

The Relationship between Intellectual Capital and Innovations

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This study explores the relationship and importance of intellectual capital and innovation in creating additional value for entities. In today's world, where we live and create in a so-called “knowledge society,” innovation plays a significant role in the value chain, while intellectual capital is a crucial element and generator for the overall development of entities and vice versa. Thus, they represent a significant part of a company's development, performance, wealth, and competitiveness. Furthermore, through the empirical analysis, the study provides evidence that a high level of intellectual capital in its three dimensions supports and enhances a company's ability to innovate and generate new ideas and insights. In this respect, it is more than justified to link intellectual capital, comprising human, relational, and structural capital, to value creation and innovation. The investigation will conclude with an examination of the topic in the context of contemporary society, particularly in light of (inter)national crises, whether economic, health-related, or other crises caused by conflicts.

Keywords: *assets, development, innovations, intellectual capital (IC), IC in times of crisis, value creation*

Introduction

Topical Introduction

In today's knowledge society, characterized by rapidly changing market demands and constant challenges, intellectual capital and innovation are widely recognized as key drivers and supporters of development and wealth creation for entities. Furthermore, consistent with Andrikopoulos et al. (2009) and Ivinić (2022), in knowledge-based economies, value creation primarily stems from intangible resources such as knowledge (i.e., intellectual capital and innovation as part of its outcome), far more than from traditional sources of value creation like financial and physical capital. Moreover, Mutiasari and Rizki (2020) assert that intellectual capital is an intangible asset crucial for the prospect of future wealth creation for entities. Consequently, it can be assumed that intellectual capital and innovation enable entities to adapt more swiftly and efficiently to challenging market demands and to maintain competitiveness through additional comparative advantages.

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According to Forbes (2016), innovation can be seen as a dualistic dimension where, on one hand, it is an outcome of a recognized need (or from the economic point of view, a recognition of new market product potentials). On the other hand, it requires the involvement of technical knowledge and expertise, new scientific research and activities to achieve desired findings and outcomes. Consequently, it can be concluded that intellectual capital in its three-dimensional aspect¹ is a generator and supporter of the process and outcomes of innovation, while their mutual relationship is linked to competitiveness, comparative advantages, development, and wealth creation for business entities. Finally, when referring to innovations and intellectual capital and their reciprocal impacts on entities' performances, it is of high interest and more than justified to investigate the topic in-depth and gain a broader understanding of their relationships, impacts, and outcomes on business entities. Thus, the study presents Chapter Two, where a deeper insight into the topics of intellectual capital and innovations is presented and analyzed, while Chapter Three examines their relationship and impacts on business entities' performances. Chapter Four addresses the topic in the context of current developments.

Research Question, Objectives and Hypotheses Explication

According to Pece et al. (2015), innovations promote progress, growth, and competitiveness for business entities. Given that innovations are a key to development (referred to by the authors as the “engine of development”) and intellectual capital is a supporter of the development of innovations, the central research question is: Is there a relationship between intellectual capital and innovations? In addition, some additional questions that this study will explore include:

- What is the nexus between innovations and intellectual capital relationships?
- What is the effect of intellectual capital and innovations on business entities performances?
- What does the intellectual capital structure looks like and how is it composed?
- In what way does the intellectual capital structure support the development of innovations?
- How should intellectual capital be classified in current times of crisis?

Consequently, despite attempting to find answers to the above questions, the main objective of this study is to gain a broader knowledge of the relationships and impacts of innovation and intellectual capital on the performance of companies, and to find answers regarding the mutual relationships between innovation and intellectual capital. Finally, the study proposes two main hypotheses that are either accepted or rejected based on the empirical study and the qualitative method used.

H1: There is a relationship between intellectual capital and innovations.

¹The three-dimensional aspect refers to the main components of Intellectual Capital: Human Capital, Structural Capital, and Relational Capital. A further analysis of the three-dimensional aspect of Intellectual Capital is available in Part 2.1 of this study.

