge and making it available through advanced technology *(Pfaff and Hasan, 2006),* many companies made great efforts and investments in their knowledge management systems *(Li, Liu, and Liu 2016)*. However, practical implementation of a knowledge management system is not an easy task and requires a lot of effort *(Akhvan et al., 2005; Damodaran and Olphert, 2000)*. The failure to successfully implement a knowledge management system is between 50% and 70% *(Akhvan et al., 2005)*.

In order to improve a company's effectiveness and efficiency, many companies make a decision to implement knowledge management systems in their organization. These systems are specially designed to support and facilitate company's processes of knowledge creation, storage, retrieval, transfer and application *(Alavi and Leidner, 1999).* Lin (2013) confirmed that there are no precise requirements regarding knowledge management system inputs, outputs and processes, compared with traditional enterprise systems. Implementing a knowledge management system is not only a technological issue, but also a question of organizational culture, structure, process and human factors *(Bertoni et al. 2008; Quaddus and Xu, 2005).* The implementation process of a knowledge management system is technologically innovative and highly risky *(Eisenhauer, 2018; Mankin, 2015; Soualhia et al., 2014).* Companies invest a lot of resources in the implementation of a knowledge management system *(Azhdari et al., 2012).* The main characteristics of a knowledge management system is motivation to understand and identify factors that influence a company's implementation of a knowledge management system *(Alavi and Leidner, 2001; Chua, 2004; Kuo and Lee, 2011; Leech and Sutton, 2002; Lin, 2013; Mankin, 2015).*

A knowledge management system (KMS) is an information system that is developed to manage the process of creating, storing, retrieving, transferring and applying a company's knowledge *(Alavi and Leidner, 2001).*

The purpose of a knowledge management system is to leverage company's knowledge management behavior. Until now, there have been three features of knowledge management systems *(Alavi and Leidner, 1999; Bernard, 2006):*

1) **Knowledge repositories** – The most common knowledge management system is the knowledge repositories (Davenport and Völpel, 2001). Knowledge repositories enable memorization of knowledge within a company and provide functions for capturing, generating, organizing, searching, retrieving and using information and knowledge *(Holsapple, 2004; Wasko, 1999).* They offer databases that store the best practices, experience and other knowledge. Employees use knowledge repositories to be more effective and productive in their work *(Wang and Wang, 2016).*

2) **Knowledge maps** – The second type of knowledge management system is knowledge maps. Knowledge maps are highly sophisticated directories that offer indexes or catalogues of specific knowledge that different individual employees can search for

(Gray, 2000). Knowledge maps offer the possibility to find and contact individuals who possess specific specialized knowledge or experience inside a company *(Alavi and Leidner, 1999)*. The type of knowledge that is not possible to store is tacit knowledge, so most of the knowledge within a company remains uncodified. Mapping employees' knowledge is a useful way to manage knowledge *(Alavi and Leidner, 2001; Malhotra, 2003);*

3) **Collaborative tools** – The third feature of a knowledge management system is a set of collaborative tools. These tools are groupware, email, chat, electronic forums and conferencing, and they provide communication and communication services *(Bernard, 2006; Chua, 2004)*. The collaborative tools allow exchange of knowledge between individuals who are searching for knowledge (knowledge seekers) and knowledge providers *(Wang and Wang, 2016)*.

Knowledge maps and collaborative tools are network-oriented knowledge management approaches characterized by interaction, linkage and dialogue between employees inside a company *(Desouza, 2003)*. Knowledge maps identify the location of knowledge in a company, whereas collaborative tools allow employees to communicate and interact with each other, based on the knowledge they possess *(Kankanhalli, Bernard, and Kwok-Kee, 2005)*.

2.2.5 Relation between Intellectual Capital and Knowledge Management

Petty and Guthrie (2000) investigated the ways in which the information about intellectual capital supports and helps managers in the process of knowledge management application and implementation. Information about intellectual capital is closely related to the process of application, management, development and sharing of a company's knowledge *(Drucker, 1993)*. Intellectual Capital Management (ICM) and Knowledge management (KM) are multidimensions and cover most of the fields in company's operations *(Wiig 1997a)*. The ICM and KM role is to keep and sustain the present and future body of knowledge in order to secure long-term viability and profitability of a company *(Wiig,, 1997a)*.

The relationship between knowledge management and intellectual capital is highly important because intellectual capital statements report on activities that management supports in the name of knowledge management. Also, the term 'intellectual capital' cannot be seen as an accounting term, but it rather refers to ‘capital’ *(Bukh et al., 2001).* Some other authors try to link intellectual capital to knowledge and knowing capabilities of social collectivity, such as organization, intellectual community or professional practice *(Nahapiet and Ghoshal, 1998).* Boudreau and Ramstad (1997) associated intellectual capital with human resource management, while Davenport and Prusak (2010) linked intellectual capital to information technology. Intellectual capital is an invisible asset of a company and it is a value for the company *(Hashim, Osman, and Alhabshi, 2015).* Based on this definition, it can be concluded that management of knowledge generates or produces intellectual capital *(Hashim, Osman, and Alhabshi, 2015).* Knowledge management is a process inside a company, whereas intellectual capital covers all company’s operations *(Starovic and Marr, 2004).*

There is a significant overlap between intellectual capital management and knowledge management, but at the same time there are major differences. Intellectual capital management is focused on managing intellectual capital and its resources from strategic and enterprise perspectives. The main goal is to take care of company’s intellectual capital. On the other side, knowledge management has tactical and operational perspectives, it is more detailed and focused on managing knowledge-related activities such as creation, capture, transformation and use. The main function of knowledge management is to plan, implement, operate and monitor all the knowledge-related activities for successful intellectual capital management. It is very important for knowledge management and intellectual capital to complement each other and be closely related, but not to produce potential conflicts. Knowledge management and intellectual capital allow a company to act intelligently and enable sustained competitiveness, success and profitability *(Wiig, 1997a).*

Integration process between intellectual capital and knowledge management is presented in the Figure 27 below:

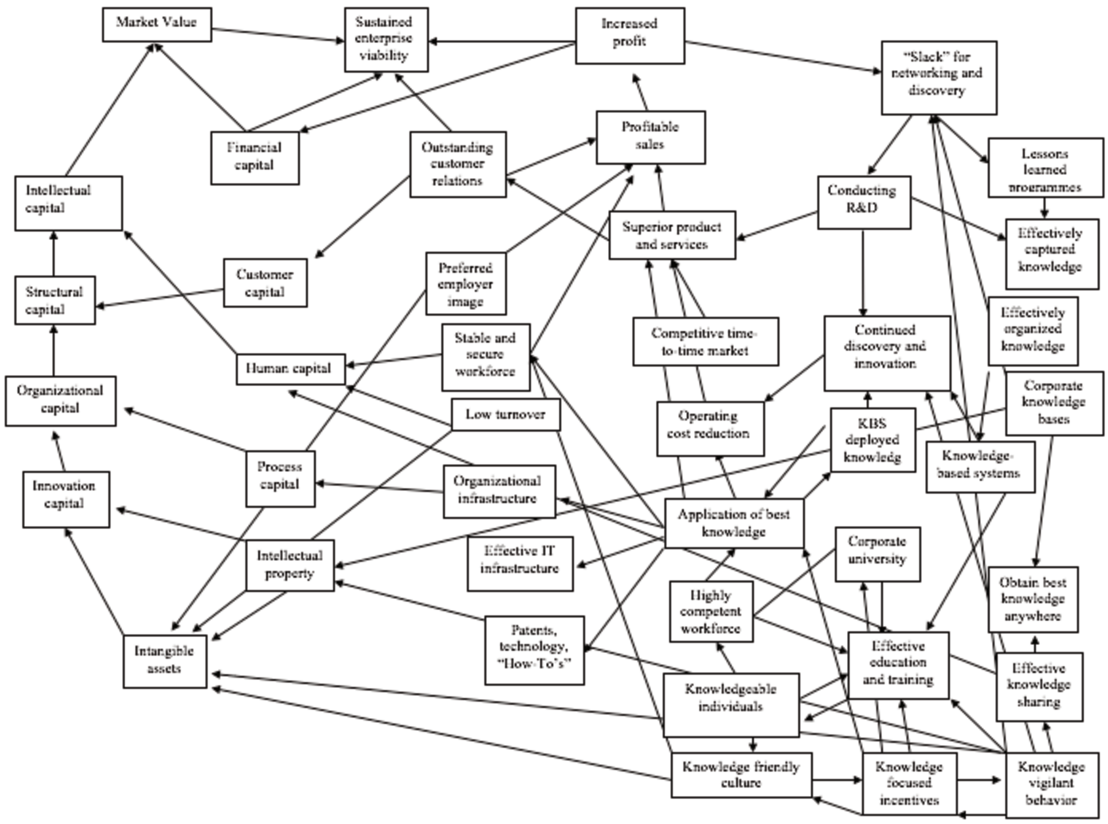

Figure 27: Intellectual capital management and knowledge management: selected characteristics (Wiig,, 1997a)

Intellectual capital management indicators are presented on the left whereas Knowledge management is on the right in the Figure 27. There is overlapping in the middle. The Figure 27 shows that intellectual capital and knowledge management must be integrated in such a way as to identify and explain the links that will describe causal relationships and driving forces. Intellectual capital and knowledge management must be seen as dynamic processes with harmonized objectives and perspectives *(Wiig, 1997a)*.

The main role of knowledge management is to create and develop sustainable competitive advantage by integrating knowledge from a company's premium knowledge base. This allows for customers' needs to be fulfilled by reaching higher loyalty, brand awareness and higher profits and market value *(Sullivan, 1998).* Intellectual capital can be used for benchmarking a company's knowledge base in order to produce greater revenues and market value (see *Figure 28* below) *(Srivastava, 2001):*

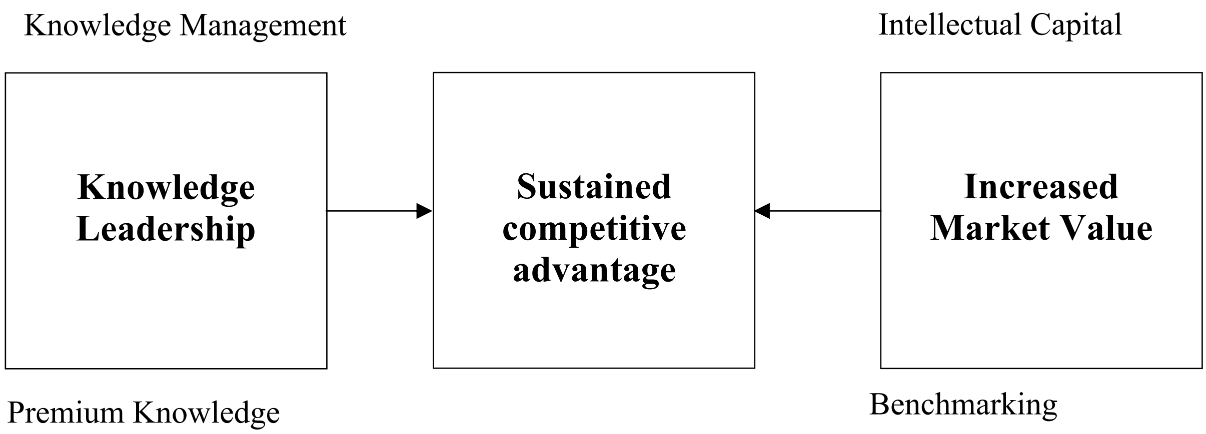

Figure 28: Relating Knowledge Management and Intellectual Capital (Stainfield, 1998)

The relationship between knowledge management and intellectual capital can be described as knowledge management which manages intellectual capital controlled by a company. Knowledge management as a function describes and explains the act of managing an object, which is intellectual capital *(Petty and Guthrie, 1999, 2000).*

2.3 Performance Measurement Systems (PMS)

First of all, literature defines performance as ability of a company to obtain results based on limited resources for reaching specific and pre-planned objectives *(Laitinen, 2002; Lebas and Euske, 2004).* In addition, performance is an output or actual work produced by a company and it refers to measuring an already obtained achievement *(Harbour, 2009; Phillips, Davies, and Moutinho, 1999).* Measurement as a term is used to quantify and control specific activities and events *(Morgan, 2004).* What is more, Bourne et al. (2003) define measurement as metrics used to quantify the success of a business action and its effectiveness and efficiency *(Bourne et al., 2003).*

The literature of performance measurement systems has so far been improved by using different methods, measurements and perspectives. Traditional accounting methods for measuring performance were the starting point. This approach was based on the historical cost and data *(Neely, 1999).* After traditional financial measurement, it was necessary to include non-financial – qualitative measures of performance. There was a need for balanced approaches that will include both financial and non-financial, quantitative and qualitative measurements of performance in one unique system *(Ghalayini and Noble, 1996; Olve, Roy, and Wetter, 2000; Burgess, Ong, and Shaw, 2007).*

Neely et al. (1995) define performance measurement as a process of quantifying the effectiveness and efficiency of a business action in a company. Performance measurement system is seen as one of the most important topics in the business management area because it includes fields of accounting, operations management, marketing, business strategy and organizational customer behavior *(Neely, 1999; Marr and Schiuma, 2003).* Performance measurement system with its tools allows managers in a company to balance between short-term performance, long-term performance, growth of a company versus control, and opportunities versus threats *(Simons, Dávila, and Kaplan, 2000).* Tayles et al. (2007) stated that one of the management accounting systems such as a performance management system must be innovative in capturing the contributions and real value of intellectual capital. Performance measurement system, as one of the most important control management systems enables maximum usage of company's strategic assets *(Simons et al., 2000).*

Franco-Santos et al. (2007) classified definitions of a performance measurement system in three groups based on different perspectives and characteristics:

1) Operations perspective that refers to the performance measurement system which is used as a set of metrics to quantify efficiency and effectiveness *(Neely, Gregory, and Platts, 1995);*

2) Strategic perspective that refers to the performance measurement system as a tool to achieve a company's strategy and goals *(Ittner, Larcker, and Randall, 2003);*

3) Accounting perspective that sees the performance measurement system as a tool for planning and budgeting performance *(Otley, 1999).*

The information about company's strategic assets is available through the performance measurement system. Also, this implies that intellectual capital can influence company performance indirectly through the use of an adequate performance measurement system *(Kaplan and Norton, 1996).*

Kaplan and Norton (2001) think that effects and impact of company's knowledge assets on performance are not direct and immediate. Because of that, the link between intellectual capital and performance is worth following through the performance measurement system.

Performance measurement can be divided into three main steps *(Neely et al., 2000):*

1) **Designing** - Designing phase refers to choosing what to measure and defining measurement indicators *(Taticchi, Tonelli, and Cagnazzo, 2010)*;

2) **Implementing** – The second phase - implementing phase - refers to implementing the selected measurement indicators into practice by educating employees or developing new information systems *(Neely et al., 2000);*

3) **Using performance measures** - The last phase is using performance measures because the purpose of the whole process is to produce the final result *(Liebowitz and Suen, 2000).*

Phillips et al. (1999) claimed that identifying ways to measure business performance is not an easy task because of two reasons; first, determination of performance, competitiveness, effectiveness and other related concepts; second, difficulties in finding metrics for measurement. Until now, no agreement has been reached as to which measurement is best to use. Srimai et al. (2011) summarized key dimensions within performance measurement systems in 1980s: efficiency, effectiveness, customer, financial internal processes, growth, learning perspective, internal and external structures, stakeholders, process, people, future, etc.

The literature review of Zeglat et al. (2012) regarding performance measurement systems has introduced several well-known balanced systems such as Balanced Scorecard *(Kaplan and Norton, 1992),* the performance pyramid system *(Cross and Lynch, 1988),* the Skandia Navigator *(Edvinsson, 1997),* the Performance Prism System *(Neely, Adams, and Crowe 2001),* the integrated dynamic performance measurement framework *(Ghalayini, Noble, and Crowe, 1997),* the hybrid measurement system *(Laitinen, 2002),* the knowledge-based measurement method *(Sveiby, 1997),* the Cambridge performance measurement process – the performance measure record sheet *(Neely et al., 1997)* and the transforming performance measurement *(Spitzer, 2007).* The study by Roberts et al. (2017) identified potential problems in implementing performance measurement systems that include both financial and non-financial measures, particularly implementing Balanced Scorecard. The implementation attempts showed limited short-term success and a need to be replaced with completely financial systems. According to Cauvin (2004), companies' performance measurement systems are too much concentrated on the financial and historical indicators that they have become less and less relevant in the current knowledge-based economies.

2.4 Summary

This chapter discusses the meaning of intellectual capital in terms of different definitions, classifications, existing measurement methods, investments indicators, relations with knowledge management systems and performance measurement systems. It has been concluded that there is not a unique definition of intellectual capital and investment in intellectual capital which can explain the term more elaborately. However, definitions by different authors reveal that intellectual capital has intangibility components and forms and that it is a source of value creation, and that it can enhance value creation when combined with other organizational resources. The analysis of classification of intellectual capital and investments in intellectual capital done by many different authors shows that intellectual capital is composed of three main categories of assets, namely: human capital, organizational or structural capital, and relational or customer capital. Human capital consists of all employees' skills, education, experience, attitudes, and efficiency that is seen as rented capital of an organization. Organizational or structural capital provides supportive organizational systems, processes, procedures, research and development activities, software. Relational or customer capital maintains organizational relationship with all company's stakeholders. The three explained categories of intellectual capital are interrelated and human capital transforms into structural capital and relational capital during the value creation process.

Until now, no unique and well-defined intellectual capital measurement model has been found. Sveiby (2010) classifies available intellectual capital measurement models into four main approaches: market capitalization approach, direct intellectual capital approach, return on assets approach and scorecard approach.

The use of advanced information technology and information in business management results in the rise of knowledge economy. Knowledge intensive companies have gained competitive advantage in knowledge economy. Intellectual capital is seen as the main value driver and an important factor for improving not only corporate financial performance, but also a company's market value *(Brennan and Connell, 2000; Petty and Guthrie, 2000; Bozbura, 2004).* So far, various researchers have added intellectual capital as a production factor, together with land, labor and financial capital *(Goh, 2005; Lev and Daum, 2004; Petty and Guthrie, 2000).*

A modest attempt has been made in this study to examine whether intellectual capital performance is related to financial company performance. Company performance is not only influenced by intellectual capital investments performances, but also by some factors at both organizational and industrial level.

CHAPTER III

RESEARCH METHODOLOGY

SUMMARY:

CHAPTER III – RESEARCH METHODOLOGY

This chapter analyses the research methodology used in the PhD dissertation. The existing research has emphasized the increasing importance of investments in intellectual capital and measurement of effects and performance of those investments. However, the literature in the area is rather fragmented and still developing. The existing literature and research discuss the selection of different measurement methods of intellectual capital and its performance; however, so far, little research has focused on investigating the performance of investing in intellectual capital components by examining how investments in intellectual capital components (human capital, organizational capital and relational capital) affect a company's final performance. Investigating these issues in the thesis is central in making the final contribution to the literature.

3.1 Conceptual Development

The management of intellectual capital and its investments is done by French companies in order to achieve higher performance. In other words, we examine the amount of value or assets value recognized and developed by an individual French company. It must be mentioned that the amount of transformation and capitalization of value differs between industries. The higher value transformed within the total book value of a company, the greater impact and performance will be achieved.

Current business and global environment cannot be easily predicted as was the case before due to the complexity of business relations and challenges that appear now and that will appear in the future. Many companies believe that entering knowledge economy is one of the safest and best business strategies to make sure that a company will survive and secure certain existence in the very competitive and turbulent global market. Companies have recently focused on knowledge and intellectual capital by managing and leveraging their potentials in order to improve their long term and immediate business performance.

Intellectual capital is the central subject of discussion in this study. At the moment, knowledge, advanced information technology, the Internet are becoming primary production factors that gain a superior competitive advantage. In the last few centuries, the revolution has been found to have taken place in the global corporate world. The view has been changed from tangible and physical assets to a new economy called 'knowledge economy', where production and performance depend on invisible, intangible and non-physical assets. In this new global economy, the role of knowledge is highly important for gaining a competitive advantage. It is recognized as a sustainable strategic asset to acquire and help maintain better performance *(Barney, 1991; Drucker, 1988; Grant, 1991).*

According to Lev (2001), the importance of intangible resources as the main gained success can be explained as a unique combination of two related economic forces. The first is seen as a business competition due to the globalization of trade and deregulation of key economic sectors such as telecommunication, electricity, transportation and financial services. The second is the advent of information technology, supported by the internet. That's why successful companies pay more attention to the recognition of knowledge assets/intangible assets/intellectual assets in knowledge economy for the purpose of surviving and developing. Many companies can be seen as knowledge intensive or high-technological companies, such as information technology, consulting, law, pharmaceutical, banking and finance and other companies whose functionality relies on intellectual assets. All organizations, more or less, require intellectual capital in the organizational structure. Greater reliance on intellectual capital will be important to maximize the value of performance and to improve market position.

Most of the companies are required to prepare and record their financial statements in a fair manner regarding their financial position at a certain moment and financial performance during a particular period. The goal of financial statements is to provide necessary financial information to the users of this information in their financial decision processes. Compared to management accounting which is concentrated on both internal and external purposes, the primary purpose of financial accounting is to satisfy the necessity of external users, such as debt holders, suppliers, customers, shareholders, etc. Two essential and most important statements in the set of financial statements are balance sheet and income statement. Income statement shows revenues and expenses of a company for the specific period of time. This period mostly covers 6 months or 1 year. It shows the financial performance during that period, and whether it is an accounting gain or loss. On the other side, balance sheet is the statement of the financial position of a company on a particular day. It shows the image of a company's assets, liabilities and equity. Balance sheet and income statement are closely related and linked. If there is a financial profit at the end of a business year, it will be automatically recorded in the company's equity, and an accounting loss has the opposite effect. Business expenditure can be divided into revenue expenditures or capital expenditures. Revenue expenditures are always recorded only as expenses in the income statement because they incur and produce benefits in one single period only. In contrast, capital expenditures produce benefits in multiple periods and must be therefore recorded in the balance sheet. The method used to recognize capital expenditures is called capitalization.

Based on the IAS 16 Property, Plant and Equipment (PPE), there are two main criteria for recognition and capitalization of tangible assets within the balance sheet. The focus here is only on the tangible assets:

1. Future economic benefits will probably be associated with the item used;
2. Historical costs will probably be measured reliably.

On the other side, based on the IAS 38 in the development phase, there are six main conditions that should be met if a company wants to capitalize and include an intangible asset inside the balance sheet *(IAS Standard 38 - Intangible Assets, 2001):*

I) Technical feasibility of completing intangible assets, so that they will be ready for use or sale;

II) Intention to complete intangible assets for use or sale;

III) Ability to use or sell intangible assets;

IV) Possibility to generate future economic benefits based on the existence of market demand;

V) Availability of adequate technical, financial and other resources to complete the development of intangible assets;

VI) Ability for precise measurement of all expenditures attributable to that intangible asset.

As explained, a company is simultaneously composed of both tangible and intangible assets. According to Wu and Wang (2006) company's intangible assets play a more important role than tangible assets in creating competitive advantage. The reasoning behind that is that tangible assets can be bought, imitated and accessed easily in factor markets by all participants. Barney (1991) stated that tangible assets fail to meet the criteria in his VRIN model to be critical factors of competitive advantage. According to the same model, knowledge is considered to be the most important company's resource taking into consideration that it fulfills all the criteria. Despite the fact that the knowledge of company's employees is considered to be the key contributor to superior performance that will further produce economic benefits, personnel expenditures are expensed directly in the income statement. Employees cannot be owned by a company. When employees leave a company, they bring with them the knowledge they have obtained. But in order to eliminate that fact, most companies make a decision to capitalize the value. Costs related to employees' trainings are of company's future value and could be capitalized and regarded as an investment in an alternative accounting system.

The intellectual-based view of the firm, which is the focus of this thesis, represents one specific aspect of the more general resource-based view, which more narrowly considers three resources (human capital, organizational capital and relational capital) that have been theoretically connected to a company's competitive advantage (Reed, Lubatkin, and Srinivasan 2006).

Intellectual capital is a vital and crucial component of each company necessary for maintaining a competitive advantage as a valuable resource for value and wealth creation. The importance of intellectual capital is in measuring, utilizing and recognizing the potential benefits that can stem from intellectual capital in the future years. The possibility not to imitate these competencies and capabilities allow a company to be strategically more important. Furthermore, intellectual capital enables a company to survive on a competitive market (Stewart, 1998). Brennan and Connell (2000) claim that intellectual capital management plays an important role in realizing planned goals of a company in advance.