H2: There is a positive impact of the relationship between intellectual capital and innovation on business entities' performances.

Theoretical Background and Methodology

By analyzing the literature, it can be deduced that there are few studies and little research concerning the direct relationship between intellectual capital and innovation. However, a good insight into the relationship between innovation and intellectual capital can be derived from the study by Hejazi et al. (2018), where the authors analyze the role of intellectual capital in the creation of innovations, using the example of HIS² and computer units.

What can be observed is that there are many separate studies about intellectual capital and innovation. Therefore, there is a lot of interest in and studies on the impact of innovation on business performance and growth, while there is some research that attempts to describe its nature. Consequently, a comprehensive insight into the topic of innovation and an excellent review of the development of the literature concerning the topic can be found in the study by Pece et al. (2015), entitled: "*Innovation and Economic growth: An Empirical Analysis for CEE³ Countries*". According to the authors, the origins of the concept of innovation and economic growth can be linked to Solow as early as 1957 (Solow 1957). Further, according to Aghion et al. (2009) and Pece et al. (2015), when discussing economic growth and innovation, one of the most notable economists who discussed innovation is Joseph Schumpeter. He pointed out that initially, there should be a clear distinction between economic development and economic growth (Schumpeter 1939). Finally, according to him, economic growth indicates a gradual but slow change of the entire economic system, while economic development arises from changes driven by innovation, where the economic system can be considered a supporter of that process. Additionally, he stated that education is one of the most important factors responsible for innovation, which subsequently drives competitiveness.

There are several studies that should be highlighted, which link innovation with economic growth and development, starting with Ulku in 2004, whose research examines economic growth and innovation across 20 OECD and 10 non-OECD countries, followed by Pessoa (2010), who conducted research on the costs of R&D and their relationship to economic growth and innovation. And while Ramadani et al. (2013) conducted an investigation into the impacts of innovation on development, Czarnitzki and Toivanen (2013) focused their study on the relationship between economic growth and research and development investments in two developed European countries. In addition, the study by Norris et al. (2010) should be mentioned, which examined the impact of innovation on financial performance within the manufacturing industry, while Jin et al. (2019) conducted a study about the effects of innovation capability on business performance. When referring to intellectual capital, the literature mainly attempts to define its term, while literature about its impact on business performance is very limited. According to Andrikopoulos and Kaimenakis (2009), intellectual capital as a company's hidden value was first

²Health information system.

³Central and Eastern Europe.

detected in the early 1980s. Thus, the pioneering theoretical studies that increased scientific interest in the subject, and contributed to creating the theoretical framework of intellectual capital, are: “*Mobilizing Invisible Assets*” by Itami (1987), “*The Invisible Balance Sheet*” by Sveiby (1989) and Stewart (1997) with “*Intellectual Capital: The New Wealth of Organizations*”. Additionally, some authors worth emphasizing when analyzing and discussing intellectual capital are Obeidat et al. (2016), Černe (2011), Pratama (2020), Abbas (2015), Abdulaali (2018), Kianto (2017), Moro-Visconti (2020) and Alkhateeb et al. (2018).

To present all the aspects of innovation and intellectual capital, and their relationship, the study will be mostly based on a qualitative empirical study involving literature analyses. This also includes analyses with descriptions and conceptualizations.

Intellectual Capital and Innovations

Intellectual Capital

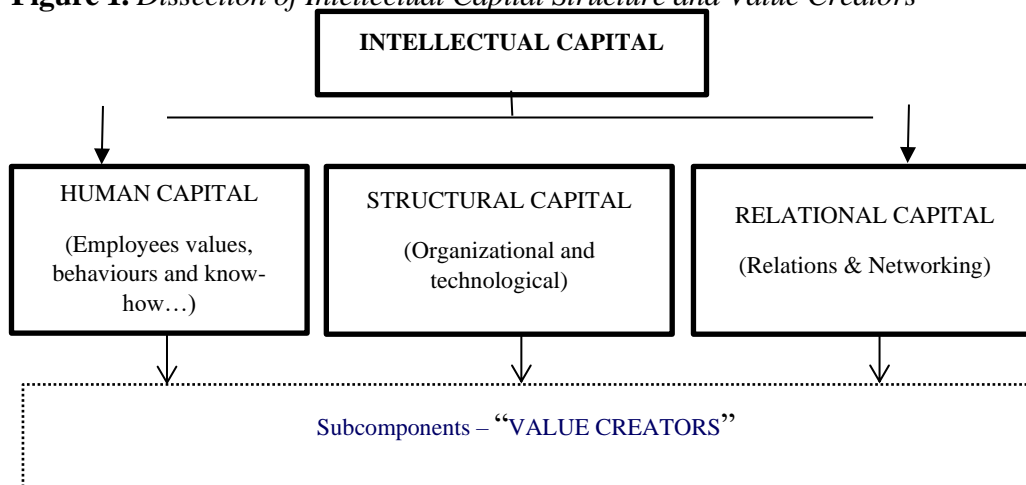
Despite a strong interest in the topic and concept of intellectual capital within the literature, there is still not a generally accepted definition of the term. However, the main structural differentiation of the concept is widely defined. For this reason, this study will draw on the literature and explanations of various notable authors by focusing on all the common elements associated with the term 'intellectual capital'. Additionally, most definitions of intellectual capital explain it as a meta-level concept of knowledge and actions that results in competitiveness, development and value creation for entities. According to many authors such as Feiwel (1975), Chang and Hsieh (2011), Černe (2011), and Ivinic (2022), intellectual capital is not a value per se, and it means more than exclusively “*pure intellect*”, therefore it can be considered as a degree and a process of “*intellectual actions*” moving from having certain knowledge and skills to using it and converting it into new value-added products or services. Alkhateeb et al. (2018) state that it can be considered as one of the most influential factors that significantly affects development and organizational performance in today's business environment. Further, according to Kym and Moon (2021), intellectual capital is the most significant resource possessed by the entity that is responsible for competitiveness and comparative advantages.

Many authors such as Khan (2014), Sardo and Serrasqueiro (2017), Abdulaali (2018) and Kym and Moon (2021) consider that intellectual capital represents an intangible asset within an organization that "delivers" new concepts, enhances competitiveness and assists in the creation of future benefits and wealth for a business entity. Additionally, many authors describe intellectual capital as a strategic asset that delivers growth and sustainability for the organization in a competitive market. Thus, intellectual capital is a hidden part of a company asset whose value varies over time and has a structure whose components differ among industries. However, it is a company's valuable resource that needs to be detected, well managed, defined and structured in order to gain comparative advantages and high efficiency (Ivinic 2022). Some other definitions concerning intellectual capital that we would like to

highlight to create a framework for linking innovation and intellectual capital are the following. According to Choong (2008), intellectual capital is a holistic or “*meta-level*” ability of a company to regroup, prepare and coordinate knowledge and, according to Sullivan (1999), to convert it into profit. Or, as Roos et al. (1997) illustrated, intellectual capital is a package of functional knowledge that, through practical application, has an impact on company performances and results. Furthermore, one of the most indicative and illustrative definitions in the context of intellectual capital is the one by Edvinsson and Malone (1997), stating that “intangible assets are those that have no physical existence but are still of value to the company.” Moreover, one of the easiest ways to present an intellectual capital concept is through a metaphorical depiction of a tree whose life and fruits rely on invisible and hidden roots (Arenas and Lavanderos 2008). Consequently, the roots represent the potential for future earnings while the fruits are new ideas and additional values.