My thesis is a piece of work in the field of intellectual capital and investments in intellectual capital. It examines and measures the amount of investments in intellectual capital and final outcomes or values coming from the recognition of assets within a company. The study measures the success, efficiency and sufficiency of investments in intellectual capital for total book value as the final performance, in French companies only.

The third chapter that is related to Research Methodology of the thesis is organized in the following way. The research methodology part is represented as a flow that will allow every independent reader to clearly understand and utilize the topic. After a short introductory part where the key points of methodological part are presented, the background of research problem follows. It describes the research problem that needs to be examined, why this is important and relevant today not only for researchers, but also for professionalisms and managers.

After exploring the main research problem which most practitioners are faced with, the theoretical gap is identified, explained and presented. The theoretical gap is important because it proves that this study can contribute to management sciences.

The theoretical gap is followed by research objectives of the whole research that are further conceptualized in the form of research hypotheses.

After deep understanding of our problem, the study presents research methodology, or more precisely put, the research tools that are used in the whole quantitative research work. The research methodology answers the following question: “How has the work been done?”.

Defined research methodology enables us to conceptualize our research design in the form of conceptual framework. Conceptual framework is important because it illustrates what the whole research work process looks like, starting from the inputs and transformation process, up to final outcomes.

After conceptualizing my work, justification of variables is done. It is of high importance to justify and prove every used variable with existing and well-known articles since this is necessary for the research study to be credible.

The research problem and theoretical gap result in the main research question that further results in presenting a sub-research question. The research questions definitely further guide the whole thesis in the planned way.

The research process plan is the crucial part of this chapter because it explains how to resolve the observed problem. How is it possible to implement this research project in every other project, not only theoretically, but also professionally and practically.

Three main research theories used in this study are explained based on the research objectives and research hypotheses. Research theories are of high importance because they show a reader the approach to the whole problem. Research theories do not change theoretical basis. They just observe the selected phenomena and provide constant observations.

Finally, the research models coupled with the Intellectual Capital Value Transformation model are presented. The Intellectual Capital Value Transformation model is the main model used in my work.

3.2 Background of Research Problem

In the present global economy of knowledge, the dominant resources are found in advanced technology, information, innovations. Different academics, researchers and practitioners paid significant attention to the role of intellectual capital as the lever of maintaining competitive advantage and a sustainable company performance in the knowledge-based world. In practice, wealth is not gained through physical assets any more. Wealth is gained through intangible assets where intellectual capital is closely associated with intangible resources. Intellectual capital is linked to the main sources of not only individual, but also organizational as well as national competitiveness in the current knowledge-based global environment *(Wiig 1997b)*. Most of the companies today rely on their financial performance and results based on intangible assets and intellectual capital and this dependence will be more important in the upcoming years. Chartered Accountants' survey concluded that intellectual assets are highly important for a company's success *(Ghosh and Wu, 2007)*. However, benefits gained from intangible assets and intellectual capital are very hard to identify and measure, and this is where the biggest challenge and skills lie. It has been concluded that traditional measuring tools are not suitable enough in the current global economy where the intellectual capital creates value *(Edvinsson and Malone, 1997)*.

Even though companies have moved from industrial age to information age, they are still not able to identify measurements of intellectual capital in their organizations. In order to measure intellectual capital, it is necessary to identify, measure and value intellectual capital and it should also be connected to a company's strategy and goals. In the knowledge economy, companies still follow traditional accounting model which is invested in the industrial age economy. Current accounting framework systems and accounting standards follow and cover physical and financial assets of an organization However, they greatly ignore intangible assets.

Growing awareness and importance of intangible assets stems directly from the increasing difference between market and book value of companies *(Lev, 2001).*

Knowledge management is a system that integrates people, technology and processes in one place to achieve higher results by improving performance through learning *(Gorelick and Tantawy-Monsou, 2005).* Knowledge management helps in the process of planning, organizing, motivating and controlling people within organizational processes and systems in a company in order to enable the improvement and use of its own knowledge-related assets *(Rajesh, Pugazhendhi, and Ganesh, 2011).* The architecture of knowledge management is composed of four main elements, and those are: knowledge components, knowledge management process, information technology and organizational aspects. Knowledge as a component in a company includes knowledge definition and knowledge categories while knowledge management process consists of the steps and activities necessary to deal with knowledge in the end. Information technology consists of information technology-related support infrastructure such as communication lines, networks, databases etc. Finally, organizational aspects are composed of organizational culture, organizational structure and human resource management. These four elements are the main components of one knowledge management concept *(Supyuenyong and Islam, 2006).*

Relationship between knowledge management and intellectual capital exists without a doubt. Intellectual capital is treated as an intelligent asset in the knowledge-oriented economy and it is used to maximize the creation of value process within companies *(Peng, 2011).* Bontis (2004) thinks that intellectual capital represents the stock of knowledge at a certain moment that has been accumulated through knowledge inflow activities within the knowledge management process *(Shih, Chang, and Lin, 2010).* Seleim and Khalil (2011) believe that intellectual capital and knowledge management are very closely related. Galabova and Ahonen (2011) think that when knowledge is converted into value, it becomes an intellectual capital of an organization. The creation of intellectual capital is only possible with constant interaction between human capital, structural capital and relational capital.

Firer and Stainbank (2003) emphasized the importance of non-traditional and non-financial measurements in the current global economy. The use of traditional performance measurements is unsuitable and may lead investors and stakeholders to make bad decisions when investing large amount of financial resources. These inappropriate decisions may lead the whole company to failure.

Various research studies illustrate that intellectual capital such as knowledge, information, information technology are primary resources in the knowledge economy. According to the OECD (2006), many more companies nowadays invest in research and development, customer relations, employee training, computer and administrative systems etc. These investments grow each year as oppose to physical and financial investments.

Employees understand the demanded knowledge they must have and the knowledge and level of competence they must possess at the moment. Employees actively participate in the process of learning, applying, seeking and exploring. Furthermore, knowledge sharing is actively encouraged between employees, teams and departments within an organization.

The present study is a modern attempt to determine investments in intellectual capital seen as incomes, on one side, and final performance and value-creation seen as outcomes, on the other side. Investments in intellectual capital must be followed for more than one year, mainly because it is not possible to expect long-term benefits and assets recognition in such a short period of time. Investments in intellectual capital are seen and observed as expenses, collected in the official profit and loss accounts of companies. After the collection, it is necessary to determine a period of time that will be followed for each particular industry. This is important because the period of capitalization is not the same for IT, automotive or manufacturing industries. This period of useful life of assets is defined by the study produced by *(Galabova and Ahonen, 2011).* There is a significant difference in empirical results based on different industries. The potential influence on corporate values differs from industry to industry. For instance, the positive link exists mostly in high technology companies, financial institutions *(Ting and Lean, 2009),* pharmaceutical companies (Mehralian, Rajabzadeh, et al. 2012), hotels, when compared to other traditional companies. Because of that, Riahi-Belkaoui (2003) mentioned that intellectual capital has all characteristics of a strategic asset, such as being valuable, rare, imperfectly imitable and difficult to substitute. Of course, the final characteristics are related to generating a sustainable competitive advantage.

After precisely defining the period of following, the next step is to recognize capitalization of assets inside the balance sheet by absolutely respecting international accounting standards. The final stage is definitely a value-creation process and improvement in the assets within a balance sheet.

The present study is a modern attempt to examine whether there is any relation between intellectual capital and total asset value as a final performance in French companies from different industries. Intellectual capital performance is measured with an appropriate methodology. Company performance is measured in two ways; one relates to the collecting and following investments in intellectual capital, and the other relates to the collection of total book value. The research study proposes functional relationship between multiple variables.

3.3 Theoretical Gap

The main objective of each company is to maximize the value. A company's value can be market value, profits, share price, book value, etc. Different companies, such as public and private ones, process valuations in different ways. Furthermore, companies' value depends generally on their own goals of valuation. Traditional valuation methods include liquidation, accounting valuations, discounted cash flows and claim valuations. All of them obtain their calculations from financial statements, balance sheet, income statement and cash flow statement. They are based on the historic performance and it is important to take into consideration the fact that the value is not a part of the financial statement. These methods mostly use tangible assets when calculating, whereas there is a greater focus on intellectual capital and employees in the knowledge-based economies. That is why mentioned and current valuation methods are suitable in business environment *(Berzkalne and Zelgalve, 2014)*.

The easiest way to explain the intellectual capital is to use an example from practice. Imagine that you speak one foreign language on an advanced level, without difficulties. Undoubtedly, you possess all language skills. Nevertheless, you do not possess an internationally recognized language certificate. The situation is the same when we speak about intellectual capital. It undoubtedly exists in the company, but we do not have tools to prove it yet.

Current business environment requires investments not only in tangible resources, such as supply chain, information systems, distribution, etc., but also in intangible resources such as product development, research & development, brand awareness, trainings *(Day, 1994; Vorhies, Harker, and Rao, 1999)*. This way of approaching the market fluctuations and trends resulted in reducing the effectiveness of performance measurement systems (PMS) and it does not identify the relationship between market-oriented resources and companies performance in a proper way *(Rust et al., 2004; Sheth et al., 2002)*. The major source for generating profits and creating value has changed dramatically in the last fifty years, because the focus moved from tangible to intangible assets. These changes were accompanied with the current accounting systems that did not change dramatically and almost remained the same, which led to ineffectiveness in representing the final performance in a true and realistic way *(Busacca, 2007; Cordazzo, 2009).*

Many studies proved that there is a positive or negative link between intellectual capital and financial performance. Also, there are many studies that proved that there is no link between intellectual capital and company performance. The existing papers are explored in the thesis above in the part 2.2.4 Relation between Intellectual capital and Performance. The main theoretical gap lies in the part of intellectual capital and total book value. Furthermore, the literature gap is in the part of investing in intellectual capital and total book value. There are different articles, papers and work that are highly close and similar to this research work, but not the same. The Ph.D. thesis proposes a contribution to the existing literature review. The theoretical part related to investments in intellectual capital has not been explored enough until now, and it will be the center of my attention in the upcoming years.

In the current research, the following gaps will be presented:

- Firstly, establishing and identifying the relationship between intellectual capital and its investments and total book value as its own main performance indicator. Both parts, investments in intellectual capital and total book value are collected from official financial statements;

- Secondly, until now, there has not been a list of amortizable life of an asset per industry in France. This classification can be found in the United States, but not yet in Europe. The study that is generally used for France is developed and published by the Ernst & Young in 2016 *(Helmer et al., 2016)*;

- Thirdly, there is no performance measurement system (PMS) that used total book value as a final performance in the core of its valuation. Mostly profits, share price, total market value, earnings are seen as the value of interest;

- Finally, there is a research gap in the part of the literature review that is related to investments in intellectual capital. The topic about intellectual capital has been in the center of attention for many years, but investing in intellectual capital is still in the process of exploration and development.

3.4 Research Aim and Objectives

The previous discussions allow us to reveal the fact that there is a lot of room to explore the intellectual capital topic. Until now, intellectual capital has been a subject of interest to many authors that enable us to explore and deeply understand the topic from different perspectives. The good understanding will give us a clear dimension of interrelationships among them, intellectual capital components and final performance. *(Edvinsson and Malone, 1997; Eisenhardt and Martin, 2000)* The main aim of this research is:

> *Investigate how the investments in intellectual capital and its components influence value creation in French companies. Investments are seen as expenditures followed in the precisely defined accounting period. The final performance relates to changes in total book value. This project proposes the framework for explaining the core elements of investments in intellectual capital and how they interact with the final performance.*

The whole thesis is structured in the manner of fulfilling the following four objectives:

1) The first objective is to define investments in intellectual capital and classification of its components *(Suen, 2000; Lentjushenkova and Lapina, 2014);*

2) Second objective is to define and calculate the Research asset values *(Damodaran, 2009);*

3) Third objective is to collect and prepare the data and calculations;

4) Final objective is reserved for testing my hypotheses and writing the thesis.

Successfully accomplishing the given research objectives will contribute to practitioners, managers, users of financial information, researchers, and scientists by providing guidelines and framework for enriching effectiveness of intellectual capital and its investments in the company performance; as well as to the academics by proposing directions for future research.

3.5 Determination of Research Methodology

Research can simply be defined as a search for knowledge. Further definition of research can be a systematic and scientific investigation for information on a specific topic. Research is an artistic and scientific search for new knowledge. Also, research can be seen as movement from known to unknown. Research is a contribution to the existing stock of knowledge *(Kothari, 2004).*

There are four types of research based on Kothari (2004):

1. To obtain new insights about the phenomenon (exploratory or formulated research studies);

2. To gain portray about the characteristics of an individual, situation or group (descriptive research studies);

3. To determine the frequency of something that can be associated with something else (diagnostic research studies);

4. To test a proposed hypothesis of a causal relationship between given variables (hypothesis-testing research studies);

Methodology is a study of relationships between theoretical concepts and warranted conclusions about the world around us. In particular, methodology examines the way in which practitioners confirm their theories by testing data and reasons why they decided to choose one and not the other theory. At the same time, methodology is a descriptive and prescriptive discipline. Finally, methodology does not automatically provide an algorithm for constructing or validating theory, and it is more art, than science *(Blaug, 1992).*

Saunders et al. (2009) defined the research methodology as the theory of how research should be taken. On the other side, research methods refer to all techniques and procedures used to obtain and analyze data. The same author explained the key characteristics of one research, and those are: data are collected and interpreted systematically, and there is a clear goal of research. According to Kothari (2004), research methodology is a way to solve a problem systematically.

Easterby-Smith et al. (2008) made a distinction between research in management sciences and other sciences:

- Managers do not allow research access unless they see personal and commercial benefits of it;
- Managers pay attention to knowledge developed by other disciplines;
- Managers are often similarly highly educated as researchers;
- Necessary requirement for the research to have practical applicability.

Kothari (2004) proposed three groups of research methods:

1. Research methods that are concerned with the collection of information. These methods will be used when the current already collected data is not sufficient enough;
2. Research methods composed of statistical techniques that are used for establishing relationships between the known and unknown data;
3. Research methods that are used to evaluate the accuracy of the results already collected.

My Ph.D. dissertation proposes the research process steps that are adapted to the study by Saunders et al. (2009)

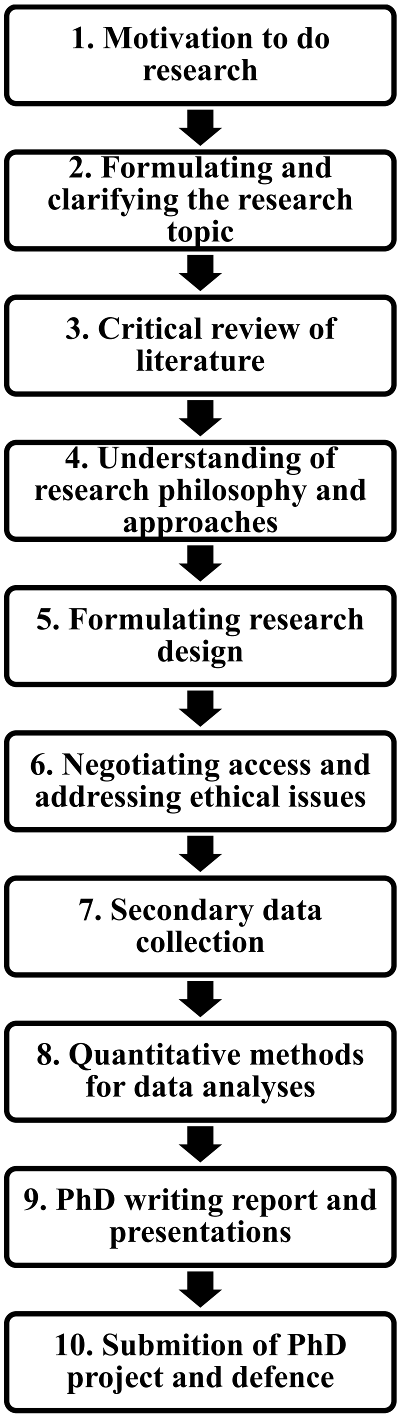

Figure 29: My Research Process Plan

My research process plan starts with motivation for this research. The financial skills and knowledge allowed me to better understand the phenomena and to propose a project that is possible to research. The topic related to intellectual capital is a current topic in the literature of management sciences and is related to current trends linked to intangible assets, a competitive advantage and achievement of better performance.

The review of literature has been analyzed, compared, presented and justified in the best possible manner, taking into consideration all great authors and research achievements. Deep understanding of literature gave me the opportunity not only to have a clearer image of my subject, but also to confirm my research predictions and goals.

Perfectly understanding research philosophy and approaches is a crucial part mainly because it provides the first structure of the project. The remaining parts of this research are built upon this structure which serves as a basis of the research project.

Formulating the design together with conceptual framework gives a clear image of what the research project will look like, what its steps are and how it will be finished. The research design has a special importance because of the visual presentation of the whole research process.

If it is not possible to collect secondary data, the whole process is questionable. The confirmation of these two steps provided a definite credibility to the research project.

Quantitative methods implemented for secondary data collection propose adequate research questions, hypotheses and research models that are statistically tested. Statistical tests show strengths of causal relationship between the proposed variables.

The final step is submitting and defending the research project that requires professional, understandable and successful PhD presentation. The presentation must provide a clear image of the whole work to any observer who is an expert in the field or who hears about the topic for the first time.

The dissertation research methodology is defined by Saunders et al. (2009) on the following key determinants:

I. **Research project** will be **quantitative, applied, analytical and empirical**. It will be completely **quantitative** mainly because it will be composed of financial information and their analyses. Also, research project will be **applied research** because it will be aimed at proposing a solution for a problem facing a company. The research will be **empirical** because some variables will affect some other through experiments or empirical studies. Finally, the research project will be **analytical research** because the researcher or observer will use the data already available, and analyze them to make a critical evaluation of the information;

II. **Research philosophy** will be **positivism** because the research project will not influence management sciences. The research project will be positioned neutrally, with the observation of the research problem being neutral as well;

III. **Research approach** will be **deductive** because the data will be collected to test the theory. The knowledge-based theory which the doctorate dissertation is based on will be used. My research study is based on the knowledge-based theory because the knowledge is seen as a core company's resource. The company's knowledge cannot be controlled *(von Krogh, 1998)*, but it can be coordinated and used for achieving advanced planned goals *(Spender, 1996);*

IV. **Characteristics and purpose of the thesis** will be examining **strengths of statistical relationships** between proposed research variables;

V. **Research strategy** is an **explanatory study** that proposes a unique approach in the management sciences that has not been found until now.

According to Johnson and Clark (2006), it is of high importance for all management and business researchers to choose an adequate research philosophy that will appear through our research strategy and make contributions not only to what we do, but also to what we investigate. Choosing one research philosophy is a matter of practical implementation and explanation of why we did not choose other alternatives compared to the philosophy that we adopted.

Remenyi (1998) stated that the positivism research philosophy is focused on social reality and that only phenomena that can be observed are possible to lead to the production of the existing data. The research strategy of positivism demands collecting data based on the development of research hypotheses. These hypotheses must be tested and confirmed (positively or negatively). A very important statement about the positivism is that the researcher is independent and does not affect the subject of the research in any way. The developed research will not change the data and will use the collected data as they are. It is mandatory for the positivism research philosophy to have a very developed and structured research methodology *(Gill, Johnson, and Clark, 2010).*

Positivism has the data collection techniques that are most often highly structured, with large samples, measurement, and with quantitative approach *(Saunders et al., 2009).*

When it comes to the research approach, it will be deductive because the research will test chosen theories. Deduction owes to the scientific research, which means a choice of development of theories that will be subjected to the rigorous test *(Collis and Hussey 2009).*

Robson (2011) listed five stages of deductive research development:

1) **Deducting a hypothesis** (testing the strength of relationships between dependent and independent variables);

2) **Expressing the defined hypothesis operationally** (explaining how the variables will be measured and tested);

3) **Testing the defined hypothesis operationally;**

4) **Examining the specific outcome of the inquiry** (it will tend to confirm the theory or need for its modification);

5) **If necessary, modification or improvement of the theory.**

Deduction means explaining causal relationships between given variables. The research hypothesis will gather chosen variables and result in the development of research models *(Saunders et al., 2009)*. The whole research work and its research methodology must be highly **structured** to facilitate replication *(Gill, Johnson, and Clark, 2010).* At the same time, the deduction process must be **operationalized**. To be operationalized, the facts for the deduction process must be adequately and quantitatively measured and established. Finally, the final characteristics of deduction require its **generalization**. To have a generalized deduction, it is necessary to choose an adequate size of a sample to be tested statistically in social sciences *(Saunders et al., 2009)*.

Saunders et al. (2009) summarized the following characteristics of a deductive approach to research:

Table 13: Deduction approach characteristics (Saunders et al., 2009)

Deduction characteristics
• Scientific principles implemented;
• Moving from research theory to data;
• Explanation of causal relationships between variables;
• Collection of quantitative data;
• Application of controls to ensure validity of data;
• Operationalization of concepts to ensure clarity of research;
• Structuration of research approach;
• Independent researcher position;
• Necessity to select samples of sufficient size

Based on the Table 13 above, my research is completely deductive, where the already developed scientific principles and methods are implemented, where the collected financial and quantitative data emerge from the explored existing literature review, where the causal relationship between proposed dependent and independent variables is explained, where different tests are examined in order to ensure clarity of research, where the adequate structuration of research is applied, where the position of main research is clearly independent and where the necessary size of sample is selected *(Saunders et al., 2009)*.

The research strategies can be exploratory, descriptive and explanatory *(Yin 2014)*.The purpose of my research is the **explanatory study** that establishes causal relationships between the proposed variables. The research demands the collection of quantitative data that explains the causal relationships between them using statistical correlation testing in order to have a much clearer explanation of the relationships *(Saunders et al., 2009)*. Experiment is a study of causal links; whether there is a change in one independent variable or another dependent variable *(Hakim, 2000)*.

The very important question is how to access the data necessary for the research and how to explain to those from whom the data are obtained why it is important. It is a matter of **negotiating access and research ethics**. This is the question whether it is possible to collect the proposed data for research variables or not, even before starting collecting. In that case, it is possible to verify the research validity *(Saunders et al., 2009)*.

According to Kothari (2004), the secondary data must possess the following characteristics before being used:

1. **Reliability of data**: If data is reliable it means that they must answer the questions, such as: Who collected the data? What were the sources of data? Were they collected by using proper methods?

2. **Suitability of data**: The data must be suitable depending on the type and purpose of research.

3. **Adequacy of data**: The level of adequacy of data means that they must be adequate for the purpose of research, otherwise it will not be adequate and used by the researcher.

My PhD thesis is composed of two main parts:

1) The first part includes the main dependent variables with all independent variables, presented in the models below;

2) The second part of the thesis includes only one investment in intellectual capital which is a research and developments investment coupled with a developed and calculated research asset value.

I would like to present my potential research models for the first part of the thesis:

H1: Total Book Value = α_o +
$$a_1 InvestR\&D + a_2 InvestCOMMEA + a_3 InvestCOSTSA + a_4 InvestPERSONN + €$$

H1.1: Total Non-Current Assets Value = α_o +
$$a_1 InvestR\&D + a_2 InvestCOMMEA + a_3 InvestCOSTSA + a_4 InvestPERSONN + €$$

H1.2: Total Intangible Assets Value = α_o +
$$a_1 InvestR\&D + a_2 InvestCOMMEA + a_3 InvestCOSTSA + a_4 InvestPERSONN + €$$

I would like to give an overview of **dependent variables**:

- Total Book Value: This value will be used from the asset's side of balance sheet of the company's financial statements as a sum up of physical, intangible and financial asset values;

- Total Non-Current Assets Value: This value will be used from the asset's side of balance sheet of the company's financial statements;

- Total Intangible Assets Value: This value will be used from the asset's side of balance sheet of the company's financial statements;

I would like to give an overview of **independent variables**:

- InvestR&D: This value will be collected from the income statement, i.e. from financial statements stated in the part of Research and Development Expenses;

- InvestCOOMEA: This value will be collected from the income statement, i.e. from financial statements stated in the part of Commercial Activities Expenses;

- InvestCOSTSA: This value will be collected from the income statement, i.e. from financial statements stated in the part of the Costs of Sales;

- InvestPERSONN: This value will be collected from the income statements, i.e. from financial statements stated in the part of All personnel charges and salaries;

I would like to present my potential research models for the second part:

H2: Total Book Value = $\alpha_o + a_1 ResearchAsset + a_2 InvestR\&D + €$

H2.1: Total Non-Current Assets Value = $\alpha_o + a_1 ResearchAsset + a_2 InvestR\&D + €$

H2.2: Total Intangible Assets Value = $\alpha_o + a_1 ResearchAsset + a_2 InvestR\&D + €$

I would like to give an overview of **dependent variables**:

- Total Book Value: This value will be used from the asset's side of balance sheet of the company's financial statements as a sum up of physical, intangible and financial assets value;

- Total Non-Current Assets Value: This value will be used from the asset's side of balance sheet of the company's financial statements;

- Total Intangible Assets Value: This value will be used from the asset's side of balance sheet of the company's financial statements;

I would like to give an overview of **independent variables**:

- InvestR&D: This value will be collected from the income statement, i.e. from financial statements stated in the part of Research and Development Expenses;

- ResearchAsset: This value will be calculated using the formula provided by professor Damadaran;

3.6 Conceptual Framework

Both practitioners and academics have shown big interest in performance measurement of intellectual capital. When implementing innovative products, companies face difficulties of how to identify, measure and manage the performance of products. The existing literature shows that there has been limited research in the value of performance measurement of intellectual capital, intellectual capital components and intellectual capital investments. A conceptual framework is developed below. It is structured around concepts contained in the existing literature which show one way of distinguishing performance measurement and intellectual capital investment management. The conceptual framework presents a structure for a pattern matching analysis using empirical data.