Finally, the scope of the aforementioned definitions about intellectual capital is to find the nexus and patterns that can be related to innovation. Another step in linking the terms intellectual capital and innovation is analyzing the structure of intellectual capital. Consequently, Figure 1 presents the structural differentiation of the term. According to several authors (i.e., Sundač and Švast 2016), innovations are one of the fundamental parts and a subcomponent of the main intellectual capital component Human Capital, which plays one of the most important roles in the creation of innovations.

Figure 1. *Dissection of Intellectual Capital Structure and Value Creators*



Source: Graphical presentation of intellectual capital components, extended for the subcomponents area, according to Ivinić (2022).

The intellectual capital structural breakdown is presented in Figure 1. Based on the literature studied, intellectual capital consists of three main components: Human Capital, Structural Capital, and Relational Capital. Further, each of these components is composed of their corresponding value creators, i.e., subcomponents.

Innovations

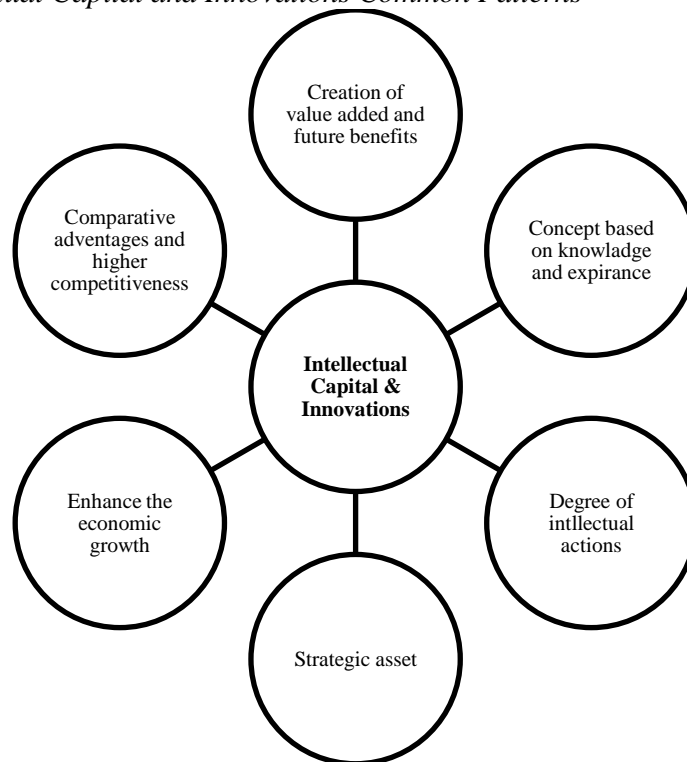
What constitutes innovation, what all types of innovation are and what impact innovation has on the economy and its growth are some of the main questions this study seeks to answer.

According to many macroeconomists and the definition of the European Central Bank (2017), innovations are vital drivers of economic progress and growth that benefit consumers, industries, and the entire economy. Further, innovations in economic terms are defined as the application and development of new ideas and technologies that improve services or goods or lead to their more efficient production. In the end, innovations contribute to economic growth and profitability. Furthermore, as early as the 1950s, according to Abramovitz (1956) from the Stanford University and Prof. Rosenberg (2004), there are only two ways of increasing output: 1) by increasing the amount of input that is used in the production process, or 2) by being smart and finding new and more efficient ways of production, where the input remains the same or decreases while the output increases.

According to Sarangi et al. (2021) and their research analysis concerning the relationship between innovations and economic growth in the G20 countries in the period from 1691 - to 2019, the long-term economic growth is highly influenced by innovations. Furthermore, innovations play an important role for business entities in remaining competitive in the market (Pradhan et al. 2016) and gaining additional and higher comparative advantages. Additionally, according to the calculations from the U.S. Chamber of Commerce Foundation (2015), in 2015 roughly 50% of the US annual GDP growth could be linked to increases in innovation. According to many authors, the clear and appropriate question is whether innovation drives economic growth or vice versa, where economic growth is responsible for the dynamics of innovations. The relationship flows both ways and according to Maradana et al. (2017), both answers can be well-supported by different theoretical arguments. Further, innovations can be of great help for adapting faster to social and economic changes and remain competitive. Innovations are not exclusively related to economic growth, but they can be linked with many other socio-economic improvements such as helping in the reduction of poverty, better education and health systems, better and more efficient infrastructure, etc.