A research design represents a general plan of how the research will respond to the research question *(Saunders et al., 2009)*. Kothari (2004) defines a research design as the arrangement of conditions for collection and analysis of data in a manner that focuses on the combination of relevance to the main purpose of research. A research design shows the way the research is realized taking into consideration conditions of data collection and analysis. Each research design with its particular research problem must consider the following factors: *(Kothari, 2004)*

- Obtaining information;
- Availability and competence of researcher or his/her staff;
- Research objective that is studied;
- Nature of research problem to be explored;
- Research working period and financial possibilities.

Conceptual framework is presented in the Figure 30 below. As described, it has three main components; input in the form of investments in intellectual capital, intellectual capital components that investments are invested in, and output performance in the form of total book value.

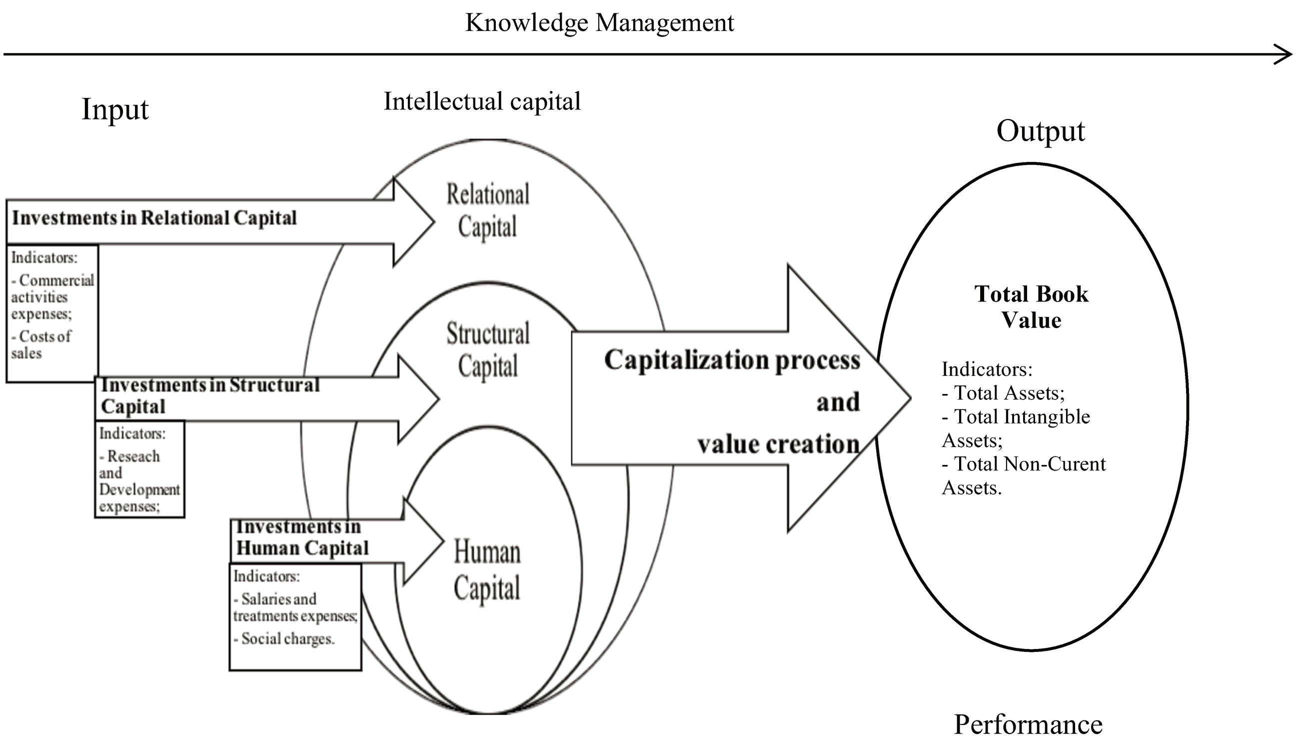

Figure 30: Conceptual Framework

The proposed Conceptual Framework is mainly inspired and justified by the Intellectual Capital Transformation Evaluating Model (ICTEM) that investigates the process of intellectual capital transformation in company performance by Molodchik et al. (2012).

The Figure 31 below explains the process of how investments in intellectual capital impact company's book value of French companies:

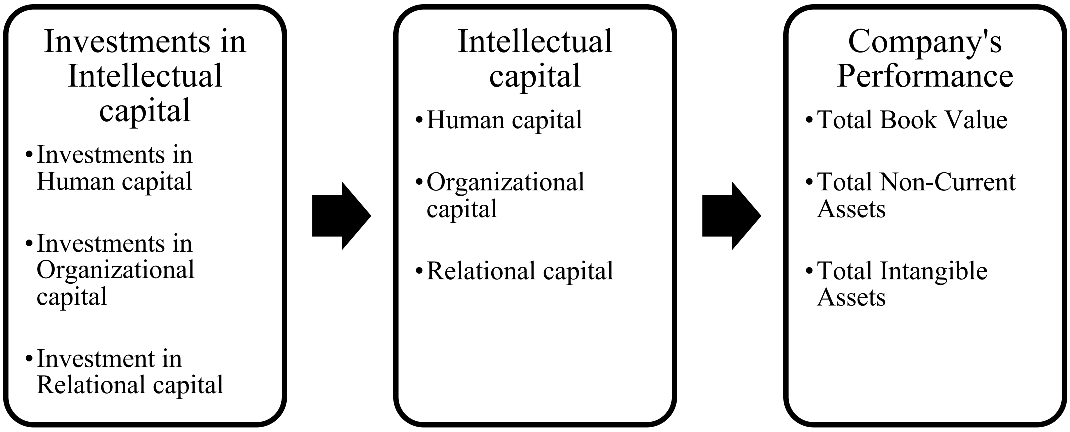

Figure 31: Simplified Conceptual Framework

The Figure 31 above establishes the relationship between investments in intellectual capital, intellectual capital and total book value. The investments in intellectual capital should indirectly improve a company's total asset value. Until now, various empirical studies have been conducted to examine the relationship between intellectual capital and financial performance of a company. This conceptual framework is fully inspired by the intellectual capital transformation model developed by Molodchik et al. (2012).

As we can see in the given conceptual framework, we have inputs that are in the forms of investments in intellectual capital components. Those components are Human capital, Structural capital and Relational capital. Each investment in each component of intellectual capital has its own indicators. These indicators are practical and possible to be obtained from financial statements, i.e. from the profit and loss account. The investments are seen as expenses from profit and loss account followed in a specific period of time. Investments in intellectual capital should create future value and develop new assets recognized by international accounting standards. The accent is on the transformation from investments or expenses into book value assets. The capitalization of investments in intellectual capital will result in increasing the total book value of a company. As a final output, total book value is followed, and then total intangible asset value and total non-current asset value. These two last indicators show where the value is developed more precisely. The book value of a company, total intangible asset value and total non-current asset value are the final outputs of the research project and they are visible in financial statements, i.e. balance sheet.

3.7 Justification of Study

The justifications of this study are:

a) Many past researchers in the field of intellectual capital have confined their efforts to only using qualitative research methodology. Very few combined their studies with the existing financial information or quantitative research approaches, and a very few still use mixed methodology to examine this topic. It is important because of the following: to gain a much deeper understanding of the observed phenomena of the subject, to learn about the idiosyncrasies within a company and all potential future economic benefits;

b) The past studies mostly examined the relation of intellectual capital components – human capital, organizational capital and customer capital and their influence on the final performance. Very few of them studied potential investments in the components of intellectual capital. The importance of investing in intellectual capital components has become one of the most important interests of this study;

c) So far, there has been no study on intellectual capital investments in French companies. As explained before, French economy is seen as very innovative, creative and knowledge-intensive economy. This was the main motivation for choosing a sample of French companies from different industries. The study will prove and show how even smaller French companies invest in innovations and research and development based on their opportunities;

d) The final point is related to the justification of transformation of investments into real value that is recognized by the international accounting standards. This is significant because this will keep expenses within company's accounts without transformation or capitalization of expenses into value. There will be no value creation.

3.8 Research Questions

The main research question of my thesis will be:

" How do the investments in intellectual capital influence the total book value of a company based on the French evidence? "

I would like to propose the following sub-questions based on the above stated main research question:

1.1 Is it possible for investments in intellectual capital components to be transformed into the Total Book Value of a company?
1.2 Do investments in intellectual capital positively influence the Total Non-Current Assets Value of a company?
1.3 Do investments in intellectual capital positively influence the Total Intangible Assets Value of a company?
1.4 Do only research and development investments grouped with developed Research Asset influence total book value, total non-current asset value, or total intangible asset value?

Regarding the first sub-question, understanding transformation process is of crucial importance. Transformation process is explained in the Literature Review where the Intellectual Capital Value Transformation Model is presented in a more detailed way. It is interesting to see whether expenses in intellectual capital, seen as investments, and followed specific number of years transform into concrete, recognized, standardized book value. The main purpose of the thesis is to follow these investments and to prove that there is a transformation and integration of the value inside the total book value of a company. This is important because this value is recognized and visible by the accounting-setters, decision-makers, employees, stakeholders, etc. as oppose to the total market value, which is mainly not influenced and controlled by the company itself.

The second and third sub-questions come from the main research question, where we are focused only on the main total book value of a company in total. In these last sub-questions, we want to see how investments influence the total non-current asset and total intangible asset values. Total non-current asset value includes all long-term assets of a company, so the purpose is to see whether investments in intellectual capital create value in this part of the company, or not. Furthermore, the total intangible asset value is composed of all intangibles, so the purpose is to use this value as a dependent variable to see whether the transformation can create new intangibles in the company.

Finally, the last question is about the research and development investments in intellectual capital components only. The purpose is to see whether the investments in only one intellectual capital component can yield any results and effects on the company's book value, non-current asset value of intangible value, or not.

3.9 Research Process Plan

This part covers the process of conducting the whole research from the beginning until the end. This is important to understand because it presents the development of the research process. The research process plan is composed of the following seven steps:

1) Development of literature from the most prominent authors;
2) Identifying the theoretical gap;
3) Determining the plan for proving the research topic;
4) Developing the research methodology;
5) Collection of data;
6) Identifying the classification of industries, useful life of assets and capitalization requirements;
7) Statistical operations and correlations;
8) Explanation of empirical results and final conclusions.

The first step is related to the development of literature from the existing and most prominent authors. This part is well developed in the Second Chapter, where the literature was properly developed starting from the intangible assets, then intellectual capital, investments in intellectual capital, knowledge management and finally performance measurement systems.
The PhD dissertation started with intangible assets because intangible assets topic is broader than the intellectual capital. The goal of this part is to get an insight into the development of intangible assets from the past until now. How have intangible assets changed? Why are they so important? It was necessary to understand intangible assets deeply in order to understand intellectual capital.

Intellectual capital has been an attractive topic for the last twenty years and it has occupied the attention of many authors around the world. Even though the intellectual capital has been the center of research for many years, it is still not accepted and recognized by the international accounting standards, so authors and researchers are trying to conceptualize it. This is important as it can help remove all potential dilemmas, wrong decisions and unsuccessful investments. Generally, intellectual capital is the strategic asset that can produce and increase company's final results.

Investing in intellectual capital is not as developed as intellectual capital in general, but it is the topic that will be important in the upcoming years. Investments in intellectual capital show that it is possible to invest not only in intellectual capital in general, but also in the particular intellectual capital components. Why is this important? Because most of the research papers are focused on measuring intellectual capital. The question that appears in most research papers is whether intellectual capital exists or not, and what is its quantity? We start with the assumption that every company has intellectual capital on a bigger or smaller scale. After definitely accepting the assumption that intellectual capital exists, the next step is to invest in it and follow its contributions.

Knowledge management is the process of identifying, codifying, storing and implementing in order to achieve pre-planned company's goals. Knowledge management and intellectual capital are two sides of the same coin. Neither of them can exist without each other. If we take a look at intellectual capital as the static component, and knowledge management as the dynamic one, we can see that intellectual capital is the critical substance that will or will not produce some future value, whereas knowledge management will follow that value creation process. Intellectual capital lies in the core of a company, and the only question is whether it will be stimulated and used in a proper way. Knowledge management together with some of the existing performance measurement systems can follow that process properly.

The second step is related to identifying the research gap. Identifying the research gap is the hardest part of the job because it requires not only hard work, but also creativity to propose a completely new contribution to the management science. It is necessary to have good and deep understanding of the existing literature and to propose its own unique topic. Even the slightest suggestion for improvement can bring benefits and contributions to the science. The proposed topic of this study can contribute greatly by determining the relation between investments in intellectual capital and company performance seen in the form of total book value.

The third step is about the creation of a plan for proving the thesis. It is very important to propose adequate variables and correlations that will further produce expected results. The research plan stems from the existing literature and identified research gap. This is the part which conceptualizes the whole work in one process and brings the value creation process to the end.

The fourth step determines the research methodology. The research methodology presents the ways and tools of the whole research process. How is the work done? How is it finished? These are some of the questions that are answered in this part. The whole research methodology part is very carefully developed and created in order to present how the work was implemented to all potential readers of this thesis. Determining and proposing the research models is in the center of the research methodology. First of all, which model from the theory is used and second, how is the research conceptualized. The proposed research models structure and conceptualize the whole work into one.

The fifth step is the most important part of every research work. Researchers often propose very interesting topics based on the literature, but they do not confirm feasibility, possibility to collect empirical information and to prove the results in the end. This study had first been confirmed empirically before the whole research work started. This confirmation allowed me to proceed with the development of the whole work and made me more confident in the given research. The collection of financial information was the toughest part of the job even in this study. The access to financial databases was very limited, expensive and unsecure. Even though it is possible to find planned financial information in the official annual reports, financial database that could supply me with the same information was necessary for this study. And here is the biggest problem. After many unsuccessful attempts, I was granted the access to the financial database “Point Risk” from the IAE of Paris, Sorbonne Business School. The “Point Risk” database is composed only of French companies. This database is sufficient for my research because it possesses all the necessary financial information observed by the research models. The collection is composed of information from 2008 until 2016 and it includes 8 main variables. Those are:

- Total Book Value;
- Total Non-Current Assets Value;
- Total Intangible Assets Value;

- Research and Development Expenses;
- Commercial Costs;
- Personnel Costs;
- Costs of Sales.
- Research Asset Value.

The first seven variables were collected from the database, whereas the final eighth variable "Research Asset Value" was calculated. The Research Asset Value is the value coming from the research and development expenses. The potential value is created and developed from the research and development expenses for a long, not short, period of time which is regarded as the useful life of assets. The useful life of assets is the period during which one asset can be used, amortized completely and removed from the company's property. This useful life of assets differs from industry to industry, and from country to country. The collection process included not only the collection of the useful life of all assets observed in this study, but also the main classification of industries implemented.

The sixth step includes the identification of the useful life of assets and the main classification of industries for the thesis.

The figure below was published in the Ernst & Young study by the authors Helmer et al. (2016). This study presented the depreciation rates of asset types and the types of depreciation methods based on the useful life of an asset. There are 11 different types of assets in total and useful life that ranges from 2 to 25 years for office buildings. In France, generally, the most used depreciation method is the straight-line method. Applicable tax depreciation rate depends mainly on useful life for tax purposes. This Ernst & Young study is absolutely adapted to the French case, so it is perfect for the thesis as well.

Table 14: Depreciation rates for asset types in France (Helmer et al, 2016)

Asset type	**Useful life for tax**	**Type of tax depreciation method**	**Applicable tax depreciation rate**
Plan, machinery and equipment	Between 6 and 10 years	Straight-line basis	Between 10 % and 15 %
Motor cars	Between 4 and 5 years	Straight-line basis	Between 20 % and 25 %
Industrial buildings	20 years	Straight-line basis	5 %
Furniture	10 years	Straight-line basis	10 %
Computer hardware	3 years	Straight-line basis	33.33 %
Computer software	2 years	Straight-line basis	50 %
Office building	25 years	Straight-line basis	4 %
Transport other than motor cars	Between 4 and 5 years	Straight-line basis	Between 20 % and 25 %
Tools/equipment	Between 5 and 10 years	Straight-line basis	Between 10 % and 20 %
Office equipment (including office furniture and fixtures)	Between 5 and 10 years	Straight-line basis	Between 10 % and 20 %
Property used in R&D	5 years	Straight-line basis	20 %

Table 14 shows us all the potential asset types on the left, useful life for tax, type of the depreciation method and the depreciation rate. Most of the assets are tangible and intangible, so companies develop and produce particular types of assets based on the industry they belong to. That is why it was highly important to specifically identify the useful life of assets together with the adequate classification of the industries adapted to the French case. Useful life for tax starts from 2 years and finishes with the longest period of 25 years. This useful life of assets is important because it shows to me how many years I need to follow if I want to expect results from investments in the development of new assets in my study. All depreciation methods are straight-line basis with precise depreciation rates at the end.

I used this useful life of assets to link each company to the industry they belong to in order to see how many years it is necessary to follow financial information from the database. This was the key proof for my thesis. Classification of Industries that will be used is developed by Francis and Schipper (1999).

Table 15: Table of classification of industries by Francis and Schipper (1999)

High-Technology Industries	
283	Drugs
357	Computer and Office Equipment
360	Electrical Machinery and Equipment, Excluding Computers
361	Electrical Transmissions and Distribution Equipment
362	Electrical Industrial Apparatus
363	Household Appliances
364	Electrical Lighting and Wiring Equipment
365	Household Audio, Video Equipment, Audio Receiving
366	Communication Equipment
367	Electronic Components, Semiconductors
368	Computer Hardware (Including Mini, Micro, Mainframes, Terminals, Discs, Tape Drives, Scanners, Graphics Systems, Peripherals and Equipment)
481	Telephone Communications
737	Computer Programming, Software, Data Processing
873	Research, Development, Testing Services
Low-Technology Industries	
020	Agricultural Products – Livestock
160	Heavy Construction, Excluding Building
170	Construction – Special Trade
202	Dairy Products
220	Textile Mill Products
240	Lumber and Wood Products, Excluding Furniture
245	Wood Buildings, Mobile Homes
260	Paper and Allied Products
300	Rubber and Miscellaneous Plastics Products
307	Miscellaneous Plastics Products
324	Cement Hydraulic
331	Blast Furnaces and Steel Works
356	General Industrial Machinery and Equipment
371	Motor Vehicles and Motor Vehicle Equipment
399	Miscellaneous Manufacturing Industries
401	Railroads
421	Trucking, Courier Services, Excluding Air
440	Water Transportation
451	Scheduled Air Transportation, Air Courier
541	Grocery Stores

Francis and Schipper (1999) claimed that financial statements lost their relevance mostly because of some high-technology companies that cannot recognize all the expected cast flows in their financial statements and that are important for the investors. High-technology industries part includes all computer, electronics, pharmaceuticals and telecommunication industries. Low-technology industries part does not include all industries, but most of those that might have unrecorded intangible assets.

The study developed by Oswald, (2000) used the classification of industries by Francis and Schipper (1999) for estimating whether companies should expense or capitalize R&D expenses in the UK companies sample. Furthermore, Ding et al. (2004) implanted the same classification of industries by Francis and Schipper (1999) for their study of determining the strategic decision of R&D expense capitalization in France.

Ding et al. (2004) explains that the decision about R&D expenditures differs from industry to industry. Companies that belong to high technology industries invest much more than other companies from low technology industries.

This classification of industries was linked to the useful life of assets in such a way that each company belongs to a particular industry and has the precise useful life of its own assets. There is clear information as to how many years are necessary for each company based on the financial information that is followed. This classification will be used to group all companies from the sample into smaller groups, and the industries they belong to.

The final step in the fifth step of financial information collection relates to the calculation of research asset value. The following formula presents the value of the research asset calculation given by Damodaran (2009):

$$\text{Value of the Research Asset} = \sum_{t=-(n-1)}^{t=0} R\&D_t \frac{(n+1)}{n}$$

R&D - is related to research and development expenses during n number of years observed.
N – is related to the number of years observed.

Damodaran (2009) gave an example of calculation of research asset on Boeing over the last 10 years:

Table 16: Table of calculation of research asset by Damodaran (2009)

Year	**R&D**	**Unamortized Portion**	**Unamortized Value**
1988	$ 751	0.10	$ 75
1989	$ 754	0.20	$ 151
1990	$ 827	0.30	$ 248
1991	$ 1,417	0.40	$ 567
1992	$ 1,846	0.50	$ 923
1993	$ 1,661	0.60	$ 997
1994	$ 1,704	0.70	$ 1,193
1995	$ 1,300	0.80	$ 1,040
1996	$ 1,633	0.90	$ 1,470
1997	$ 1,924	1.00	$ 1,924
Capitalized Value of R&D Expenses			**$ 8,587**

Based on the Table 16 we can analyze and state that, after following research and development expenses for the last 10 years, there is an unamortized portion and unamortized value that are kept and stored in the form of an asset or some value. That value will be further recognized within the company's total value. Very similar understanding of this process is used in my thesis, and the value creation process is followed in French companies. As we can see, the capitalized value of research and development expenses in the example above is $ 8,587. This value is further recognized inside a company's value and this proves that total book value has improved and increased.

What is very important is that the capitalization processes are allowed in France, like in other European and Worldwide countries, where IFRS/IAS are accepted and implemented. The capitalization process is not permitted in the US, where US GAAP are available. Research and development expenses are expensed as they incur. It is not allowed to capitalize them. In France, both decisions are allowed, and it is up to the management of a company to decide. Generally, the decision needs to be made whether to expense research and develop expenses as they incur or to capitalize them. However, this decision is rather subjective and personal, and it brings uncertainty and risk to each manager who has to make such a decision. Taking into consideration that global environment is highly dynamic, uncertain and progressive, long-term decisions such as capitalization of research and development expenses after, 5, 10 or 20 years are very risky.

After successfully collecting data, it was necessary to prepare all the information for further analysis. Substantial time was spent only on preparing financial information because there were a lot of companies without complete information. From the initial 1,990 companies, 498 companies entered the first research model and 482 companies entered the second one. There are different companies from different industries and different sizes in this sample. After the data had been prepared, each company was identified by the industry they belonged to and the useful life of assets was automatically calculated. In that way, the number of years during which they would be followed was established from the database. In the second research model, 6 companies were removed from the sample because the useful life of assets was 20 years. These 6 companies were from the industry Low Technology – Construction – Special Trade. The observed and collected period of time was 9 years, so the observation for these 6 companies was not possible. One more company was removed from the sample from the second research model because the useful life of an asset was 25 years. The industry they belonged to was Low Technology – Wood Buildings, Mobile Homes.

When the whole sample and data were prepared, the seventh step related to statistical correlations was the next one. In the statistical, i.e. empirical chapter, all statistical correlations were implemented and applied, starting from the data sample description, justification of variables, movement of dependent and independent variables, descriptive statistics, Pearson correlations between variables, and finally, complex regression analyses.

The final step is the explanation of the produced results. From the first and second research models, the results were produced and the understanding of them tells us that investing in intellectual capital is possible only when all three components are taken into consideration. Not only one, two components of intellectual capital because. If only one is taken into consideration, investments will not have the expected results. The final results remain in the form of expenses and do not create or develop new forms of assets that will finally contribute to the improvement of total book value of a company.

3.10 Research Hypotheses

The main research hypotheses of my PhD thesis is:

Hypothesis 1: "The intellectual capital investments positively influence the total book value".