Relationship and Impact between Intellectual Capital and Innovations

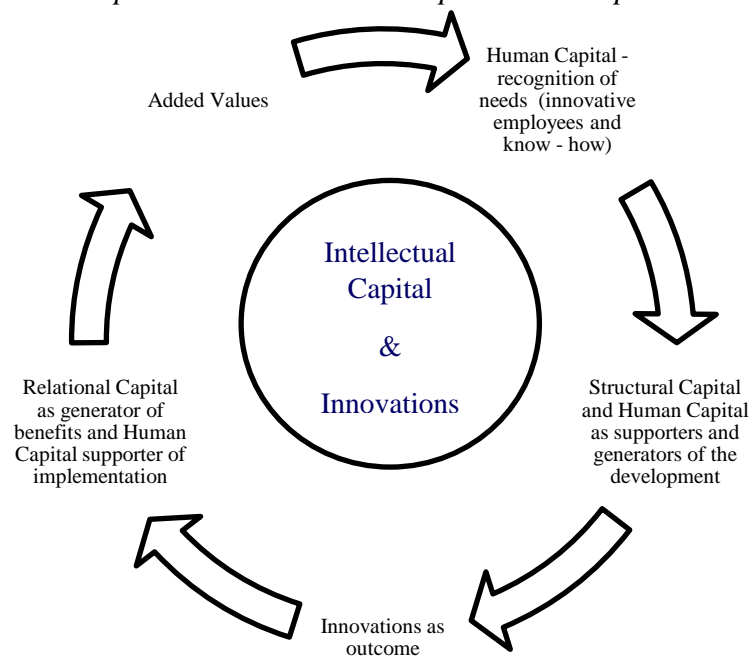
Based on the literature analyzed and everything sketched so far in this study, it is likely to conclude that there is a positive relationship between intellectual capital and innovations. According to several authors (i.e., Geissdoerfer et al. 2018, Rosenberg 2004, Uppenberg 2009, Sarangi et al. 2021), the discovery of new technology occurs thanks to innovations which create products, processes and systems that improve productivity and efficiency within the economy, creating new income channels and new values. Further, the study offers Figures 2, 3 and 4 with the scope of offering an efficient visualization and analysis of the relationship between intellectual capital and innovations.

Figure 2. *Intellectual Capital and Innovations Common Patterns*

Source: Authors graphical presentation of some intellectual capital and innovations common patterns.

In Figure 2, the authors intend to highlight some patterns which can be related to the terms of intellectual capital and innovations. The aim is to provide a basis and framework for a better analysis of the study and to see whether the two terms can be linked or not. The conclusion is that intellectual capital and innovations have some of the main characteristics in common. Consequently, on the basis of the analyzed literature, the similarities between the two terms turn out to be the strongest: they are strategic assets, they are a product of intellectual activities, they are based on knowledge and experience, and they are seen as supporters of economic growth, enhancing comparative advantages and competitiveness - they are “creators” of future values.