$Alternative\ Hypothesis \qquad H_a:\ \mu > \mu_{H_O}$

$Null\ Hypothesis \qquad H_O:\ \mu = \mu_{H_O} = TBV$

The research objective is to prove the alternative hypothesis and to reject the null hypothesis. The main proposed hypothesis is the alternative hypothesis and we want to accept the alternative hypothesis, and to reject the null hypothesis. This means that, we want to confirm through this study that investments in intellectual capital positively influence a company's total book value. The complex regression analysis proves this in the following steps of the thesis.

There are two more sub-hypotheses developed from the main research hypothesis that will be tested as well.

Hypothesis 1.1: "The intellectual capital investments positively influence the total non-current assets value".

$Alternative\ Hypothesis \qquad H_a:\ \mu > \mu_{H_O}$

$Null\ Hypothesis \qquad H_O:\ \mu = \mu_{H_O} = TNCA$

Hypothesis 1.2: "The intellectual capital investments positively influence the total intangible assets value".

$Alternative\ Hypothesis \qquad H_a:\ \mu > \mu_{H_O}$

$Null\ Hypothesis \qquad H_O:\ \mu = \mu_{H_O} = TIA$

By using the proposed hypothesis 1.1 and 1.2, we want to accept and confirm the alternative hypothesis and to reject the null hypothesis. We want to confirm though the study that investing in intellectual capital positively influences total non-current assets value and total intangible assets value respectively. This examination and confirmation will be established by producing complex regression analyses.

On the other side, the second research model proposes the main hypothesis 2, and its sub-hypothesis 2.1. and 2.2.

Hypothesis 2: "The research asset coupled with R&D expenses positively influence the total book value".

$$Alternative\ Hypothesis \qquad H_a:\ \mu > \mu_{H_O}$$

$$Null\ Hypothesis \qquad H_O:\ \mu = \mu_{H_O} = TBV$$

The research objective is to prove the alternative hypothesis and to reject the null hypothesis. The aim is to confirm the alternative hypothesis and to reject the null hypothesis. If we accept the alternative hypothesis, it means that investing only in the organizational capital of a company, i.e. investing in research and development positively influences a company's total book value. By accepting the alternative hypothesis, we automatically reject the null hypothesis. If we reject the starting alternative hypothesis and accept the null hypothesis, it means that investments in intellectual capital do not positively influence total book value. Those investments in intellectual capital negatively influence the total book value of a company. Both accepting or rejecting will result in some findings. The examination of accepting or rejecting the alternative and null hypothesis respectively will be confirmed by producing complex regression tests.

There are two more sub-hypotheses developed from the main research hypothesis that will be tested as well.

Hypothesis 2.1: "The research asset coupled with R&D expenses positively influence the total non-current assets value".

$$Alternative\ Hypothesis \qquad H_a:\ \mu > \mu_{H_O}$$

$$Null\ Hypothesis \qquad H_O:\ \mu = \mu_{H_O} = TNCA$$

Hypothesis 2.2: "The research asset coupled with R&D expenses positively influence the total intangible assets value".

$$Alternative\ Hypothesis \qquad H_a:\ \mu > \mu_{H_O}$$

$$Null\ Hypothesis \qquad H_O:\ \mu = \mu_{H_O} = TIA$$

Sub-hypothesis, hypotheses 2.1. and 2.2 will be observed using the same approach. The aim is to accept the alternative hypothesis and to reject the null hypothesis. It means that we want to accept the alternative hypothesis and to confirm that investing in intellectual capital components will result in increasing a company's total non-current assets value and total intangible assets value. If we reject the alternative hypotheses and accept the null hypothesis, it means that investments in intellectual capital components negatively influence a company's total non-current assets value and total intangible assets value.

3.11 Research Theories

Grant (1991) stated that company's resources are classified in the resource-based theory as tangible, intangible and personnel based. Company's resources have diverse nature and they prepare companies for the implementation of their strategies in order to improve their current efficacy and efficiency. According to Itami and Roehl (2009), the management of intangible assets is the central question of strategy formulation and implementation of a company. Solow (2010) stated that all scientific and academic theories are based on assumptions and predictions that are not completely true. The skill of theorizing is in making the inevitable assumptions in such a way that the final results will not be sensitive. It is highly important to have a very realistic main assumption. If the main assumption is dubious, then the final result is questionable and difficult to prove.

Caldwell (1994) believed that modern economists must use testable theories that will turn the predictions of a theory into reality. That predictive adequacy is a very important characteristic one theory can have and ordering different theories should be confirmed by the strength of that confirmation of those variables being compared and tested. Scientist should not test their hypotheses empirically first, they should construct hypotheses that make some predictions about certain phenomena and then try to make tests about the hypotheses. Also, scientist should accept hypotheses that are confirmed and eliminate those disconfirmed. Testing in that way makes a difference. It is necessary to construct a model of theory to test one theory. The same theory may be formed by different models. Finally, the data employed in empirical testing importantly corresponds to the main concepts in the theories being tested.

Three main theories are a core of the research methodology in the PhD dissertation. The research theories are as follows:

1) Resource-based View;
2) Knowledge-based view;
3) Intellectual capital theory.

3.11.1 Resource-Based View (RBV)

According to Barney (1991), a company possesses a sustained competitive advantage *"when it is implementing a value creation strategy within a company not simultaneously applied by any other competitor and when these companies are unable to duplicate the benefits of this strategy (page 102)."* The same author does not speak about the specific period that defined the existence of a sustainable competitive advantage, but the inability of current and potential competitors to duplicate that strategy that makes a competitive advantage sustained.

According to Barney (1991), a company's resource must possess the following features, so-called VRIN attributes, to have necessary competitive advantage:

1. **V**aluable;
2. **R**are;
3. **I**n-Imitable;
4. **N**on-Substitutable.

Barney (1991) cited Hirshleifer et al. (2005) who said that *"as long as the number of companies possess a particular valuable resource is less than number of companies needed to generate* *perfect market position and competition dynamics in an industry, that resource has the potential of generating a competitive advantage to a company. (page 107)."*

Barney (1991) listed three main reasons for company's resources to be imperfectly imitable:

1. Unique historical position or conditions;
2. Causal ambiguity
3. Social complexity.

The same author states the fourth reason as being substitutability that can take at least two forms. If it is not possible to imitate another company's resource precisely, it is possible to substitute it with a similar resource to serve its purposes. But, if it is a case of a strategic equivalent, none of the management teams are a source of sustained competitive advantage.

The second framework of the resource-based view (RBV) was proposed by Peteraf (1993), who identified the following four conditions of company's resources to be met in order to obtain sustainable competitive advantage:

1. Resource heterogeneity;
2. Ex-post limits to competition;
3. Imperfect resource mobility;
4. Ex-ante limits to competition.

Resource heterogeneity is built on the Ricardian theory or monopoly rents *(Ricardo, 2015).* It means that companies of different resources are capable of competing in the market.

What Peteraf (1993) means by ex-post limitations to competition is that subsequent to a company's obtaining superior position and earning from rents, there must be factors which limit competition for those rents.

Imperfect resource mobility is the third out of four conditions that needs to be met.

The last condition is a highly important factor and it means that any company can establish a superior resource position, but there must be limited competition for that position.

The theory resource-based view (RBV) explains the idea that a company is composed of unique resources with diverse nature that gains competitive advantage *(Barney, 1991; Teece et al., 1997; Nelson, 1991; Penrose, 1959; Peteraf, 1993; Prahalad and Hamel, 1990; Rumelt, 1984; Schumpeter, 1934; Wernerfelt, 1984).* Company's resources are nature resources that enable a company to conceive and implement the main strategy that will improve their effectiveness and competitiveness *(Amit and Schoemaker 1993; Grant 2014, 1991).* The value-based views present the way a company improves its performance through investments including intellectual capital accumulation. The resource-based view explains that a company has to secure their resources when they are *(Barney, 1991; Conner and Prahalad, 1996; Grant, 1991; Kristandl and Bontis, 2007; Nelson, 1991; Peteraf, 1993; Wernerfelt, 1984):*

- **Appropriable.** The company's resource rents must exceed their cost.
- **Valuable.** The company's resources need to create sustainable value for the company.
- **Rare.** The company's resources must be secured from their competitors and heterogeneously distributed across the company.
- **Durable.** The company's resources must have a longer useful lifespan than the one competitor have.
- **Non-transferable.** Competitors must be able to acquire the same company's resources from the market.
- **Imitable.** The nature of company's resources must protect them from being imitated or copied.

Moreover, Dierickx and Cool (1989) expended the previous list of characteristics to the following:

- Cannot be commercialized because they are developed internally;
- Display not only intrinsic character, but also social complexity;
- Their origin lies in organizational learning and skill;
- Strong link to a company;
- Their development is questioned with the level of learning, investment, stocks and other activities.

Scholars have extended this RBV approach to dynamic markets *(Teece et al., 1997).* In these markets, companies must possess dynamic capabilities by integrating, building and reconfiguring internal and external competencies to adapt in a rapidly changing business environment *(Teece et al., 1997)*. The successful management of knowledge resources is important in such markets *(Grant, 1996; Kogut and Zander, 1996)*. Resources are in the center of the resource-based view and can be divided into physical, human and organizational assets that can be further used for implementing value-creating strategies *(Barney, 1986a; Wernerfelt, 1984)*. Company's resources define the basis of value-creating strategies that will lead to the development of competitive advantage in the dynamic markets *(Collis and Montgomery, 1998; Porter, 1996; Womack et al., 2007)*. Dynamic capabilities of a company are based on the managers' integration and recombination of company's resources in order to implement new value-creating strategies *(Grant, 1996; Pisano, 1994)*. Because of that, managers are the key drivers behind the process of turning the existing resources into new sources of competitive advantage *(Teece et al., 1997; Henderson and Cockburn, 1994)*.

It should be emphasized that intellectual capital is a heterogeneous resource and it is therefore important to split it into three main components and analyze each of them separately, *Molodchik et al. (2012)*.

3.11.2 Knowledge-Based View (KBV)

The key task of a manager is to protect and accumulate precious and valuable company's knowledge *(Barney, 1986b; Teece et al., 1997; Rumelt, 1984; Wernerfelt, 1984)*. Company's knowledge is a capacity to successfully convert inputs into valuable outputs *(Arrow and Hahn 1991; Debreu 1987; Nelson and Winter 2004)*. In the strategy literature, the common assumption is that limitations of companies should encompass these valuable resources, competencies and knowledge *(Prahalad and Hamel, 1990)*. When knowledge is developed, the decision to internationalize it or keep it as internal should be made. The company's position is to both exploit and protect knowledge. However, the main question is not how to exploit already developed knowledge, but rather how to organize and generate new knowledge within a company *(Nickerson and Zenger, 2004)*. Managers very often choose problems while identifying knowledge for these problems either internally, inside a company, or externally *(Nelson and Winter, 2004)*. Nelson and Winter (2004) defined a company's knowledge as a combination of different inputs together with all potential combinations and levels of activities within a company.

Scholars have been focused on developing a knowledge-based view or knowledge-based theory of a firm *(Conner, 1991; Conner and Prahalad, 1996; Demsetz, 1988; Grant, 1996; Kogut and Zander, 1996; Madhok, 1996; Nahapiet and Ghoshal, 1998).* Knowledge-based view (KBV) was initially developed by Nonaka and Takeuchi (1995). According to the knowledge-based view of the firm by Kogut and Zander (1996), a firm can be seen as a social community specialized in creating and transferring knowledge. Many academics emphasized the increasing importance of knowledge for the work nature *(Drucker 1999).* The knowledge-based view is different from bureaucracy because all knowledge necessary for organizing and strategizing one company is located at the top management of a company *(Spender, 1996).*

Foss (1996) thinks that a knowledge-based view determines the issues of existence, boundaries and internal organization of a multi-person company. According to Foss (2005), knowledge and its nature (tacit, socially constructed, etc.) are central to the theory of the knowledge-based view. The key elements of the knowledge-based view are:

- Knowledge is the most important resource and factor of production in a company;
- There is a difference in performance among companies because of different company's stock of knowledge and capabilities to use and develop knowledge;
- Companies exist to create, transfer and transform knowledge into competitive advantage;
- Knowledge is related to people;
- Individuals are intelligent and pro-active agents;
- People are limited by cognitive limitations; how much and what they can know has cognitive boundaries;
- When complex situation occurs, there is a need to integrate and coordinate knowledge;
- Knowledge is demonstrated and acquired in action; cognition and action are closely related;
- Knowledge can be located and demonstrated in many forms and locations; It is situated in the minds of individuals, developed within companies' processes and routines, as well as in codified databases and book;
- Different types of knowledge influences can be transferred and leveraged.

Having in mind that knowledge is the most important resource within a company, there are similarities and difference between resource-based view (RBV) and knowledge-based view

(KBV) *(Barney, 1986a; Conner, 1991; Penrose, 1959; Wernerfelt, 1984).* The RBV is interested in the essentially important productive resources (knowledge), and how they can be acquired, used, valued and protected *(Spender, 1996).* On the other side, KBV is based on the opinion that knowledge cannot be controlled, but can be managed under certain conditions *(von Krogh 1998),* and on the way knowledge is used and coordinated *(Spender, 1996).*

Knowledge is highly inter-subjective, and it stems from endless social interactions among the members of a company. Even though knowledge can be accumulated and stored in databases, the most important type of knowledge is located between people *(Spender, 1996).* Knowledge that is possible to imitate or duplicate is not the knowledge that will create sustainable competitive advantage for a company *(Wernerfelt, 1984).*

3.11.3 Intellectual Capital-Based View

Since the moment intellectual capital theory was initiated for the first time, when Stewart (1991) published the term 'intellectual capital' in an article, many different definitions have been released. Some definitions define intellectual capital as a unique combination of intangible assets that are the basis for further company's competitive advantage *(Andriessen 2004).* Intellectual capital theory is seen as one of the knowledge economy theories determined by the transformation of importance of tangible assets to the intangible ones. Intellectual capital theory has close connections with organizational innovation and challenges of strategic management *(Kohl et al., 2014).* This theory has been present for almost thirty years and it is not a surprise that certain paradigms influence it *(Užienė, 2015).*

Ansoff (1986) defined the competitive advantage follows: *"to isolate characteristics unique opportunities within the field determined by the product-market scope and the growth vector. This is what should be seen as the competitive advantage. It is of high importance to identify particular items of individual product markets that will give a company a stronger competitive position"*

According to Reed et al. (2006), the intellectual capital-based view of a firm represents one specific aspect of the more general resource-based view because it considers all three resources that have been theoretically connected to a company's competitive advantage more narrowly (human capital, organizational capital and relational capital).

3.12 Research Model

The main research model that will be used in the thesis is the model developed by Molodchik et al. (2012). Molodchik et al. (2012) developed the Intellectual Capital Transformation Evaluating Model (ICTEM) that investigates the process of intellectual capital transformation in company performance. The ICTEM also takes into consideration internal and external factors that influence the transformation process. The value-based view must be applied to reveal intellectual capital outcome from the intellectual capital investments *(Molodchik et al., 2012)*.

The Figure 32 above presents the framework of the Intellectual Capital Transformation Evaluating Model (ICTEM). The quality and quantity of intellectual capital resources are presented as inputs in the Figure 32 below.

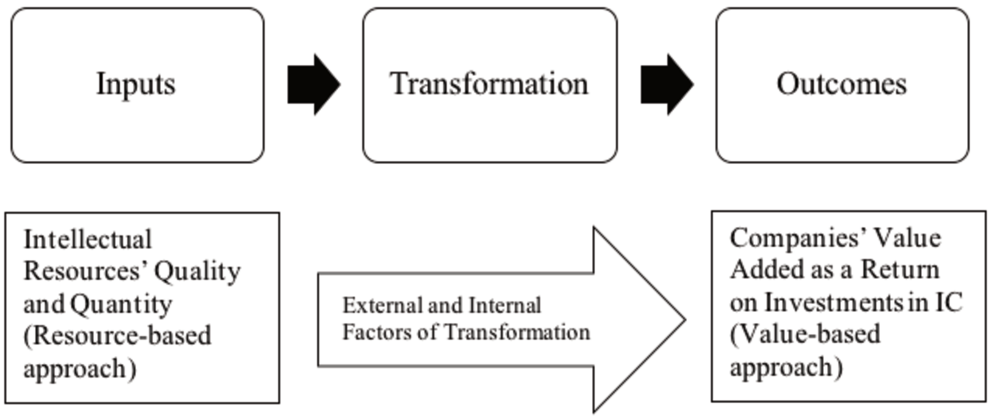

Figure 32: Framework for Intellectual Capital Transformation Evaluating Model (Molodchik et al., 2012)

The Figure 32 presents the main model that will be implemented in this study. All independent variables will be integrated in the input part. Precisely, inputs represent all investments in the intellectual capital components. The investments are seen as expenses, and they are: research and development, commercial activities, costs of sales and personnel charges. The transformation period is the second step during which the process of capitalization starts. The transformation period is different from industry to industry. It can last from 2 to up to 9 years which is the maximum potential period observed. The final step represents final outcomes. In our case, these are produced assets in the company's balance sheet. Generally, the outcomes must increase and improve company's value.

In the Figure below, the Intellectual Capital transformation scheme is presented:

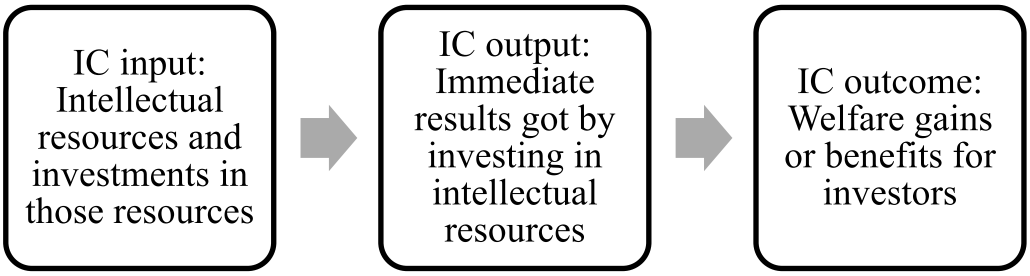

Figure 33: Intellectual Capital Transformation scheme (Molodchik et al., 2012):

The final outcomes depend on the quality and quantity of intellectual resources. The inputs transform into companies' benefits that arise from investments in intellectual capital. The value creation is the key checkpoint for successful investments *(Molodchik et al., 2012).*

Molodchik et al. (2012) presented potential internal and external factors in the intellectual capital transformation process:

Table 17: Table of transformational factors and indicators by Molodchik et al. (2012)

Transformational Factors	**ICTEM Indicators**
Internal Factors	Company age
	Company size
	Global market orientation
External Factors	Industry
	Country
	Developed market
	Sub-indexes of Knowledge Economy
	Location in the state (or region) capital
	Location in a megapolis

Based on the Table 17, the intellectual capital transformation model indicators that will be considered are industry related to the external factors and country. None of internal factors will be examined.

Table 18 below is composed of definitions, example of indicators and ICTEM Input Indicators based on the work of Molodchik et al. (2012):

Table 18: Table of components in ICTEM Model by Molodchik et al. (2012)

Components	**Definition**	**Example of Indicators**	**ICTEM Input Indicators**
Human Capital	What a particular employee brings into the value creation process in a company?	Revenue generated per employee, training spent per employee, value added per employee, new ideas generated by staff.	Share of wages in costs, cost of employee, earnings per employee
Structural Capital	How good are the relations between the people in a company, how well are they related and what remains when all employees go home?	Income per R&D expense, number of patents, individual links to database, number of new products.	R&D investment, intangible assets, patents, licenses, trademarks, ERP systems implementation, stable turnover growth
Relational Capital	The company's relations with its stakeholders.	Growth in sales, revenues per customer, brand loyalty, reputation of a company.	Commercial expenses share, well-known brand, foreign capital employed, participation in business associations

Based on the Table 18 above, the key input indicators will be considered for each intellectual capital component. All expenses and costs related to the personnel charges, salaries, bonuses etc. will be considered as human capital. All research and development expenses will be considered as structural capital. Finally, all commercial activities that are related to marketing and promotions campaigns and activities, and costs of sales, all costs that are related to the relations with company's customers and clients will be considered as relational capital.

Work of Molodchik et al. (2012) proposed some key points for better understanding of transformation process:

- The companies' efforts on intellectual capital management are possible in developed markets and in knowledge-based economies.

- Human capital is relevant only in long-term returns.
- Structural capital's factors such as strategy, innovation behaviors, company's network do not play the most important role in the value creation process.
- Relational capital's effects differ depending on a particular asset and a particular business moment. For instance, brand generates profits at the beginning followed by a company's web site.

3.13 Summary

This study aims to explain the importance of intellectual capital regarding the performance of French companies and intends to show the dimensions of intellectual capital components. The intellectual capital components represent an integral part of the general development of company's intellectual capital that will further contribute to the outstanding final performance. This study is also about identifying the level of intellectual capital components availability and components which have a more profound effect on the performance of French companies, taking into consideration knowledge management and performance measurement systems in that value creation process.

In order to remain competitive in the market place, companies, especially those in knowledge-intensive industries, depend on intellectual assets. The main purpose of this study is to provide an evidence that acquiring intellectual capital assets generates long-term benefits. By collecting data about French companies, the study examines the association between investments in intellectual capital and total book value. The goal is to prove whether transformation process happens when there are investments in intellectual capital. The French companies observed and collected in this sample belong to all different industries.

The expected results are positive associations between independent and dependent variables because the prediction is to generate an increase in a company's value after capitalization of investments in intellectual capital. This indicates that, after investment transformation and capitalization process and recognition of assets inside the balance sheet, a company will develop new assets (tangible or intangible) that will generate profits and benefits for many years in the future.

The developed research methodology is adapted to the quantitative research approach that will enable achieving and finalizing research work successfully.

CHAPTER IV

EMPIRICAL RESEARCH

SUMMARY:

CHAPTER IV – EMPIRICAL RESEARCH

This chapter presents the empirical findings of the whole research. Many empirical studies have been done to empirically examine the impact and effects of intellectual capital on company performance. In this chapter, the empirical study fills in the reviewed literature gap. The empirical part that is concentrated on intangible resources, intellectual capital and its investments finalizes the whole research work by providing tangible results. This part is composed of the following six sub-parts.

The empirical part starts with the description of data sample, analyses of the selected sample. The sample is composed only of French companies from 2008 to 2016. The main reasons for choosing France as an example were already explained in the section encouragement for research in intellectual capital evidence in France in the Introduction chapter. Here, the sample analyses are done in order to have better understanding of the observations we have.

The second part is related to descriptive statistics. This part is focused on describing statistical explanation of the selected sample. It is possible to conclude which further empirical steps to take based on these results.

Pearson correlations are applied after providing descriptive statistics and data sample description. Pearson correlations are important because they show the strength of correlation between all dependent and independent variables. It is crucial to see the strength between the observed variables and prepare for the complex regression.

The calculation of complex regression analyses is the next step, where the strength between independent and dependent variables shows their relation. The main question that is answered in this section is whether there is a positive or negative correlation.

Finally, the discussion about the findings presents the main results from our research study. The final findings put the whole scientific work together and provide deeply explored existing literature review.

4.1 Data Sample Description

I collected **1,990 French companies** for my sample by using the French financial database "Point Risk". I obtained the access to the financial databases from the Faculty IAE of Paris, University Paris 1 – Pantheon Sorbonne during my work as a Research Assistant in the period from October 2017 until June 2018. I collected complete financial statements for each company for the period from 2008 until 2016, so 9 business years in total. I observed main eight variables from the collected data. The first collection had 1,990 companies, but this number was reduced because of the missing information necessary to meet pre-planned criteria for my thesis. Average values for all variables are calculated for the period from 2008 until 2016.

Furthermore, we provide a deep analysis of my collected data, present the main classification of industries used for collected companies adapted for the French economy, establish useful life of assets necessary for the development of new assets adapted for the French economy, justify all variables, movements and trends of all variables, provide descriptive statistics, test of normality, complex regressions and limitations during the empirical work.

4.1.1 Analyses of Data Sample

We pay attention to the following points: *(Kothari, 2004)*

- **Type of population** –Only French companies are used as a sample. France implements IAS/IFRS, which is a very important condition taking into consideration that IAS/IFRS standards see expenses in intangibles as investments and require them to capitalize as soon as they are incurred, whereas US GAAP standards require no capitalization. France belongs to the group of European countries which invest the largest part of their investments in intangible assets *(OECD, 2013);*

- **Sampling units** – All companies will be grouped into smaller groups based on the industry they belong to in order to see which industry in France is intellectually capital intensive;

- **Source list** – The database "Point Risk" is used and necessary financial data that need to be collected are available at the University Paris 1 – Pantheon Sorbonne. Database

“Point Risk” is a perfect database for collecting financial information about the biggest French companies;

- **Size of my sample** – Having in mind pre-planned criteria,1,990 companies are taken from the financial database;

4.1.2 Data Sample Description for Research Models I and II

Research Model I

In the research model I, the initial number of companies was 1,990. After detailed investigation, 1,195 companies did not have complete given financial information and demanded variables. Furthermore, 297 companies are mentioned more than once in the database. The final number of companies observed and tested is 498.

Table 19: Number of companies included in the first research model

NUMBER OF COMPANIES	
Starting Number, Observed	**1,990**
Missing Data Companies	1,195
Repeating Companies	297
Final Number of Companies	**498**

As we can conclude from the sample, the largest number of companies are from the Low Technology Industry – Miscellaneous Manufacturing Industries – 89, followed by those from High Technology, listed chronologically, Computer Programming, Software, Data Processing, Research, Development, Testing Services, Drugs and Electrical Apparatus, 81, 44, 38 and 35. In total, there are 241 companies that belong to the High Technology industries, and 257 companies that belong to the Low Technology industries. The percentage between the High Technology and Low Technology is 48 % and 52 %. None of the companies is excluded because they all meet the requirements regarding the necessary useful life of assets.

Table 20: Number of companies per industry in the first research model

Industry	Number of Companies	Amortizable Life of Assets (Number of Years)
Low Technology - Miscellaneous Manufacturing Industries	89	9 years
High Technology - Computer Programming, Software, Data Processing	81	2 years
High Technology - Research, Development, Testing Services	44	5 years
High Technology - Drugs	38	5 years
High Technology - Electrical Industrial Apparatus	35	9 years
Low Technology - General Industrial Machinery and Equipment	31	9 years
Low Technology - Agricultural Products	26	9 years
Low Technology - Miscellaneous Plastics Products	18	9 years
Low Technology - Motor Vehicles and Motor Vehicle Equipment	18	5 years
Low Technology - Blast Furnaces and Steel Works	16	6 years
High Technology - Electrical Machinery and Equipment, Excluding Computers	15	9 years
Low Technology - Wood Buildings, Mobile Homes (EXCLUDING)	14	25 years
High Technology - Computer and Office Equipment	11	9 years
Low Technology - Grocery Stores	10	9 years
Low Technology - Textile Mill Products	9	9 years
Low Technology - Lumber and Wood Products, Excluding Furniture	8	9 years
High Technology - Computer Hardware	6	3 years
High Technology - Telephone Communications	6	9 years
High Technology - Electronic Components, Semiconductors	5	9 years
Low Technology - Construction - Special Trade (EXCLUDING)	5	20 years
Low Technology - Trucking, Courier Services, Excluding Air	5	5 years
High Technology - Electrical Transmissions and Distribution Equipment	4	9 years
High Technology - Household Audio, Video Equipment, Audio Receiving	4	9 years
Low Technology - Paper and Allied Products	4	9 years
High Technology - Communication Equipment	3	9 years
High Technology - Electrical Lighting and Wiring Equipment	3	9 years
Low Technology - Dairy Products	3	9 years
Low Technology - Cement Hydraulic	2	6 years
Low Technology - Rubber and Miscellaneous Plastics Products	2	9 years
Low Technology - Scheduled Air Transportation, Air Courier	1	5 years
Low Technology - Water Transportation	1	5 years
Total Number of Companies		**498**

Research Model II

In the research model II, the starting number of companies was 1,990. After detailed investigation, 1,086 companies did not have complete given financial information and demanded variables. Also, 388 companies can be found more than once in the database and 41 companies have very small and irrelevant values for my tests. The final number of companies observed and tested is 475.

Table 21: Number of companies included in the second research model

NUMBER OF COMPANIES	
Starting Number, Observed	**1,990**
Missing Data Companies	1,086
Repeating Companies	388
Small and Irrelevant Values	41
Final Number of Companies	**475**

As we can conclude from the sample, the largest number of companies belong to the High Technology - Computer programming, Software, Data Processing, 77 companies. 55 companies belong to the Low Technology Industry – Miscellaneous Manufacturing Industries. In total, there are 243 companies from the High Technology industries and 239 companies from the Low Technology industries. In percentages, the chronological ratio between High Technology and Low Technology industries is 50.415 % and 49.585 %. 6 companies were excluded from the Low Technology industry – Construction – Special Trade because my sample has only financial information for the last 9 years. In order to include this industry, financial information for the last 20 years is necessary. One company was excluded from the High Technology – Electrical Lighting and Wiring Equipment industry because financial information for the last 25 years is necessary in order to include this industry, and it was possible to follow only the last 9 year based on my sample. The largest investments in R&D are found in High Technology – Electronic Components, Semiconductors, High Technology - Computer programming, Software, Data Processing, High Technology – Communication Equipment and High Technology – Telephone Communication. The conclusion is that the largest investments in R&D are found mostly in the High Technology industries' companies.

Table 22: Number of companies per industry in the second research model

Industry	Number of Companies	Amortizable Life of Assets (Number of Years)
High Technology - Computer Programming, Software, Data Processing	77	2 years
Low Technology - Miscellaneous Manufacturing Industries	55	9 years
High Technology - Electrical Machinery and Equipment, Excluding Computers	48	9 years
High Technology - Research, Development, Testing Services	41	5 years
Low Technology - General Industrial Machinery and Equipment	39	9 years
High Technology - Drugs	36	5 years
Low Technology - Agricultural Products	28	9 years
Low Technology - Motor Vehicles and Motor Vehicle Equipment	19	5 years
Low Technology - Blast Furnaces and Steel Works	17	6 years
Low Technology - Miscellaneous Plastics Products	13	9 years
Low Technology - Grocery Stores	13	9 years
Low Technology - Lumber and Wood Products, Excluding Furniture	12	9 years
Low Technology - Paper and Allied Products	11	9 years
High Technology - Electronic Components, Semiconductors	10	9 years
Low Technology - Textile Mill Products	8	9 years
High Technology - Telephone Communications	8	9 years
High Technology - Computer and Office Equipment	6	9 years
Low Technology - Construction - Special Trade (EXCLUDING)	6	20 years
High Technology - Electrical Industrial Apparatus	5	9 years
Low Technology - Rubber and Miscellaneous Plastics Products	5	9 years
High Technology - Computer Hardware	4	3 years
Low Technology - Cement Hydraulic	4	6 years
High Technology - Electrical Transmissions and Distribution Equipment	3	9 years
Low Technology - Dairy Products	3	9 years
Low Technology - Trucking, Courier Services, Excluding Air	2	5 years
High Technology - Household Audio, Video Equipment, Audio Receiving	2	9 years
High Technology - Communication Equipment	2	9 years
Low Technology - Water Transportation	2	5 years
Low Technology - Wood Buildings, Mobile Homes (EXCLUDING)	1	25 years
High Technology - Electrical Lighting and Wiring Equipment	1	9 years
Low Technology - Scheduled Air Transportation, Air Courier	1	5 years
TOTAL NUMBER OF COMPANIES		**475**

4.1.3 Justification of Variables

I would like to use literature and justify all the given variables in the Table 23 below.

Table 23: Justification of variables

VARIABLES	AUTHORS
DEPENDENT	
Total Book Value	*(Daryaee et al., 2011; Edvinsson and Malone, 1997; ICM Group, Inc., 1998; Lee et al., 2005; Mohd Ali et al., 2008; Yi Wu and Wang, 2004)*
Total Non-Current Assets Value	*Proposition from the author*
Total Intangible Assets Value	*Proposition from the author*
INDEPENDENT	
Personnel Costs	*(Ballester et al., 2002; Bontis and Fitz-enz, 2002; Bukowitz and Petrash, 1997; García-Zambrano et al., 2018; Koch and McGRATH, 1996; Lajili, K. and Zeghal, 2005; Martín-de-Castro et al., 2011)*
Research and Development Expenses	*(Awano et al., 2010; Bandeira and Afonso, 2010; Martín-de-Castro et al., 2011; OECD, 1989; "RICARDIS" project 2006)*
Commercial Costs	*(Allen and Wilburn, 2002; Canibano et al., 2000; Cohen and Kaimenakis, 2006; Corrado et al., 2006; García-Zambrano et al., 2018; Martín-de-Castro et al., 2011; OECD, 1998)*
Costs of Sales	(Martín-de-Castro et al. 2011; OECD 1998a)
Research Assets Value	*(Damodaran, 2006, 2009)*

Based on the Table 23 above, we can list the following dependent and independent variables justification. It is highly important to justify the proposed variables using the existing and well-known literature. The credibility and validity of the whole study is questionable without that. I started with the dependent variables first. Total Book Value is confirmed by the main already published authors. The proposition of the last two dependent variables are from the authors, and those are Total Non-Current Assets Value and Total Intangible Assets Value. The last two dependent variables are taken in order to see how and where the value is developed. It is important to see whether we have capitalization of tangible or intangible assets value after investing in intellectual capital component. Are tangible or intangible assets created? The answer to these questions will be very interesting to examine.

On the other side, there are five following independent variables that are all confirmed and justified by the existing publications. Based on their causal relationship, all of them should contribute to the proposed dependent variables. The tendency of the author of this study is to explore the most recent studies that can justify the proposed independent variables.

4.1.4 Movement and Trends of Variables

4.1.4.1 Movement of Dependent Variables

As described below, the following dependent variables are included in the research process: Total Book Value (TBV), Total Non-Current Assets Value (TNCA) and Total Intangible Assets (TIA) Value. Total Book Value is the total, historic accounting value of a company that can be found in the official annual report. Total Non-Current Assets Value represents all assets whose useful period is over one year, and it includes all long-term assets. Total Intangible Assets represent all intangible assets of a company. Movements and trends of each dependent variable are presented in the Figures below in order to show their fluctuations and changes. The values represent an average and range from the lowest up to the largest. The observed period is from 2008 until 2016. The given values can be found in the official annual report, in the balance sheet part.

Total Book Value variable movement

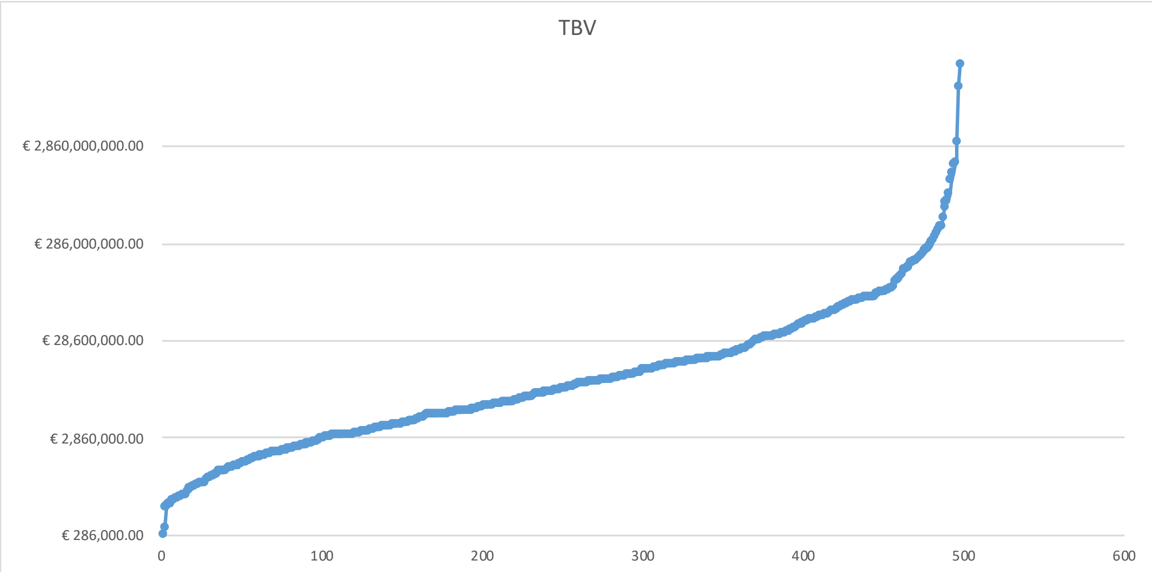

Figure 34: Average Total Book Value of companies ordered from highest to lowest in the period 2008 – 2016

The Figure 34 presents the structure and organization of all companies starting from the smallest up to the largest amounts of their total book value. The value starts from €287,000 and finishes at €19,728,169,000. This is an indicator that the sample is highly diversified and heterogenous and is composed of small, medium and large French companies. We can conclude that the biggest number of companies belong to the middle group of companies. The company Schneider Electric Industries SAS has the highest value of total book value.

Total Non-Current Assets variable movement

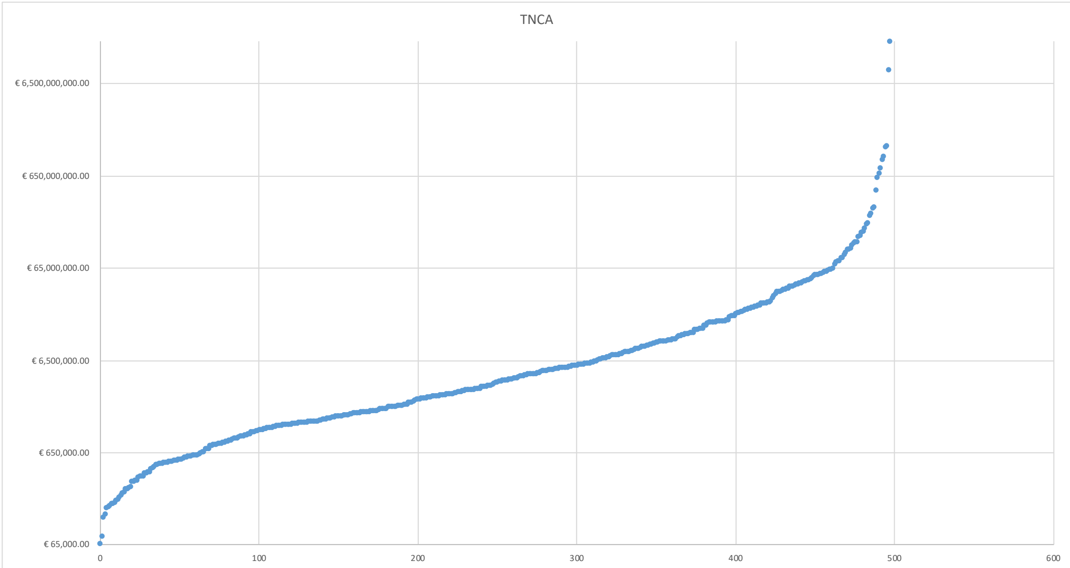

Figure 35: Average Total Non-Current Assets Value of companies ordered from highest to lowest in the period 2008 - 2016

We can observe the distribution of total non-current assets value of all companies taken into the final sample in the Figure 35. What is interesting is that the distribution starts at €65,222 and finishes at €18,158,162,000. This is a big indicator that the sample is highly diversified and heterogenous and is composed of small, medium and large French companies. The situation is the same as for total book value - the company Schneider Electric Industries SAS has the highest total non-current assets value. What can be concluded here is that most of the companies observed belong to the middle-sized companies.

Total Intangible Assets variable movement

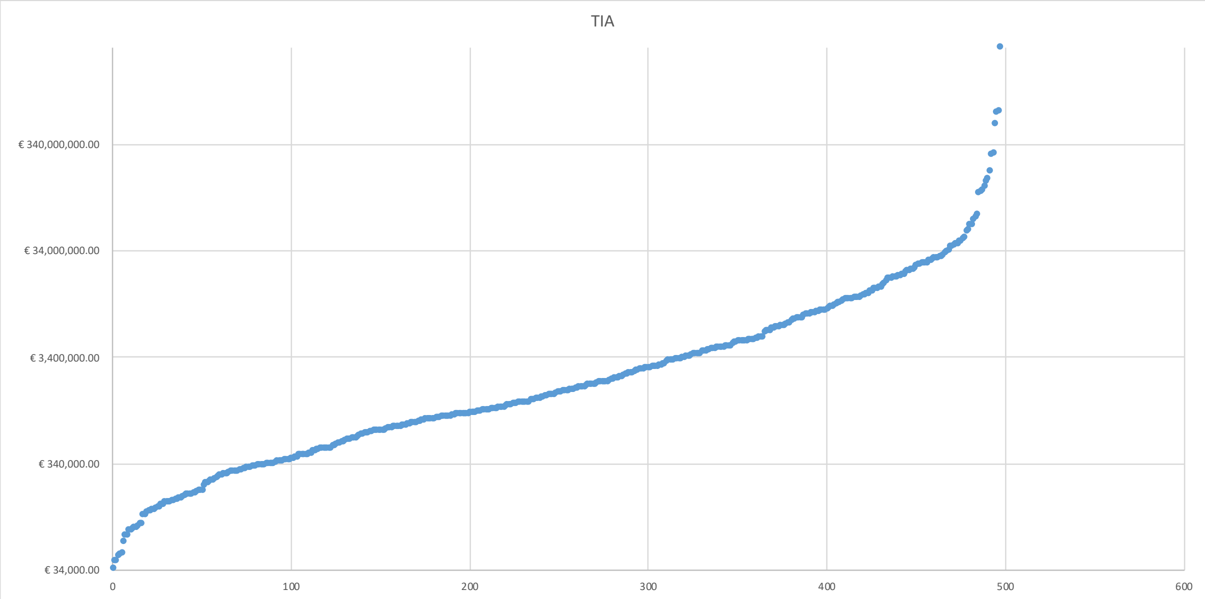

Figure 36: Average Total Intangible Assets Value of companies ordered from highest to lowest in the period 2008 – 2016

We can see the organization of all companies in our sample and their value of total intangible assets by looking at the Figure 36. The value starts at €35,000 and finishes at €2,777,520,000. Here also, the company that has the highest total intangible assets value is Schneider Electric Industries SAS.

Movement of all dependent variables

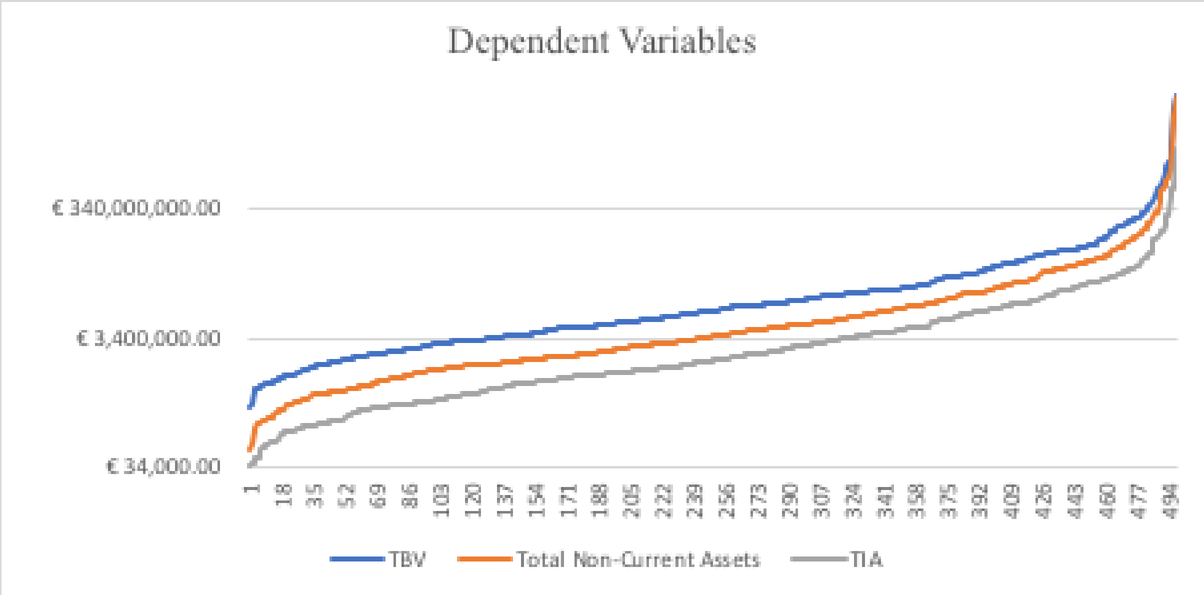

Figure 37: Movement of dependent variables

Movements and trends of all dependent variables are presented in the Figure 37 above. The Figure 37 has the purpose to prove that the Total Book Value variable is higher than the others, and the Total Non-Current Assets variable is higher than the Total Intangible Assets Value variables. By observing all three dependent variables, we can conclude that the distribution of company's values is equally organized, and that the final sample is composed of different companies at the same time. There are no radical differences between companies within the final sample.

4.1.4.2 Movement of Independent Variables

As described below, the following independent variables are included in the research process: Personnel Costs, Research and Development Expenses, Commercial Expenses and Costs of Sales. Personnel Costs include all salaries, treatments and social charges. Research and Development Expenses are all expenses related to research and development activities. Commercial Expenses are all expenses related to commercial activities. Costs of Sales are all costs related to sales of goods or services to the clients. Movements and trends of each dependent variable are presented in the Figures below in order to show their fluctuations and changes. The values represent an average and range from the lowest up to the largest. The observed period is from 2008 until 2016. The given values can be found in the official annual report, in the profit and loss account part.

Personnel Costs variable movement

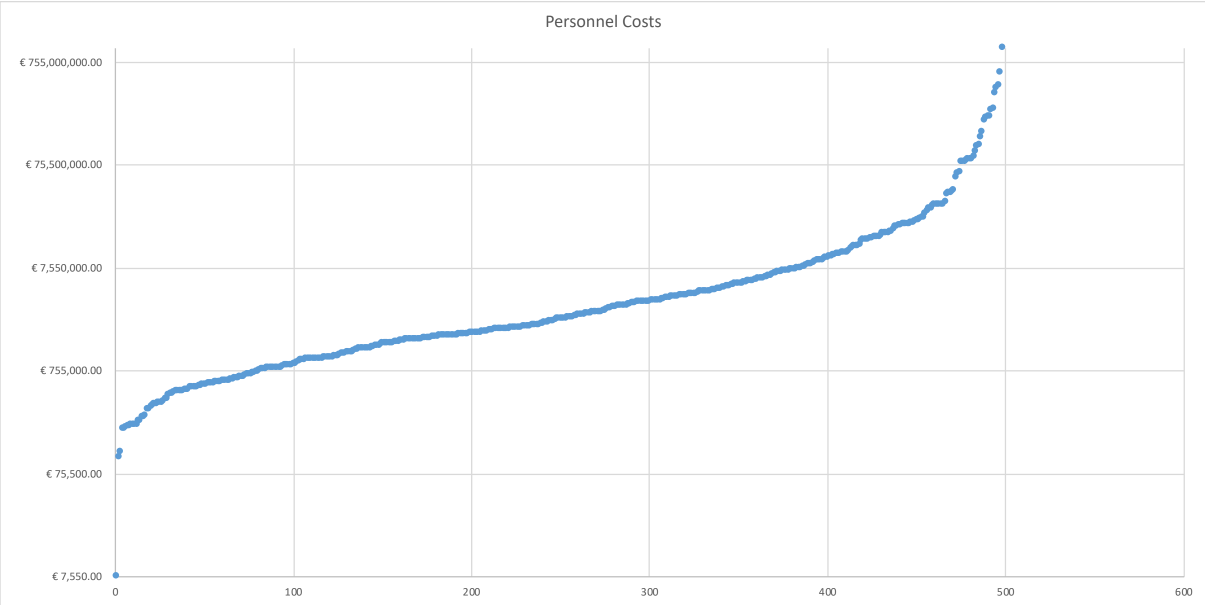

Figure 38: Average Personnel Costs Value of companies ordered from highest to lowest in the period 2008 - 2016

Observing the Figure 38, we can conclude that values start at €7,555 and finish at €1,019,128,000. This is an indicator that the sample is highly diversified and heterogenous and is composed of small, medium and large French companies. The company that invests the highest amounts in the personnel costs is CEGID. Personnel costs are closely related to the human capital component of intellectual capital.

R&D expenses variable movement

Figure 39: Average Research and Development (R&D) Expenses Value of companies ordered from highest to lowest in the period 2008 - 2016

The Figure 39 shows that value of research and development expenses ranges from €2,000 to €625,988,000. As we can see, the distribution of this value is highly distinctive, but majority of companies observed in the sample belong to the group of middle-sized companies.