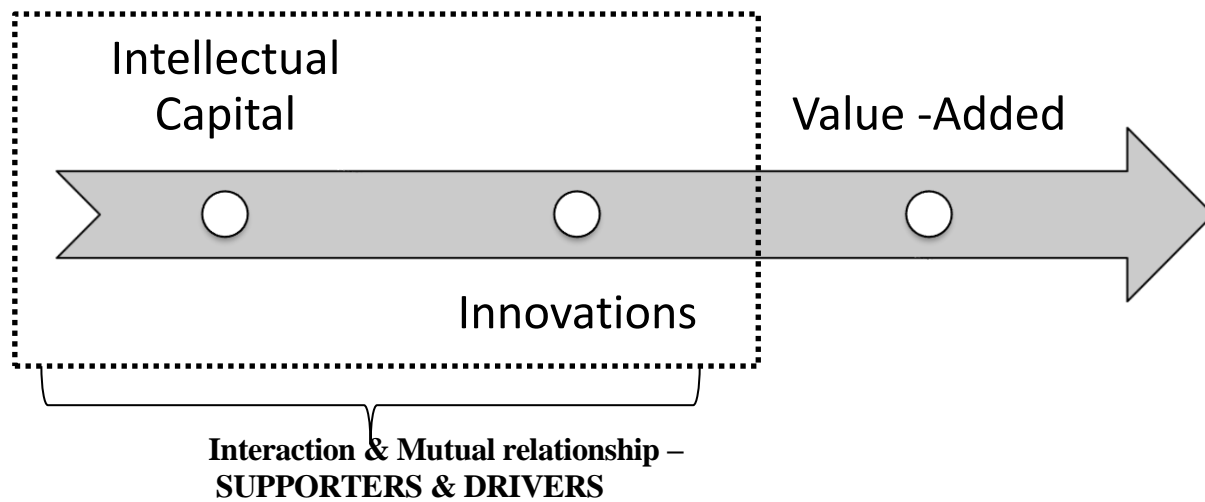
Figure 3. Intellectual Capital and Innovations Reciprocal Development Process



Source: Authors graphical presentation of intellectual capital and innovations reciprocal development process.

Figure 3 represents the intellectual capital and innovations process development. Consequently, based on the figure it is possible to conclude that there is a positive and reciprocal relationship between all intellectual capital components and innovations. Therefore, it is possible to state that innovations and all the innovation processes begin from human capital as one of the three main components of intellectual capital. Human capital is the only one responsible for creating innovations and recognizing a need for innovations. Further, the creation and the development process of innovation is highly supported by another component of intellectual capital - i.e., Structural Capital. Finally, innovation as an outcome has to be monetized and efficiently distributed, all in line with the strategy of a business entity. This role is intended for relational capital as the final, third component of intellectual capital. Consequently, the relational and human capital are responsible for all the value-added that a generated innovation can produce. Finally, all the components of intellectual capital play an important role in the creation, development, implementation and management of innovations. Consequently, it is possible to conclude that the relationship between intellectual capital and innovation flows in both directions.

Figure 4. Intellectual Capital, Innovations and Value – Added Relationship and Interaction Line



Source: Authors graphical presentation of intellectual capital, innovations and value-added interaction.

The presented Figure 4 represents the relationship and interaction line between intellectual capital, innovations and value-added. Consequently, intellectual capital and innovations have a mutually positive relationship that flows in both directions, where they are both supporters and generators of new and additional values. Within the figure, intellectual capital appears as first in the chain of value creations due to the simple fact that the first one recognizing a need for innovations is, as previously mentioned, human capital. However, once the need for innovation is recognized, the relationship and interaction between intellectual capital in its full form (with all the items and value creators) and innovations flows in both directions, intending to achieve new values.

Classification of the Topic at the Current Times

If you look at the current situation in the world economy, the situation of global companies and the world markets, their problems and challenges are raised almost in the same breath. Topics such as delivery bottlenecks due to the corona pandemic or escalating energy costs due to the war in Ukraine continue to play a central role in the current media landscape (Allam et al. 2022, p. 1). But what is also at the center of media attention is the struggle for human capital. Although this is articulated more independently of crises due to its characteristics, it has intensified again as a result of the crises mentioned. It is the competition for the most suitable personnel, the search for adequate employees or summarized under the heading widespread shortage of skilled workers (compare e.g., PwC's global survey on "Hopes and Fears 2022").