Commercial Expenses variable movement

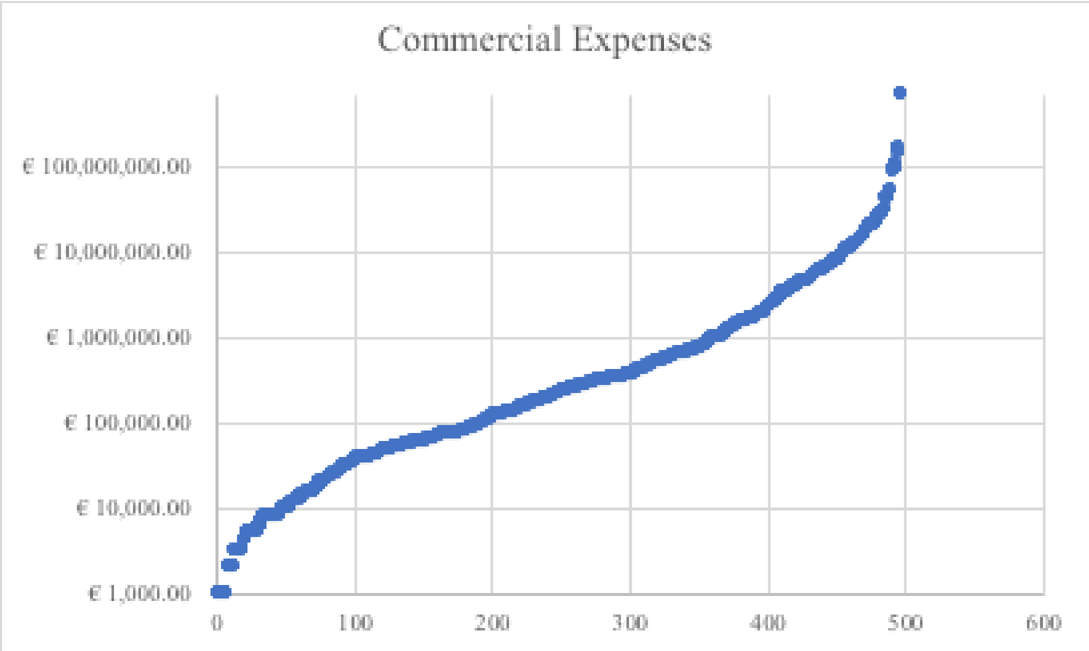

Figure 40: Average Commercial Expenses Value of companies ordered from highest to lowest in the period 2008 - 2016

Based on Figure 40 above, it can be concluded that the company that invests the largest amount in commercial activities is Monoprix Exploit Par Abbreviation MPX. We can make a conclusion that values start from €1,000 and finish at €684,690,000. This is an indicator that the sample is highly diversified and heterogenous and is composed of small, medium and large French companies.

Costs of Sales variable movement

Figure 41: Average Costs of Sales Value of companies ordered from highest to lowest in the period 2008 - 2016

The Figure 41 shows that the sample of companies observed is highly diversified. This is stated because the distribution of value of Costs of Sales ranges from €3,555 up to €3,905,922,000. When compared to all the other companies, Monoprix Exploit Par Abbreviation MPX and Decathlon invest the most.

Research Asset Value variable movement

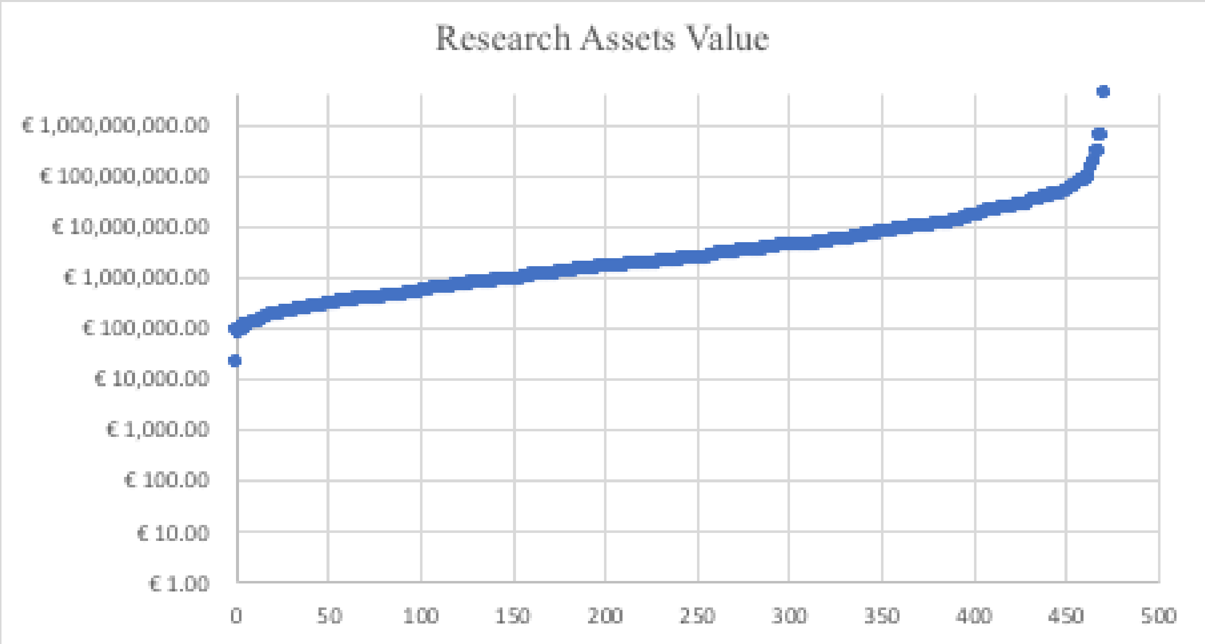

Figure 42: Average Research Assets Value of companies ordered from highest to lowest in the period 2008 - 2016

Based on the Figure 42 above, it can be concluded that Research Asset Value developed from the research and development expenses ranges from €22,110 to €4,024,849,670. The conclusion is that regardless of the company's size, French companies invest in intellectual capital. The amount of investments differs from industry to industry, but also from the smallest to the largest corporations. The amount of their investments differs mostly from the company's opportunities. General conclusion is that French companies are innovative, and this is confirmed by the studies already explored at the beginning of this study.

Independent Variables movement

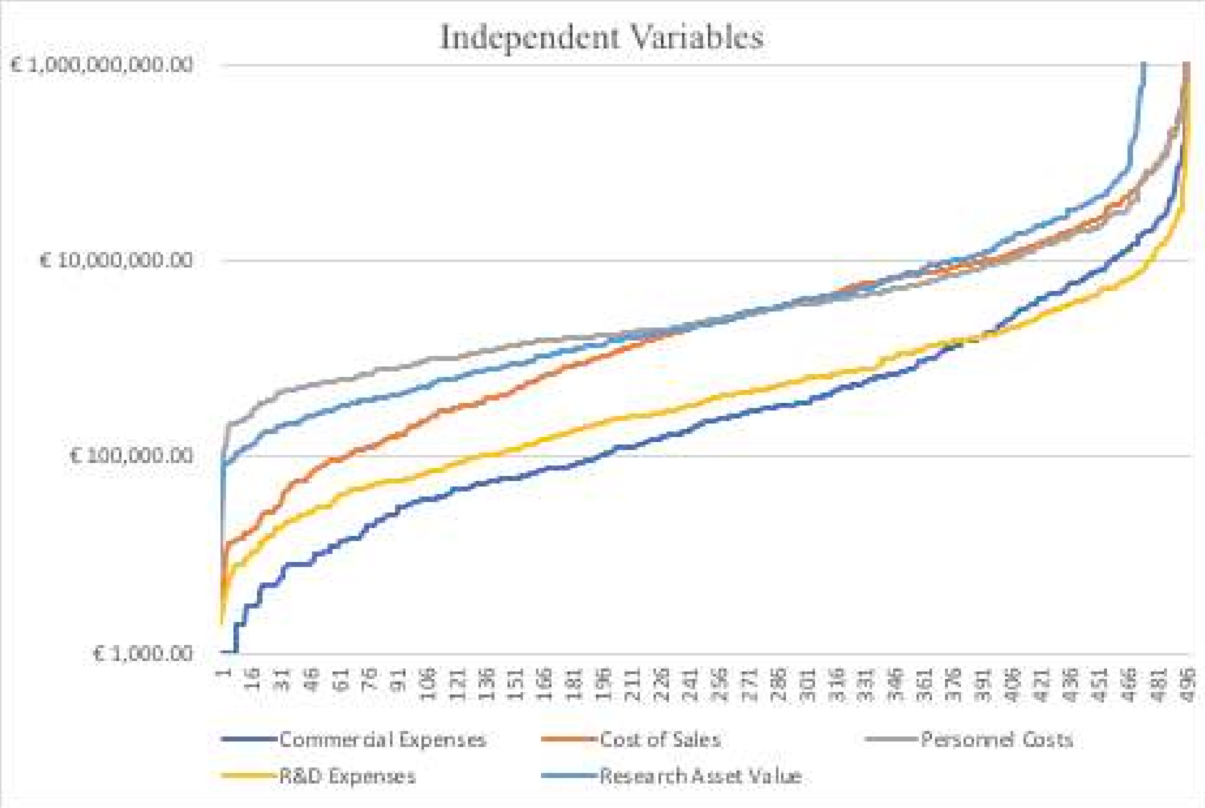

Figure 43: Movement of independent variables

The Figure 43 above presents the movements of all independent variables. As it can be concluded, small companies have the highest investments in Personnel Costs, whereas the situation is different when it comes to large companies whose investments are highest in the Costs of Sales or relationships with their clients. One more interesting fact is that regardless of whether a company is small or large and multinational, all of them spend on the given variables, which is very optimistic and positive. This is the proof that companies are highly innovative and competitive regardless of their size and industry. The exploration produced by different authors about innovativeness of French economy was proven and validated with my data sample.

The fact is that French companies invest in intellectual components, but the question is how they manage it? How do they use those investments, and in which manner?

4.1.4.3 Ratio Analysis

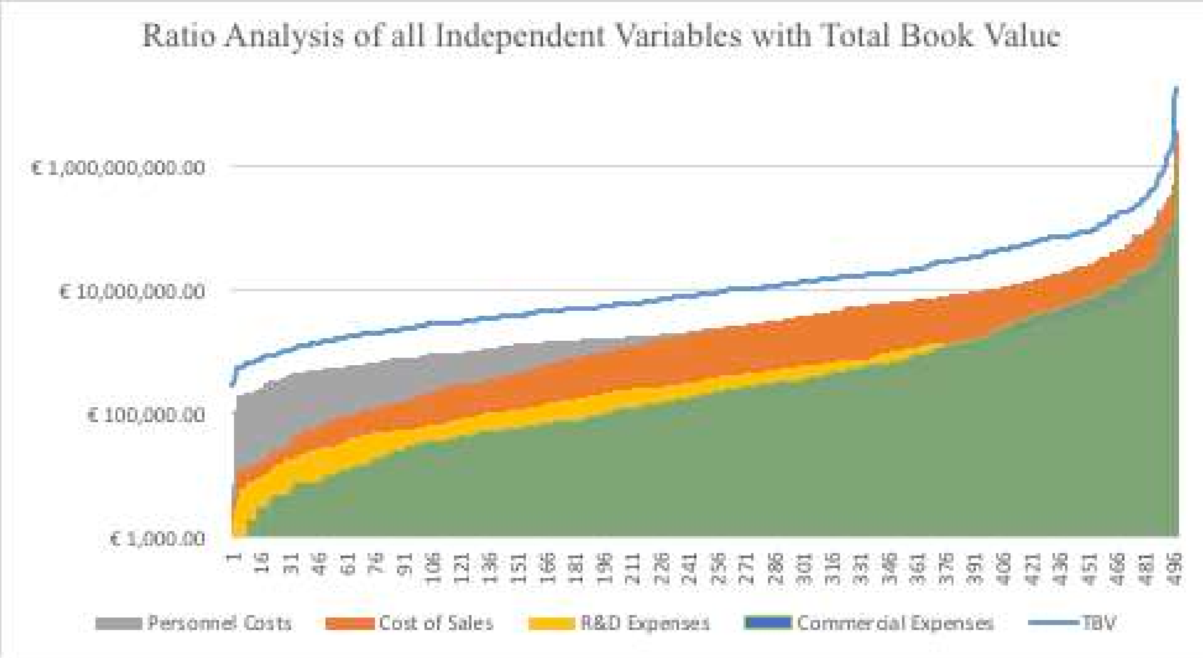

Figure 44: Ratio Analysis of all Independent variables and Total Book Value variable

Based on the Figure 44 above, we can conclude that expenditures on employees, sales activities, research and development activities, commercial activities, are highly proportional compared to the value of total book value. It is good to have such a diversified sample of companies because it provides more comprehensive findings in the end.

4.2 Descriptive Statistics

Descriptive values of analyzed companies in the sample are provided in the Table 24. Data are given for all the proposed variables and they contain the minimum and maximum values of variables, mean, median, standard deviations, variances, test of normality (kurtosis and skewness), range and sum.

The descriptive statistics of dependent and independent variables of 498 companies gathered in the first research model and 482 companies collected in the second research model are tested. The mean value in the Table 24 shows that sample companies are considerably effective in generating values from their intellectual capital base. All variables have the respective mean values of 20,566,069; 3,693,153; 6,289,476; 29,469,536; 16,361,130; 18,211,491; 84,546,702 and 118,432,756. By observing the independent variables, it is apparent that the Relational capital is the most effective component of intellectual capital, followed by Human capital, and finally Structural capital at the end. By observing the dependent variables, it is obvious that the most effective component is Total Book Value, followed by Total Non-Current Asset Value and finally Total Intangible Assets Value.

Table 24: Descriptive statistics

		Research Asset Value	Research and Development Expenses	Commercial Fond (Expenses)	Costs of Sales (Expenses)	Personnel Costs (Salaries and Traitments + Sociales Charges)	Total Intangible Assets	Total Non-Current Assets (mora da bude vece od TIA)	Total Book Value
N	Valid	475	498	498	498	498	498	498	498
	Missi	23	-	-	-	-	-	-	-
Mean		20,566,069	3,693,153	6,289,476	29,469,536	16,361,130	18,211,491	84,546,702	118,432,756
Std. Error of Mean		8,706,028	1,380,616	2,017,923	11,034,138	3,044,223	6,067,000	41,005,508	46,922,327
Median		2,006,000	370,500	224,000	2,271,000	2,416,056	1,559,000	3,635,500	9,016,500
Mode		85,440	16000a	8,000	3,047,000	795,000	327000a	353000a	16,890,000
Std. Deviation		189,743,489	30,809,718	45,031,785	246,236,861	67,934,611	135,390,637	915,075,382	1,047,114,585
Variance		36,002,591,784,481,500	949,238,695,524,134	2,027,861,623,283,460	60,632,591,752,763,800	4,615,111,330,303,220	18,330,624,560,269,300	837,362,954,065,728,000	1,096,448,954,132,360,000
Skewness		20	18	14	15	9	18	17	16
Std. Error of Skewness		0	0	0	0	0	0	0	0
Kurtosis		421	346	203	226	114	351	326	278
Std. Error of Kurtosis		0	0	0	0	0	0	0	0
Range		4,024,827,560	625,986,000	684,689,000	3,905,918,445	1,019,120,445	2,777,485,000	18,158,096,778	19,727,882,000
Minimum		22,110	2,000	1,000	3,555	7,555	35,000	65,222	287,000
Maximum		4,024,849,670	625,988,000	684,690,000	3,905,922,000	1,019,128,000	2,777,520,000	18,158,162,000	19,728,169,000
Sum		9,768,882,840	1,839,190,370	3,132,158,944	14,675,828,725	8,147,842,906	9,069,322,598	42,104,257,779	58,979,512,447

a. Multiple modes exist. The smallest value is shown

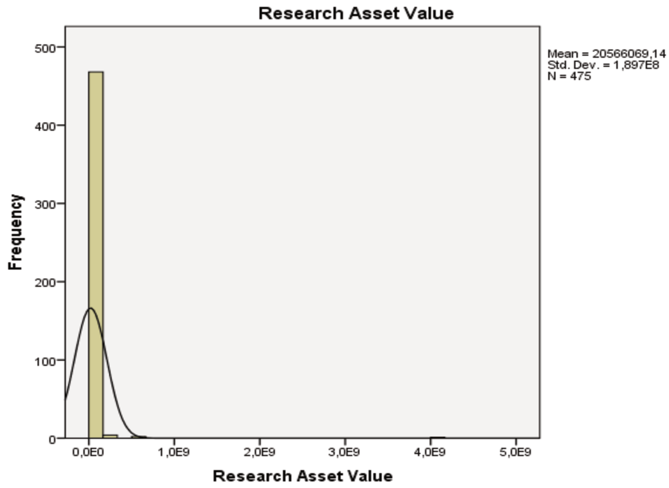

Figure 45: Histogram distribution of Research Asset Value

The histogram Figure 45 illustrates the distribution of Research Asset Value variable. The graphic shows that distribution is positive and not less than zero, concentrated around the center and there are extreme values because of high diversity of sample units. The number of extreme values does not influence the quality of the produced final results.

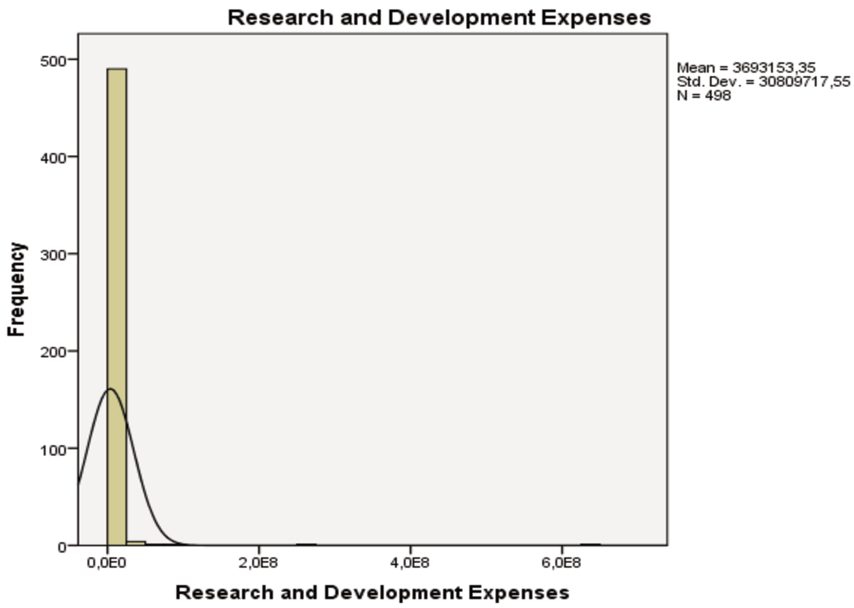

Figure 46: Histogram distribution of Research and Development Expenses

The Figure 46 presents the distribution of Research and Development Expenses variable. What is important is that the number of extreme values does not influence and limit the quality of the final findings of this study.

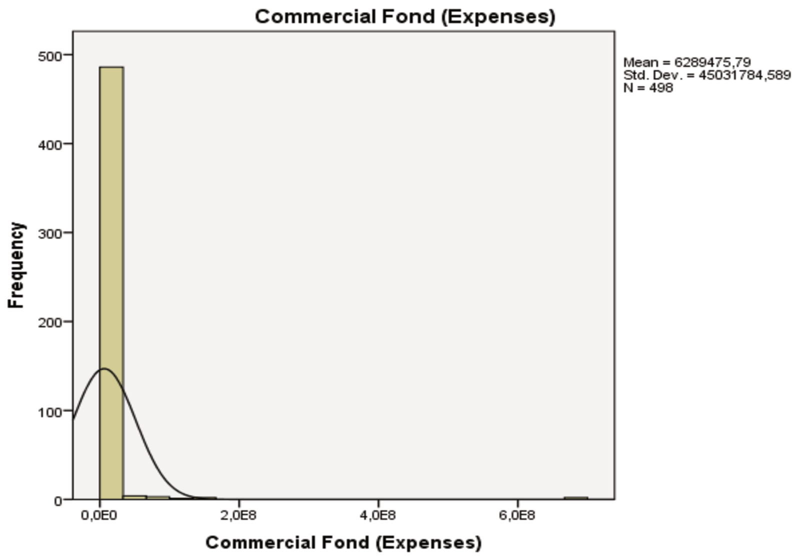

Figure 47: Histogram distribution of Commercial Fond (Expenses)

Based on the Figure 47 above, the histogram of the organization of Commercial Fond is presented. The number of extreme values does not influence the quality of the produced final results. The histogram graphic illustrates the distribution of Commercial Fond (Expenses) variable. The graphic shows that distribution is positive and not less than zero, concentrated around the center and there are extreme values because of high diversity of sample units.

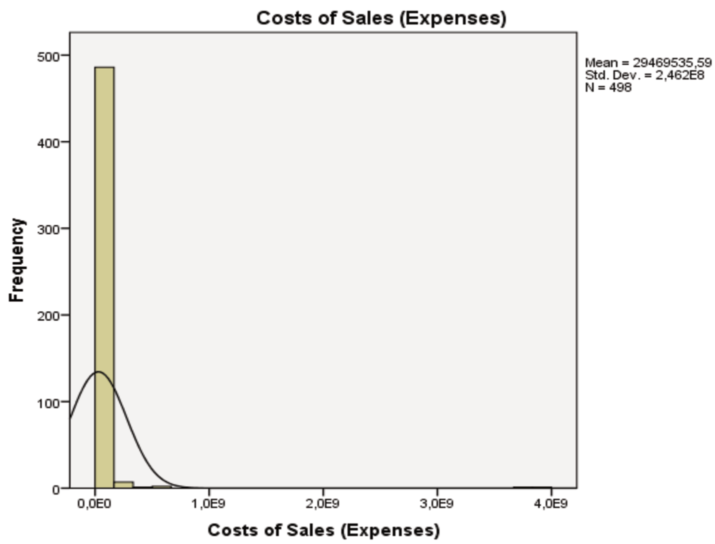

Figure 48: Histogram distribution of Costs of Sales (Expenses)

Next, the Figure 48 presents the distribution of Costs of Sales (Expenses) variable. In this Figure, there are extreme values because of high diversity of sample units that are observed and collected. What is important is that the number of extreme values does not influence the quality of the produced final results.

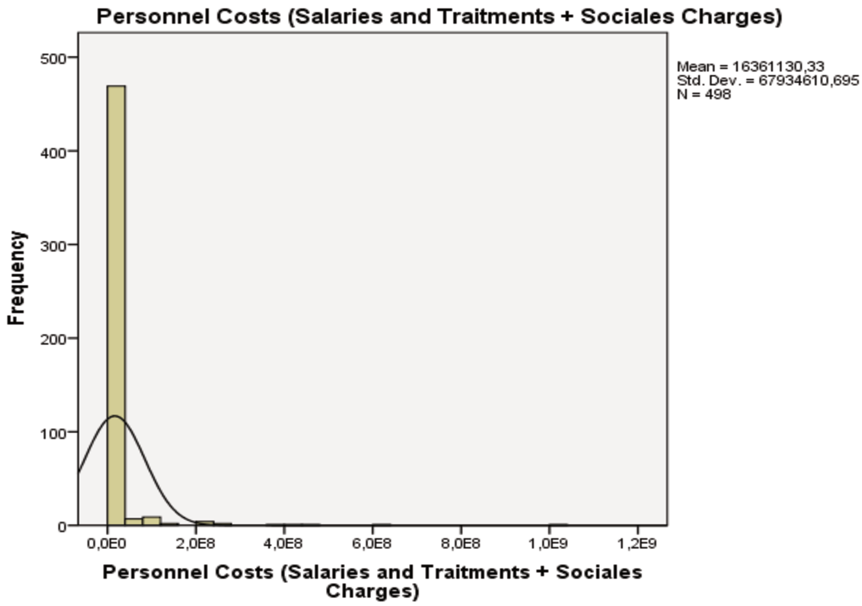

Figure 49: Histogram distribution of Personnel Costs (Salaries and Traitments + Sociales Charges)

The Figure 49 above presents the histogram of the distribution of Personnel Costs (Salaries and Traitments + Sociales Charges) variable. The distribution of values is positive, concentrated around the mean, with the standard deviation of 67,934,610. This is the proof that the whole sample is highly diversified.

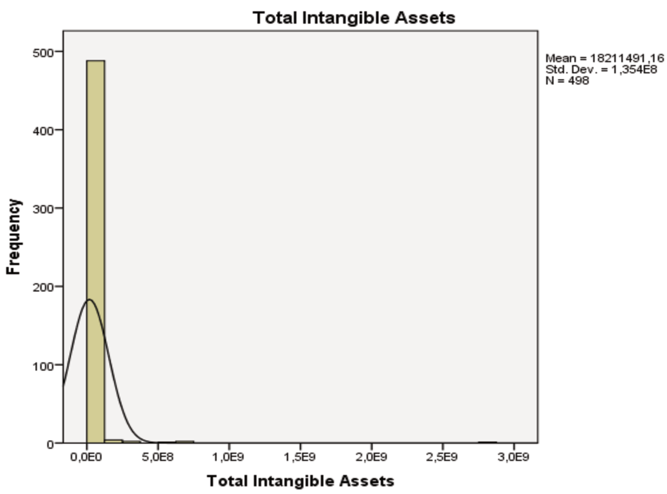

Figure 50: Histogram distribution of Total Intangible Assets

The histogram graphic illustrates the distribution of Total Intangible Assets variable. The graphic shows that distribution is positive and not less than zero, concentrated around the center and there are extreme values because of high diversity of sample units. The number of extreme values does not influence the quality of the produced final results.

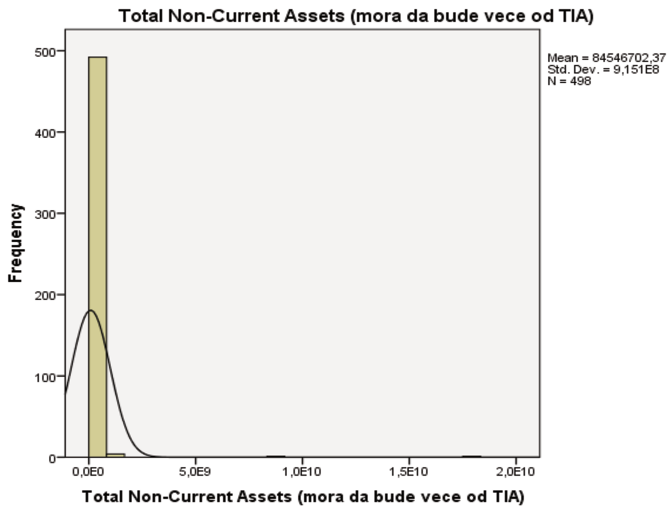

Figure 51: Histogram distribution of Total Non-Current Assets

The histogram graphic illustrates the distribution of Total Non-Current Assets variable. The graphic shows that distribution is positive and not less than zero, concentrated around the center and there are extreme values because of high diversity of sample units. The number of extreme values does not influence the quality of the produced final results.

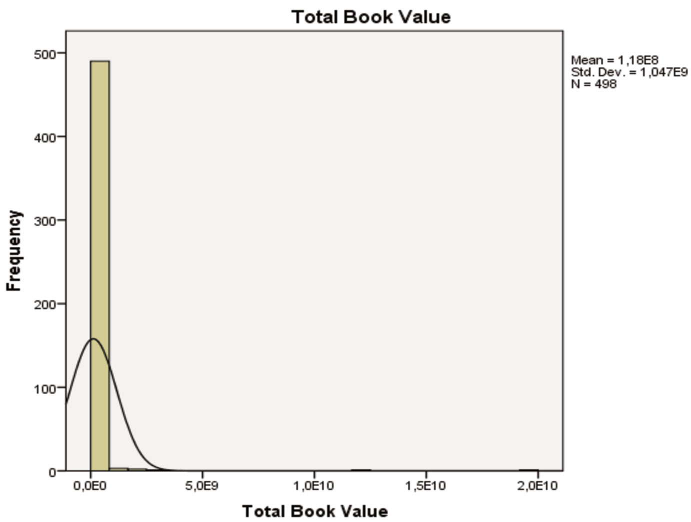

Figure 52: Histogram distribution of Total Book Value

The Figure 52 above presents the histogram distribution of the Total Book Value variable. This variable is a dependent variable in this study. The mean is 1,18E8, whereas the Standard

Deviation is 1,047E8. The whole distribution is positive, and it is around the center, not less than zero. What is important to understand is that the number of extreme values does not influence the quality of the produced final results.

Regarding the sample that is observed in this research, there are big oscillations which are identified mainly because of the large size of the sample and size difference between companies included in the sample. A very important indicator is seen in the parameter test of kurtosis and distribution of data that shows that the data is concentrated around the center of distribution. This parameter has positive values and because of that it is concentrated around the center in the middle. The second very important parameter of asymmetry is skewness. So, the positive values of asymmetry show that if they are positioned to the left of the middle value then it is the matter of positive value, or opposite, if they are more to the right, it is the negative value. Information about the asymmetry is needed for calculation, especially in social sciences with smaller samples that will show much more normal and precise distribution of data. Normal distribution of data in social sciences is a very rare case.

4.3 Pearson Correlations

Correlations between all variables are presented in the following table. The Pearson correlation test, i.e. non-parametric test, was applied and used for analyzing data and sample without normal distribution. Interpretations of correlation analyses results are based on the scale given by Cohen (2013). Low correlation is found in coefficients of correlation between -0.29 and -0.10 or between 0.10 and 0.29, middle correlation is found in coefficients between -0.49 and -0.30 and 0.30 and 0.49, and high correlation is found in all coefficients between -1.0 and -0.5 and 0.5 and 1.

According to the Pearson correlations table, the most strengthened relations are found between Research and Development expenses variable and Commercial Fond, Total Intangible Assets, Total Non-Current Assets and Total Book Value. Also, the powerful relation is found between the Commercial Fond and Total Intangible Assets variable.

The weakest correlations are found between Research Asset Value variable and Total Intangible Assets, Total Non-Current Assets Value and Total Book Value variables. Also, the weak relation is found between Commercial Fond Expenses variable and Research Asset Value variable.

Table 25: Table of Pearson Correlations

Correlations

		Research Asset Value	Research and Development Expenses	Commercial Fond (Expenses)	Costs of Sales (Expenses)	Personnel Costs (Salaries and Traitments + Sociales Charges)	Total Intangible Assets	Total Non-Current Assets (mora da bude vece od TIA)	Total Book Value
Research Asset Value	Pearson Correlation	1	-.010	-.010	-.007	-.017	-.009	-.007	-.009
	Sig. (2-tailed)		.830	.833	.876	.717	.838	.872	.847
	N	475	475	475	475	475	475	475	475
Research and Development Expenses	Pearson Correlation	-.010	1	,685**	.027	,540**	,871**	,819**	,780**
	Sig. (2-tailed)	.830		.000	.555	.000	.000	.000	.000
	N	475	498	498	498	498	498	498	498
Commercial Fond (Expenses)	Pearson Correlation	-.010	,685**	1	,484**	,545**	,809**	,645**	,641**
	Sig. (2-tailed)	.833	.000		.000	.000	.000	.000	.000
	N	475	498	498	498	498	498	498	498
Costs of Sales (Expenses)	Pearson Correlation	-.007	.027	,484**	1	,326**	,207**	,104*	,189**
	Sig. (2-tailed)	.876	.555	.000		.000	.000	.020	.000
	N	475	498	498	498	498	498	498	498
Personnel Costs (Salaries and Traitments + Sociales Charges)	Pearson Correlation	-.017	,540**	,545**	,326**	1	,492**	,476**	,517**
	Sig. (2-tailed)	.717	.000	.000	.000		.000	.000	.000
	N	475	498	498	498	498	498	498	498
Total Intangible Assets	Pearson Correlation	-.009	,871**	,809**	,207**	,492**	1	,940**	,924**
	Sig. (2-tailed)	.838	.000	.000	.000	.000		.000	.000
	N	475	498	498	498	498	498	498	498
Total Non-Current Assets (mora da bude vece od TIA)	Pearson Correlation	-.007	,819**	,645**	,104*	,476**	,940**	1	,992**
	Sig. (2-tailed)	.872	.000	.000	.020	.000	.000		0.000
	N	475	498	498	498	498	498	498	498
Total Book Value	Pearson Correlation	-.009	,780**	,641**	,189**	,517**	,924**	,992**	1
	Sig. (2-tailed)	.847	.000	.000	.000	.000	.000	0.000	
	N	475	498	498	498	498	498	498	498

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

4.4 Complex Regression Analyses

Statistical relationships between dependent and independent variables are presented in the following tables based on the complex or multivariate regression analyses. The analyses show the relationship and its strength between dependent and independent variables, as well as the percentage of precision of these analyses. Tables present that value creation efficiency of investments in intellectual capital is significantly positively associated with the financial performance in the form of the total book value of a company in the first research model. In the second research model, the results are different and combined with positively and negatively associated correlations.

1 Multiple Regression Analysis

Source	SS	df	MS
Model	3.4948e+20	4	8.7370e+19
Residual	1.9546e+20	493	3.9646e+17
Total	5.4494e+20	497	1.0964e+18

Number of obs	=	498
F(4, 493)	=	220.37
Prob > F	=	0.0000
R-squared	=	0.6413
Adj R-squared	=	0.6384
Root MSE	=	6.3e+08

TotalBookVa~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Researchand~s	23.20292	1.535174	15.11	0.000	20.18663	26.21921
CommercialF~s	1.95104	1.122955	1.74	0.083	-.2553286	4.157409
CostsofSale~s	.4605262	.1543567	2.98	0.003	.1572481	.7638044
PersonnelCo~a	1.03997	.5331264	1.95	0.052	-.0075104	2.08745
_cons	-1.01e+07	2.91e+07	-0.35	0.728	-6.72e+07	4.70e+07

TotalBookValue = a0 + a1*ResearchandDevelopmentExpenses + a2*CommercialFondExpenses + a3*CostsofSalesExpenses + a4*PersonnelCostsSalariesandTra + E

In the following research model, the dependent variable is Total Book Value (TotalBookValue), whereas the independent variables are Research and Development Expenses (ResearchandDevelopmentExpenses), Commercial Fond Expenses (CommercialFondExpenses), Costs of Sales (CostsofSalesExpenses) and Personnel Costs, Salaries and Social Charges (PersonnelCostsSalariesandTra).

First of all, the focus is on the ANOVA part. Model SS has the value of 3.4948e+20 and shows how much our regression explained the study in comparison with the total value which is 5.4494e+20. The percentage of explanation is 64,131831 % precisely, which is over 50 % and represents a very good percentage. The residual value of SS shows how much remains unexplained and that is 35,868169 %. On the right side, we can see the number of observations, which is 498. 498 is the number of companies observed, and this number is already confirmed in the part of data sample description, number of companies in the first research model. R-Squared is the percentage of explanation with my study. Prob > F has the value of 0.0000 which represents the highest precision of the study, without errors.

The next step is exploring strength of independent variable coefficients: Research and Development Expenses, Commercial Fond Expense, Costs of Sales and Personnel Costs, Salaries and Social Charges. We will focus on each variable separately. First, Research and Development Expenses variable has a highly positive coefficient of 23.20292. Because t = 15.11 has a higher value than P > | t | = 0.000, then we can definitely conclude that there are relationships between these two variables. The positive link is confirmed. The Research and Development Expenses variables have a standard deviation of 1.535174.

The second independent variable is Commercial Fond Expenses. Commercial Fond Expenses variable has a positive coefficient of 1.95104. Because t = 1.74 has a higher value than P > | t | = 0.083, then we can definitely conclude that there are relationships between these two variables. The positive link is confirmed. The Commercial Fond Expenses variable has a standard deviation of 1.122955.

The third independent variable is Costs of Sales. Costs of Sales variable has a positive coefficient of 0.4605262. Because t = 2.98 has a higher value than P > | t | = 0.003, then we can definitely conclude that there are relationships between these two variables. The positive link is confirmed. The Costs of Sales variable has a standard deviation of 0.1543567.

The fourth independent variable is Personnel Costs, Salaries and Social Charges. Personnel Costs, Salaries and Social Charges variable has a positive coefficient of 1.03997. Because t = 1.95 has a higher value than P > | t | = 0.052, then we can definitely conclude that there are relationships between these two variables. The positive link is confirmed. The Personnel Costs, Salaries and Social Charges variable has a standard deviation of 0.5331264.

Based on the produced statistical results, we can conclude that independent variables Research and Development Expenses (ResearchandDevelopmentExpenses), Commercial Fond Expenses (CommercialFondExpenses), Costs of Sales (CostsofSalesExpenses) and Personnel Costs, Salaries and Social Charges (PersonnelCostsSalariesandTra) extremely positively influence the dependent variable Total Book Value (TotalBookValue).

1.1 Multiple Regression Analysis

Source	SS	df	MS
Model	7.7201e+18	4	1.9300e+18
Residual	1.3903e+18	493	2.8200e+15
Total	9.1103e+18	497	1.8331e+16

Number of obs =	498
F(4, 493) =	684.40
Prob > F =	0.0000
R-squared =	0.8474
Adj R-squared =	0.8462
Root MSE =	5.3e+07

TotalIntangibleAssets	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ResearchandDevelopmentExpenses	2.771438	.129474	21.41	0.000	2.517049	3.025827
CommercialFondExpenses	1.239213	.0947082	13.08	0.000	1.053132	1.425295
CostsofSalesExpenses	.0093771	.0130182	0.72	0.472	-.0162009	.034955
PersonnelCostsSalariesandTra	-.1579316	.044963	-3.51	0.000	-.2462743	-.0695889
_cons	2489746	2450063	1.02	0.310	-2324108	7303600

TotalIntangibleAssets = a0 + a1*ResearchandDevelopmentExpenses + a2*CommercialFondExpenses + a3*CostsofSalesExpenses + a4*PersonnelCostsSalariesandTra + E

Next research model that is observed is the research model 1.1 and it is a sub-model from the first main research model. In this research model, the dependent variable is Intangible Assets Value (TotalIntangibleAssets), whereas the independent variables are Research and Development Expenses (ResearchandDevelopmentExpenses), Commercial Fond Expenses (CommercialFondExpenses), Costs of Sales (CostsofSalesExpenses) and Personnel Costs, Salaries and Social Charges (PersonnelCostsSalariesandTra).

First of all, we focus on the ANOVA part. The percentage of explanation is 84.7403488 % precisely, which is over 50 % and represents a very good percentage. We calculated this percentage of explanation when we divided the value of 7.7201e+18 that is Model SS by the total value that is 9.1103e+18. The residual value of SS shows how much is left unexplained and that is 15,2596512 %. On the right side, we can see the number of observations, which is 498. The 498 is the number of companies observed, and this number is already confirmed in the part of data sample description, number of companies in the first research model. R-Squared is the percentage of explanation within my study. Prob > F has the value of 0.0000 which represents the highest precision of the study, without errors.

The second step is determining strength of independent variable coefficients: Research and Development Expenses, Commercial Fond Expense, Costs of Sales and Personnel Costs, Salaries and Social Charges. We will focus on each variable respectively:

- First, Research and Development Expenses variable has a highly positive coefficient of 2.771438. Because t = 21.41 has a higher value than P > | t | = 0.000, then we can definitely conclude that there are relationships between these two variables. The positive link is confirmed. The Research and Development Expenses variables have a standard deviation of 0.129474.

- The second independent variable is Commercial Fond Expenses. Commercial Fond Expenses variable has a positive coefficient of 1.239213. Because t = 13.08 has a higher value than P > | t | = 0.000, then we can definitely conclude that there are relationships between these two variables. The positive link is confirmed. The Commercial Fond Expenses variable has a standard deviation of 0.0947082.

- The third independent variable is Costs of Sales. Costs of Sales variable has a positive coefficient of 0.0093771. Because t = 0.72 has a higher value than P > | t | = 0.472, then we can definitely conclude that there are relationships between these two variables. The positive link is confirmed. The Costs of Sales variable has a standard deviation of 0.0130182.
- The fourth independent variable is Personnel Costs, Salaries and Social Charges. Personnel Costs, Salaries and Social Charges variable have a negative coefficient of -0.1579316. Because t = - 3.51 has a lower value than P > | t | = 0.000, then we can definitely conclude that there are no relationships between these two variables. The

negative link is not confirmed. The Personnel Costs, Salaries and Social Charges variables have a standard deviation of 0.44963.

Based on the produced statistical results, we can conclude that independent variables Research and Development Expenses (ResearchandDevelopmentExpenses), Commercial Fond Expenses (CommercialFondExpenses), Costs of Sales (CostsofSalesExpenses) and Personnel Costs, Salaries and Social Charges (PersonnelCostsSalariesandTra) extremely positively influence the dependent variable Intangible Assets Value (TotalIntangibleAssets).

1.2 Multiple Regression Analysis

Source	SS	df	MS
Model	2.8487e+20	4	7.1219e+19
Residual	1.3129e+20	493	2.6632e+17
Total	4.1617e+20	497	8.3736e+17

Number of obs =	498
F(4, 493) =	267.42
Prob > F =	0.0000
R-squared =	0.6845
Adj R-squared =	0.6820
Root MSE =	5.2e+08

TotalNonCurrentAssetsmorada	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ResearchandDevelopmentExpenses	21.29513	1.258222	16.92	0.000	18.82299	23.76727
CommercialFondExpenses	2.924488	.9203696	3.18	0.002	1.116157	4.732818
CostsofSalesExpenses	.0502564	.1265101	0.40	0.691	-.1983091	.2988219
PersonnelCostsSalariesandTra	.0814109	.4369482	0.19	0.852	-.7770995	.9399213
_cons	-1.53e+07	2.38e+07	-0.64	0.521	-6.21e+07	3.15e+07

$$TotalNonCurrentAssets = a0 + a1*ResearchandDevelopmentExpenses + a2*CommercialFondExpenses + a3*CostsofSalesExpenses + a4*PersonnelCostsSalariesandTra + E$$

The third research model is examined in this part. The following research model includes the Total Non-Current Assets (TotalNonCurrentAssets) as dependent variables, whereas independent variables are Research and Development Expenses (ResearchandDevelopmentExpenses), Commercial Fond Expenses (CommercialFondExpenses), Costs of Sales (CostsofSalesExpenses) and Personnel Costs, Salaries and Social Charges (PersonnelCostsSalariesandTra).

First of all, the focus is on the ANOVA part. Model SS has the value of 2.8487e+20 and shows how much our regression explained the study in comparison with the total value which is 4.1617e+20. The percentage of explanation is 68.450393 % precisely, which is over 50 % and represents a very good percentage. The residual value of SS shows how much remains unexplained and that is 31.549607 %. On the right side, we can see the number of observations, which is 498. 498 is the number of companies observed, and this number is already confirmed in the part of data sample description, number of companies in the first research model. R-Squared is the percentage of explanation within my study. Prob > F has the value of 0.0000 which represents the highest precision of the study, without errors.

The second step is exploring strength of independent variable coefficients: Research and Development Expenses, Commercial Fond Expense, Costs of Sales and Personnel Costs, Salaries and Social Charges. It is important to explore and to see whether we accept coefficients of our proposed variables.

First, Research and Development Expenses variable has a highly positive coefficient of 21.29513. Because t = 16.92 has a higher value than P > | t | = 0.000, then we can definitely conclude that there are relationships between these two variables. The positive link is confirmed. The Research and Development Expenses variable has a standard deviation of 1.258222.

The second independent variable is Commercial Fond Expenses. Commercial Fond Expenses variable has a positive coefficient of 2.924488. Because t = 3.18 has a higher value than P > | t | = 0.002, then we can definitely conclude that there are relationships between these two variables. The positive link is confirmed. The Commercial Fond Expenses variable has a standard deviation of 0.9203696.

The third independent variable is Costs of Sales. Costs of Sales variable has a positive coefficient of 0.0502564. Because t = 0.40 has a higher value than P > | t | = 0.691, then we can definitely conclude that there are no relationships between these two variables. The positive link is not confirmed. The Costs of Sales variable has a standard deviation of 0.1265101.

The fourth independent variable is Personnel Costs, Salaries and Social Charges. Personnel Costs, Salaries and Social Charges variables have a positive coefficient of 0.0814109. Because t = 0.19 has a lower value than P > | t | = 0.852, then we can definitely conclude that there are no relationships between these two variables. The negative link is not confirmed. The Personnel Costs, Salaries and Social Charges variables have a standard deviation of 0.4369482.

We can make a conclusion that independent variables Research and Development Expenses, Commercial Fond Expenses, Costs of Sales and Personnel Costs, Salaries and Social Charges extremely positively influence the dependent variable Total Non-Current Assets.

2 Multiple Regression Analysis

Source	SS	df	MS
Model	3.7086e+20	2	1.8543e+20
Residual	1.7383e+20	472	3.6828e+17
Total	5.4469e+20	474	1.1491e+18

Number of obs	=	475
F(2, 472)	=	503.51
Prob > F	=	0.0000
R-squared	=	0.6809
Adj R-squared	=	0.6795
Root MSE	=	6.1e+08

TotalBookValue	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ResearchAssetValue	5.163009	.4587608	11.25	0.000	4.261542	6.064475
RDExpensesAverage	-3.176322	2.737094	-1.16	0.246	-8.55472	2.202075
_cons	3.19e+07	2.82e+07	1.13	0.258	-2.34e+07	8.72e+07

TotalBookValue = a0 + a1*ResearchAssetValue + a2*RDExpensesAverage + E

In the following research model, dependent variables represent Total Book Value whereas independent variables represent Research Assets Value and Research and Development Expenses.

First of all, the focus is on the ANOVA part. Model SS has the value of 3.7086e+20 and shows how much our regression explained the study in comparison with the total value which is 5.4469e+20. The percentage of explanation is 68.086434 % precisely, which is over 50 % and represents a very good percentage. The residual value of SS shows how much remains unexplained and that is 31.913566 %. On the right side, we can see the number of observations, which is 498. 498 is the number of companies observed, and this number is already confirmed in the part of data sample description, number of companies in the first research model. R-Squared is the percentage of explanation within my study. Prob > F has the value of 0.0000 which represents the highest precision of the study, without errors.

The next step is exploring strength of independent variables coefficients: Research Assets Value and Research and Development Expenses. We will focus on each variable separately.

First of all, Research Assets Value variable has a positive coefficient of 5.163009. Because t = 11.25 has a higher value than P > | t | = 0.000, then we can definitely conclude that there are relationships between these two variables. The positive link is confirmed. The Research Assets Value variable has a standard deviation of 0.4587608.

The second independent variable is Research and Development Expenses. Research and Development Expenses variable has a negative coefficient of -3.176322. Because t = -1.16 has a higher value than P > | t | = 0.246, then we can definitely conclude that there are no relationships between these two variables. The positive link is not confirmed. The Research and Development Expenses variable has a standard deviation of 0.2.737094.

We can conclude that independent variable Research Assets Value extremely positively influences the dependent variable Total Book Value, whereas independent variable Research and Development Expenses influences it extremely negatively.

2.1 Multiple Regression Analysis

Source	SS	df	MS
Model	3.1402e+20	2	1.5701e+20
Residual	1.0188e+20	472	2.1585e+17
Total	4.1590e+20	474	8.7743e+17

Number of obs =	475
F(2, 472) =	727.43
Prob > F =	0.0000
R-squared =	0.7550
Adj R-squared =	0.7540
Root MSE =	4.6e+08

TotalNonCurrentA~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ResearchAssetValue	4.800422	.3512103	13.67	0.000	4.110293	5.490551
RDExpensesAverage	-3.23883	2.095418	-1.55	0.123	-7.356332	.8786724
_cons	2337823	2.16e+07	0.11	0.914	-4.00e+07	4.47e+07

TotalNonCurrentAssetsValue = a0 + a1*ResearchAssetValue + a2*RDExpensesAverage + E

In the following research model, dependent variables are Total Non-Current Assets, whereas independent variables are Research Assets Value and Research and Development Expenses.

First, we will analyze the ANOVA part. Model SS has the value of 3.1402e+20 and shows how much our regression explained the study in comparison with the total value which is 4.1590e+20. The percentage of explanation is 75.503727 % precisely, which is over 50 % and represents a very good percentage. The residual value of SS shows how much remains unexplained and that is 24.496273 %. On the right side, we can see the number of observations, which is 498. 498 is the number of companies observed, and this number is already confirmed in the part of data sample description, number of companies in the first research model. R-

Squared is the percentage of explanation within my study. Prob > F has the value of 0.0000 which represents the highest precision of the study, without errors.

The next step is exploring strength of coefficients of independent variables: Research Assets Value and Research and Development Expenses. We will focus on each variable separately.

First, Research Assets Value variable has a highly positive coefficient 0f 4.800422. Because t = 13.67 has a higher value than P > | t | = 0.000, then we can definitely conclude that there are relationships between these two variables. The positive link is confirmed. The Research Assets Value variable has a standard deviation of 0.3512103.

The second independent variable is Research and Development Expenses. Research and Development Expenses variable has a negative coefficient of -3.23883. Because t = -1.55 has a higher value than P > | t | = 0.123, then we can definitely conclude that there are no relationships between these two variables. The positive link is not confirmed. The Research and Development Expenses variable has a standard deviation of 2.095418.

Based on the produced statistical results, we can conclude that independent variable Research Assets Value extremely positively influences dependent variable Total Non-Current Assets, whereas independent variable Research and Development Expenses influence it extremely negatively. Compared to the first research model, the results definitely do not provide certainty and stability.