In Germany, the economic heavyweight of the European Union, this topic is even stated as "*one of the major challenges of the coming decades for all actors from politics, business and science*". This elementary classification was not carried out without reason, because "*skilled workers ensure innovation and competitiveness,*

growth and employment, prosperity and quality of life” according to the Federal Ministry of Economics and Climate Protection (Federal Ministry for Economic Affairs and Climate Action 2022). For Birri, the status of the staff has even undergone a reciprocal development, which has blossomed from being a cost block to becoming such an important component of a company valuation. Human capital has thus experienced a new perspective in recent years, which, in addition to being classified as an economic variable, also acts as a driving factor for innovations and corporate developments. While in the past the focus was on the amount of the associated expenses within the personnel factor and a limit on wages and salaries as well as an optimization of the number of jobs was aimed at, the new perspective is associated with the quality, the risks and the care of human capital, which should lead to better returns and productivity. Especially in the context of the market value formation of a company, this topic is becoming more and more of a defining component, where the material values of a balance sheet have to give way more and more. This means that intangible assets are not only on the rise, they are now an integral part of a company valuation (Birri 2011, p. 25).

The central role of intellectual capital as a driver for innovations and future developments is increasingly evident. As early as 2010, Sprenger highlighted that *"the competition of the future will be decided on the personnel markets"*, a trend that has since accelerated significantly (Sprenger 2010). In Germany, only 16% of companies identified a shortage of skilled workers as a business risk then. Today, this issue has become the primary obstacle to development for companies. Understanding the importance of human capital, encompassed within the broader term intellectual capital, requires an examination of the cause behind the current skilled labor shortage. As part of the demographic change, the aging of society intensifies the bottlenecks in the skilled labor sector. Based on initial projections in the strongest economy in the EU, the working-age population (people between the ages of 20 and under 65) will decrease by 3.9 million to 45.9 million by 2030. The extrapolation to the year 2060 even predicts a decline of 10.2 million people of working age (Federal Ministry for Economic Affairs and Climate Action 2022). These first numerical statements only give an idea of the challenges companies will face in the medium and long term. Sprenger's insights have proven prescient, and the “War for Talent” coined by McKinsey aptly captures the current competitive landscape (Axelrod et al. 2001). The trend of downsizing during economic crises is now an illusion, as the competition for top talents remains fierce even during downturns. This was evident during the Great Recession when a PwC survey revealed that over 50% of CEOs considered the availability of skilled workers a major challenge (PwC 2010). Given these trends, it is clear that intellectual capital is not only a critical factor for innovation and development but also a decisive element in ensuring long-term business sustainability and competitiveness.

The previous explanations in this chapter have clearly expressed how intellectual capital has categorically developed in recent years. In addition to the actual recruitment, maintaining and passing on the experience and know-how of older employees in the long term represents the even bigger construction site. It shows that the human factor in today's companies with a high proportion of knowledge work - but therefore

primarily in the tertiary sector - can no longer be readily substituted. Innovations can only be secured in the future by maintaining such knowledge resources.

Conclusion

Finally, based on the study analysis conducted, it is evident that nowadays innovations and intellectual capital are crucial and fundamental factors of competitiveness, value creation as well as for current and future financial results of business entities. The study analyzes various literature, definitions and opinions from several authors concerning the terms innovations and intellectual capital, aiming to connect the terms and highlight their general features. In addition, reference is made to current circumstances, which more than illustrate the importance of intellectual capital as an elementary part of human resources. In order for companies to continue to operate successfully in their markets, this resource must be maintained, secured or expanded in order to withstand future developments and be able to tackle innovations in a sustainable manner (especially based on Chapter 4). Therefore, the study demonstrates that there is a positive relationship (i.e., mutual supporters and drivers of value creation) between innovations and intellectual capital and the connection between the two terms is more than justified.

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