2.2 Multiple Regression Analysis

Source	SS	df	MS
Model	7.7214e+18	2	3.8607e+18
Residual	1.3783e+18	472	2.9201e+15
Total	9.0997e+18	474	1.9198e+16

Number of obs	= 475
F(2, 472)	= 1322.10
Prob > F	= 0.0000
R-squared	= 0.8485
Adj R-squared	= 0.8479
Root MSE	= 5.4e+07

TotalIntangibleA~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ResearchAssetValue	.7360119	.0408504	18.02	0.000	.6557408	.8162829
RDExpensesAverage	-.4011961	.2437246	-1.65	0.100	-.8801155	.0777234
_cons	5735967	2506985	2.29	0.023	809734.8	1.07e+07

TotalIntangibleAssetsValue = a0 + a1*ResearchAssetValue + a2*RDExpensesAverage + E

In the following research model, dependent variables represent Total Intangible Assets Value, whereas independent variables are Research Assets Value and Research and Development Expenses.

Model SS has the value of 7.72114e+18 and shows how much our regression explained the study in comparison with the total value which is 9.0997e+18. The percentage of explanation is 84.853347 % precisely, which is over 50 % and represents a very good percentage. The residual value of SS shows how much remains unexplained and that is 15.146653 %. On the right side, we can see the number of observations, which is 498. 498 is the number of companies observed, and this number is already confirmed in the part of data sample description, number of companies in the first research model. R-Squared is the percentage of explanation within my study. Prob > F has the value of 0.0000 which represents the highest precision of the study, without errors.

Exploring strength of independent variable coefficients includes the following variables: Research Assets Value and Research and Development Expenses. We will focus on each variable separately.

First, Research Assets Value variable has a positive coefficient of 0.7360119 e. Because t = 18.02 has a higher value than P > | t | = 0.000, then we can definitely conclude that there are relationships between these two variables. The positive link is confirmed. The Research Assets Value variable has a standard deviation of 0.408504.

The second independent variable is Research and Development Expenses. Research and Development Expenses variable has a negative coefficient of -0.4011961. Because t = -1.65 has a higher value than P > | t | = 0.100, then we can definitely conclude that there are no relationships between these two variables. The positive link is not confirmed. The Research and Development Expenses variable has a standard deviation of 0.2437246.

Based on the produced statistical results, we can conclude that independent variable Research Assets Value positively influences the dependent variable Total Intangible Assets Value, whereas the independent variable Research and Development Expenses influence it extremely negatively.

4.5 Discussion about Findings

Multiple regression results are presented in this section. Within the regression results, the explanatory power of regression models is presented through R^2 and adjusted R^2. Standardized regression coefficients are presented to judge the predictive power and strength of independent variables (De Veaux, Velleman, and Bock 2016).

PhD thesis is focused on exploring relationships between intellectual capital, its investments and total book value as the final performance using French companies as examples. This link between investments in intellectual capital and total book value is unique in the literature, and it will bring new contribution to the science.

Table 26: Statistical Relations between Independent and Dependent Variables in the first research model

Independent Variables / Dependent Variables	Total Book Value	Total Non-Current Assets Value	Total Intangible Assets Value
Personnel Costs, Salaries and Social Charges *(Human Capital component)*	**Positive**	**Positive**	**Positive**
Research and Development Expenses *(Structural Capital component)*	**Positive**	**Positive**	**Positive**
Commercial Fond Expenses *(Relational Capital component)*	**Positive**	**Positive**	**Positive**
Costs of Sales *(Relational Capital component)*	**Positive**	**Positive**	**Positive**

The given Table 26 shows what coefficients of correlation between variables look like. This is a proof that investing in intellectual capital and its components can contribute to a company's total fixed assets value on a longer run. These results are highly positive when investments are made all together at the same time.

Table 27: Statistical Relations between Independent and Dependent Variables in the second research model

Independent Variables / Dependent Variables	Total Book Value	Total Non-Current Assets Value	Total Intangible Assets Value
Research and Development Expenses (Structural Capital component)	**Negative**	**Negative**	**Negative**
Research Asset Value (Structural Capital component)	**Positive**	**Positive**	**Positive**

Statistical correlations between given independent and dependent variables are presented in the Table 27. Here, the focus is only on the Research and Development Expenses and Research Asset Value. The Research Asset Value is a value created based on the research and development expenses activities and processes. The main purpose of this table is to see the relationship between financial performance in the form of fixed assets values and investing only in the Relational capital. The results are diverse, half of them are positive, the rest are negative. The conclusion is that it is not possible to expect the increase in the total fixed assets values by investing only in one intellectual capital component.

Based on the previous detailed literature review, research methodology and empirical correlational testing, the following findings were explored:

1) A strong positive relationship between intellectual capital investments and total book value was proven. Intellectual capital investments were seen as an independent variable, whereas total book value as a dependent variable. It was proven that, when investments in all intellectual capital components are made for a longer period of time, they can produce new value recognized by the standards. Taking into consideration that all three components compose the intellectual capital as a whole, it is not possible to examine them separately. The complex regression correlations proved positive relationship that will increase value in the company’s book value. Sub-models of research, together with Pearson correlations proved that predictions represent creation value in the part of intangible assets of a company;

2) Secondly, correlational relationship between one intellectual capital component and other components showed that there is a negative relationship, which is not the expected

prediction. It is a signal that the value will not be created and that it will reduce the financial resources of a company through investments, and it will not be capitalized. None of the values will be produced through investing in one intellectual capital component. The explanation for this kind of results is that it is important to have synergy of all intellectual capital components and their unitedness;

3) The final discovery is linked to the transformation of investments in intellectual capital into book value. The transformation process is possible and realistic because after a certain period of time of investing in particular intellectual capital component, it is possible to expect benefits from it. The benefits will be recognized assets, accepted and recognized inside a company's balance sheet. Why is it so important? It is important to develop new assets that will generate profits for a longer period of time, compared to the other final performances that are limited only to a few years in the future. Developing new assets will definitely influence the financial and economic result.

4.6 Summary

The empirical results are presented in the Empirical research chapter. An observation was made into how investing in all three components of intellectual capital can influence total book value. Also, the same question was posed when investing in only one component of intellectual capital and the effects it has on the total book value of French companies. These results are logical taking into account that it is not possible to expect future benefits without the correlation among all three components of intellectual capital. When the time comes to develop new assets, it is necessary to involve the whole organizational structure combined with organizational culture. It is not possible to expect the creation of value only from investing in research and development if previously internal potentials, employees' skills capabilities, experience and requirements and demands from the company's stakeholders are not included at the same time.

In my study, the investments in all three components of intellectual capital, human capital, structural capital and relational capital are tested in the first model. After observing financial information for nine years, it was statistically proven that there is a strong positive relationship. This means that, after investing in all three components of intellectual capital, capitalization or transformation processes inside a company are possible. It is possible to expect improvement of the company's total asset value. At the same time, similar dependent variables were tested, and those are non-current asset values and total intangible assets. The non-current asset values are related to property, plant and equipment values (PPE). Taking this variable is important in order to see whether capitalization and transformation processes are concentrated towards intangible assets.

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CHAPTER V

CONCLUSION

SUMMARY:

CHAPTER V – CONCLUSION

5.1 Introduction

This chapter finalizes the work of the whole thesis by presenting the key findings that will be relevant for the management science itself. This thesis has been developed from research into how and why organizations measure and invest in intellectual capital. There is a huge focus in both the academic literature and practice on measuring effects of investments in intellectual capital. When investing in intellectual capital of a company, companies face difficulties when deciding how to measure and manage these investments and how to do so in a worthwhile way.

Intellectual assets represent a substantial part of one company. Intellectual assets are a generator of value based on knowledge. Intellectual assets are invisible and non-physical substances that are difficult to be measured, understood and defined. It is without a doubt that intellectual assets are a source of a competitive advantage and increase of future value. However, they do not influence value creation directly, but rather indirectly.

Different components of intellectual capital can be categorized as human, structural and relational capital, for instance all knowledge, skills, talents, patents, know-how, software, databases, management processes, corporate strategies, brand, customer relationships, corporate culture, etc. These intellectual components are interrelated and interconnected and cannot be viewed separately, only together. Because of that, it is not possible to measure and observe components separately.

Management of intellectual capital and research of their influence on company performance demand a need for measuring its size. There are four different ways to measure its influence. The first group of methods entails identifying all particular components directly, estimating their value and thus the total value of intellectual capital of a company. The second group of methods was based on comparing the market value with a book value of a company. If the market value is higher than the book value, then that difference is intangible. The third group of methods analyzes financial statement data. The analysis of a certain financial position treated as indicators of intellectual capital enables estimating the size and efficiency of exploitation of intangible assets. The final group of methods are scorecard methods by means of which it is only possible to visually follow the changes of intangible indicators.

Even though intellectual capital is one of the most important generators of future value, current financial statements and annual reports do not provide relevant financial information. One of the biggest problems from this irrelevance is uncertainty when it comes to estimating future results and values by investing in a company's assets. That is why the investments in intellectual capital are generally observed as costs because it is easier like that. However, respecting the principle of caution, all long-term costs related to intangible assets must be seen as investments, not as expenses. Because of all that has been stated above, it is necessary to emphasize all the drawbacks of current traditional systems of financial reporting.

The main objective of this doctoral dissertation research is to determine the interrelation between intellectual capital as the intellectual capital and total book value of French companies That is why it was necessary to choose indicators for measuring and testing these variables adequately. All the data was collected from the financial databases "Point Risk" obtained from the Faculty IAE Paris, University Paris 1 Pantheon Sorbonne, during my work as the Research Assistant on the research project.

Two main research hypotheses are tested in this work.

The first research hypothesis shows that it is possible to invest in all components of intellectual capital and to expect those investments to have a positive influence, or more precisely put, to expect those investments to develop and capitalize new assets within a company. It is possible to expect positive results only by investing in all components at the same time. Produced results showed strong positive and objective relations between dependent and independent variables.

The second research hypothesis shows that positive influence on a company's book value is not possible if the investment is made only in one intellectual capital component, which is in our case structural capital or research and development expenses. The explanation for this is that all three intellectual capital components are very closely interrelated, and it is not possible to imagine adequate results without one or two other components, such as relational capital that is linked to customers, suppliers or other stakeholders, or human capital that is linked to employees' skills, trainings and education. The results in the second research hypothesis were negative because there is no capitalization and development of new assets within a company's balance sheet without taking into consideration all the components of intellectual capital as a whole.

Completed research showed that by investing in intellectual capital components (human, structural and relational), it is possible to follow those investments on a long period of time and to follow development of new assets that will be capitalized and recognized within a company. This is important because the total book value of a company will increase by integrating new assets which will in turn generate profits and benefits in the foreseeable future.

5.2 Results Findings

Investments in intellectual capital and its success are made by implementing the Intellectual Capital Transformation Evaluating Model (ICTEM) developed by *Molodchik et al. (2012).* The present study is conducted based on the data of a sample of 498 and 482 French companies. Overall empirical results that are based on multiple regression analysis between investments in intellectual capital and total book value, clearly indicate that investments in intellectual capital are an important determinant of the corporate financial performance of the selected sample of French companies. Findings prove that a company can enhance its total book value if it invests in its intellectual capital components, precisely in employees' salaries, trainings, education, skills etc., in organizational structures, systems, software, research and development, innovations, organizational processes, and finally in commercial activities, marketing, promotions, advertising and other. Another interesting finding is that one out of three components is not enough to enhance and improve a company's fixed asset value. It is necessary to invest in all three components at the same time. Otherwise, the results will be very uncertain, unpredictable and unexpected.

5.3 Limitations in Research

During my three-year research, I faced some limitations which I would like to present here.

The first limitation is related to the literature review. The literature review concerned with investments in intellectual capital has not been developed yet, as is the case with intellectual capital topic in general. The main difficulty was to explore and present published literature review in my work. There are a few key studies that helped me to complete the dissertation successfully, but, generally, further studies must be more developed in the upcoming years.

The second limitation is definitely related to finding an adequate transformation model that will be utilized for my conceptual framework, as well as for justifying the process of transformation from investments into real value in the whole research methodology part. Until now, the topic related to investments in intellectual capital has not been developed enough, so the need for improvement is obvious. The main difficulty was to find a research model that had already been explored, justified and used in the literature and that could be implemented in this study. The difficulty lies not only in the field of research methodology of investments in intellectual capital, but also in the literature because this topic has not been developed yet.

The third limitation was linked to finding justified indicators for my variables. Taking into consideration that until now there have not been many research models regarding the investments in intellectual capital, the next difficulty was to find the justification of each variable in my work. After deep and systematic research exploration, I found a few studies that proved and justified my given variables. This difficulty comes from the limitation in literature review of the topic investments in intellectual capital. After deep and systematic research of the existing literature regarding the topic, the given variables were justified.

The final limitation was related to collecting the quantitative data, based on the already justified variables. Most of the variables that I chose in the work are not so evident, transparent in the official annual report, for instance, research and development expenses or marketing expenses. So, the main difficulty was to find and collect this information for my study that will play a crucial role in producing final results. Without this information, the work would definitely be different.

5.4 Contribution to Science

Based on the explored theoretical gap and completed empirical, and statistical testing, the contribution to science is evident. After a deep discovery of current literature published by the most relevant authors in the field, the justification of selected variables was done. This was important because without the existing articles and papers and precise justification and theoretical proof of these variables, the work will not be sufficient. After justifying all the variables, the precise research models were made based on the research questions, research methodology, research hypotheses and research theories. Finally, the complex statistical regression correlations that produced and proved expected positive results were made. These results proved our research hypotheses and made a big final contribution to management science.

The research contributions are described below.

First of all, the research contributes to the general body of intellectual capital concerning performance measurement. That performance is seen in the form of value in the balance sheet of a company. Until now, this performance has not been used on a larger scale generally because of the difficulties to be measured and recognized. This research provides an empirical-tested model and interrelationships between the proposed variables.

Second, the research follows the collection of investments in intellectual capital from the current financial statements. The data collection in combination with research tools and techniques developed here enables each company or organization to do the same. In this way, each company will be allowed to follow its value creation processes.

Third, the research project emphasizes the importance of recognition of value by absolutely respecting international accounting standards. This is important mainly because the difference between the total market value and total book value in each company dramatically increases each and every year. By understanding and recognizing the value in the balance sheet, the difference will be definitely reduced, accepted and capitalized. Reducing the difference will lead to improving the total performance of a company.

Fourth, the research & development (R&D) investments, as one of the very important investments in intellectual capital are seen as a part of organizational capital in a company.

Deeper understanding of research & development investments will definitely allow the management of one company to pay more attention and to improve them in the upcoming years. Generally, accountants and management of companies did not generally look at the research & development investments and investments in intellectual capital in a proper way. These expenses were viewed as operational expenses that would last only for one year, without any benefit expectations in the future. This is the major mistake mainly because these investments should be seen as capital expenses or investments that will produce future benefits, but on a longer term only. It is not possible to expect bigger expectations in one business year. It is not possible to expect a patent to be developed in one business year. These investments are planned for a long-term period and it is the matter of business and financial understanding that must be changed *(Damodaran, 2009; Damodaran, 2012; Lentjushenkova and Lapina, 2014).*

Finally, this research takes into consideration the sector of activities or industry to which, each company belongs. This is one of the most important factors that will present which industry in France is capital-intensive by providing not only the amount of investments in intellectual aspect from global point of view, but also the amount of investments in research and development, taking into consideration the study that was published by European Innovation Scoreboard in 2016 that proved that France is a strong innovator, not only in Europe, but in the world in general *(Hollanders et al., 2016).*

5.5 Practical Applicability

The research topic concentrates on the intangible resources within a company. Intangible resources can be recognized and included inside one company, such as brands, patents, licenses, customer lists. Otherwise, they cannot be recognized by the current international accounting standards. These intangible resources such as collective knowledge, learning, leadership talents, skills, techniques, soft skills, organizational systems inside the company, relationships with stakeholders also influence the final company performance. These intangible resources are known as intellectual capital. Simply explained, intellectual capital is the difference between total market value and total book value developed by *(Edvinsson and Malone 1997)*. This gap between total market value and total book value increases every year more and more, which can be seen as non-recognized or non-used value. Numerous previous articles have classified intellectual capital into human, organizational and relational capital and they have identified the relation with corporate performance. Also, the interrelationships have been identified among these three components of intellectual capital that lead to the final value creation. There is an extensive and comprehensive theoretical framework for following empirical examination of the synergetic effects of intellectual capital *(Glynn, 1996)*. However, it is still very unclear as to how various elements influence organizational value.

This research investigates the way the investments in intellectual capital contribute to the organizational book value by offering the practical framework that can be implemented in every company. The results of this thesis are presented in the form of statistical correlational coefficients. In that way, the projection of value creation for future period is provided.

The recognition of intellectual capital inside financial statements is a key success factor in a global and highly competitive market because it creates a highly important competitive advantage. That market has endless opportunities for researchers to explore new practices for management sciences. Intellectual capital is defined as a combination of its three components that creates future economic value. The main ability of a company today is to transform an idea or innovation into conceptualized and recognized economic value. The research starts with an extensive literature review that will present all achievements in the observed fields. Furthermore, the study concentrates on all different sizes of French companies (small, medium and large size) from different industries. The importance is in the availability and possibility to collect particular financial information from annual reports and to follow their progress during the future period. It will be up to the management of every company to decide whether it will invest and capitalize the value after a long-term period, or whether it will expense after a short-term period. Based on the study, it is recommendable to capitalize assets developed from investments in intellectual capital that will generate much greater benefits in the future of a company.

5.6 Recommendation for Further Research

The recommendation for further research will be definitely focused on integrating much more variables inside the same research models, such as industries, size of companies, number of employees, etc. Also, the same study could be examined for the companies from different countries implementing the IFRS/IAS standards. Furthermore, the focus will be on collecting as many variables as possible for the same or similar research models. In that way, the research results will be much more improved.

Recommendations from the research will be generally inspired by the three main recommendations given by *(Ciprian et al., 2012):*

- Introduction of generally accepted intellectual capital measurement model;
- Necessity to develop harmonized specific accounting rules that will standardize intellectual capital and its components and values;
- Proposing alternative accounting as a complementary information system.

For further research, we predict to have a research based more on the characteristics of an industry to which companies belong. This might be achieved by expanding research with more control variables and analyzed time period. Also, it is necessary not only to expand our research models with new control variables, but also to expand independent variables with more new variables that will produce results and findings with more detailed and precise outcome.

5.7 Summary

In this study, a holistic understanding of intellectual capital and investments in intellectual capital components are suggested by proposing a conceptual framework of potential value creation process within the organizational structure of a company. With this study, deficiencies in the current value creation understanding and obstacles in collecting financial information that are related to the components of intellectual capital can be overcome, where the absence of other aspects of intangible assets such as, culture, vision, mission, motivation, team spirit, benevolence, trust, honor, loyalty, values and other will significantly improve the understanding of intellectual capital. The works of Sveiby et al. (1990), Brooking (1997), Edvinsson and Malone (1997), Stewart, (1991), Saintonge (1999), Lev et al. (1996) and Sullivan (1998) have influenced and changed the thinking about the intangible-factors that determine the final success of a company *(Andriessen, 2001)*. Intellectual capital is seen as the stored knowledge that is owned by a company that may be a tacit type of knowledge, personal knowledge possessed by one employee or may be the explicit knowledge, stored and codified by a company and its organizational structure *(Nonaka and Takeuchi 1995)*. Many different studies proved and presented measuring, reporting and managing intellectual capital *(Brooking, 1997; Petty and Guthrie, 2000b; Sveiby, 1997; Edvinsson, 1997; Edvinsson and Malone, 1997; Mouritsen, 1998; Marr, 2005)*. The new approach to intellectual capital, where intellectual capital should improve final company performance through an indirect effect by investments in the intellectual capital components will contribute to the research field. Until now, intellectual capital or investments in intellectual capital and its components have been used in correlation with different financial performance, such as profits, market shares, market values, etc., but not total market value. The main research question was: “What will happen in total book value if we invest in intellectual capital components?” Can we expect value creation or just expenses left within the company?

The present study deeply investigated the association between investments in intellectual capital, its transformation and capitalization process and recognition of that value inside the total book value of a company. However, a company’s transformation process of investments is observed by multiple dimensions. What remains to be done in this study is to analyze the value creation efficiency of investments in intellectual capital and a company’s corporate value. The investigation was based on a sample of 498 and 482 French companies from all industries respectively in two main research models. The main model was Intellectual Capital

Transformation Evaluating Model (ICTEM) developed by Molodchik et al. (2012). This model enabled us to develop better understanding of the whole value transformation process.

The principal purpose of this study is to investigate the relationship between corporate performance and intellectual capital investments. The study includes three dimensions of intellectual capital, respectively, total book value, total non-current assets value, and total intangible assets value. On the other side, when talking about intellectual capital investments, they are respectively presented: employees' salaries and charges, research and development expenses, costs of sales, and commercial activities costs. The final findings showed that after investing in intellectual capital components, there is a capitalization process within a company and improvement of total book value.

Company's value maximization is generally considered to be one the most important objectives of every company. In the knowledge economy, the financial performance of a company is always under first observation, not only by internal users of financial information, but by external users as well. The company's financial performance is under direct or indirect influence of invisible assets and resources posed by a particular company. Those invisible assets or resources are called intellectual capital. Various empirical studies proved that intellectual capital itself directly influences financial company performance. Since intellectual capital is the main source of superior financial performance of a knowledge company, it was of high importance to examine its impact of investing in intellectual capital on the company's book value.

The PhD dissertation is finalized with the metaphoric explanation of the meaning of intellectual capital by studies published by Edvinsson and Malone (1997) and Gradstrom and Edvinsson (1999). They explained the meaning of intellectual capital by arguing that the existence of tree has actually a much broader meaning and purpose, more than just the production of fruits. A tree will grow and flourish healthily to produce fruits only if it receives and absorbs enough rainfall from the sky and light from the sun in a natural environment. The tree lives according to all natural rules, disciplines, conditions and, in that case, produces necessary fruit products. The tree normally consumes all the necessary resources for its purposes to produce maximum outputs every and each time for the benefits of all forms of life. What is visible to the human eye are all fruit products, trees and leaves. However, what is not visible are roots under the ground. The same applies to intellectual capital. Everything visible are new products, new services, new processes, new procedures, new systems, new employees, new structure.

Everything not visible are all components and inputs that created previous elements that are visible, and those are: intellectual capital, human capital, organizational capital, relational capital, knowledge, ideas, innovation, information, competencies, skills, capabilities.

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LIST OF ABBREVIATIONS

CC:	Cost of Capital
CE:	Capital Employed
CEE:	Capital Employed Efficiency
CGMA:	Chartered Global Management Accountants
CICA:	Canadian Institute of Chartered Accountants
CIV:	Calculated Intangible Value
DIC:	Direct Intellectual Capital
EIRI:	European Industrial Research Innovation
EU:	European Union
EVA:	Economic Value Added
FASB:	Financial Accounting Standards Board
GAAP:	General Accepted Accounting Principles
GDP:	Gross Domestic Product
GRM:	Groupe de Recherche en Management
HC:	Human Capital
HCE:	Human Capital Efficiency
HRA:	Human Resource Accounting
HRM:	Human Resource Management
IAS:	International Accounting Standards
IC:	Intellectual Capital
ICM:	Intellectual Capital Management
ICM:	Intellectual Capital Model
ICT:	Information and Communication Technology
ICTEM:	Intellectual Capital Transformation Evaluating Model
IFRS:	International Financial Reporting Standards
IT:	Information Technology
KBV:	Knowledge-Based View
KCE:	Knowledge Capital Earnings
KM:	Knowledge Management
KPI:	Key Performance Indicator
KSF:	Key Success Factor
MCM:	Market Capitalization Methods

MVA:	Market Value Added
NOPAT:	Net Operating Profit After Tax
OECD:	Organization for Economic Cooperation and Development
PhD:	Philosophy Doctor
PMS:	Performance Measurement System
R&D:	Research and Development
RBV:	Resource-Based View
ROA:	Return on Assets
ROIC:	Return on Invested Capital
S&P:	Standards and Poors
SC:	Structural Capital
SCE:	Structural Capital Efficiency
SFAC:	Statement of Financial Accounting Concepts
SME:	Small Medium Entreprises
TBV:	Total Book Value
TIA:	Total Intangible Assets
TNCA:	Total Non-Current Assets
UK:	United Kingdom
US:	United States
VA:	Value Added
VAIC:	Value Added Intellectual Capital
WACC:	Weighted Average Cost of Capital

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