

The Relationship between Intellectual Capital and Innovations

This study explores the relationship and importance between intellectual capital and innovations in creating additional value for entities. In today's world, where we live and create in a so-called "society of knowledge", innovations play a significant role in the value chain, while intellectual capital is an important element and generator for the overall development of entities and vice versa. Thus, they represent a significant part of the 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 and its structure that consists of human, relation and structural capital, to the creation of value and innovation. The investigation will be rounded off with a look at the topic in the present time, when our society is particularly affected by (inter)national crises, be it economic, health or other crises caused by wars.

Keywords: *Assets, Development, Innovations, Intellectual Capital (IC), IC in times of crisis, Value creation*

Introduction

Topical Introduction

Nowadays, creating and working in a so-called "society of knowledge", with fast-changing market requests and constant challenges, intellectual capital and innovations can be highly recognized as generators and supporters of the development and creation of wealth for entities. Further, in line with Andrikopoulos et. al. (2009) and Ivinić (2022), in knowledge-based economies, the creation of value mostly derives from intangible resources, as knowledge (i.e. intellectual capital and innovations as a part of its outcome), significantly more than it is in case with the traditional sources of value creations (as financial capital and physical capital). Furthermore, Mutiasari and Rizki (2020) claim that intellectual capital is an intangible reference responsible for the prospect of future wealth creation for entities. Consequently, it can be assumed that thanks to the intellectual capital and innovations, as part of its outcome, entities can adapt faster and with more efficiency to tough market demands and challenges and remain competitive in the market with additional comparative advantages.

According to Forbes (2016), innovation can be seen as a dualistic dimension where, on one hand, they are an outcome of a recognized need (or from the economic point of view, a recognition of new market product potentials). While on the other hand, they require the involvement of technical knowledge and expertise, new scientific research and activities, in order to get desired findings and outcomes. Consequently, it can be considered that intellectual capital in its three-

1 dimensional aspect¹ is a generator and supporter of the process and outcomes of
 2 innovation, while their mutual relationship can be related to competitiveness,
 3 comparative advantages, development and wealth creation for business entities.
 4 Finally, when referring to innovations and intellectual capital and their reciprocal
 5 impacts on entities' performances, it is of high interest and more than justified to
 6 investigate deeper into the topic and get a wider knowledge concerning their
 7 relationships, impacts and outcomes on business entities. Thus, the study presents
 8 chapter two where a deeper insight into the topics of intellectual capital and
 9 innovations is presented and analyzed, while the third chapter is presenting their
 10 relationship and impacts on business entities' performances. Chapter 4 makes
 11 direct reference to the topic in the context of current developments.
 12

13 *Research Question, Objectives and Hypotheses Explication*

14
 15 According to Pece et. al. (2015), innovations are providing further progress,
 16 growth and competitiveness for business entities. Thus, assuming that innovations
 17 are a key to development (from the authors' standpoint they can be called the
 18 “engine of development”) and intellectual capital is a supporter of the
 19 development of innovations, the central research question is: is there a relationship
 20 between intellectual capital and innovations? In addition, some of the other
 21 questions that need to be highlighted and that this study will attempt to analyze
 22 and find answers to are as follows:
 23

- 24 • Where and what is the nexus of innovations and intellectual capital
- 25 relationships?
- 26 • Which is the effect of intellectual capital and innovations on business
- 27 entities performances?
- 28 • How does the intellectual capital structure looks like and how is it
- 29 composed?
- 30 • In which sense the intellectual capital structure supports the development
- 31 of innovations?
- 32 • How is intellectual capital to be classified in current times of crisis?
- 33

34 Consequently, despite trying to find answers to the above questions, the main
 35 objective of this study is to gain a broader knowledge of the relationships and
 36 impact of innovation and intellectual capital on the performance of companies, and
 37 to find answers on the mutual relationships between Innovations and intellectual
 38 capital. Finally, the study puts forward two main hypotheses that are accepted or
 39 rejected according to the empirical study, the qualitative method used.
 40

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

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

- 1 • H2: There is a positive impact of intellectual capital and innovations
2 relationship on business entities performances.
3

4 *Theoretical Background and Methodology*
5

6 By analyzing the literature, it can be deduced that there are not many studies
7 and researches concerning the direct relationship between intellectual capital and
8 innovations. However, a good insight about the relationship of innovations and
9 intellectual capital can be taken from the study of Hejazi et. al (2018) where
10 authors are analyzing the role of intellectual capital in the creations of innovations,
11 but in the example of HIS² and computer units.

12 What can be remarked, is that there are many separate researches about
13 intellectual capital and innovations. Therefore, there is a lot of interest and studies
14 on the impact of innovation on business performance and growth, while there is
15 some research that tries to describe its notion. Consequently, a quality insight into
16 the topic of innovations and an excellent review of the development of the
17 literature concerning the topic can be taken from the study of Pece et.al. (2015)
18 entitled: “*Innovation and economic growth: An empirical analysis for CEE³*
19 *countries*”. Thus, according to the authors, the origins of the concept of
20 innovations and economic growth can be linked to Solow already in the year 1957
21 (Solow 1957). Further, according to Aghion et. al. (2009) and Pece et.al. (2015),
22 when it is about economic growth and innovations, one of the most notable
23 economists that talk about innovations is Joseph Schumpeter. He pointed out that
24 in the very beginning, there should be a clear distinction between economic
25 development and economic growth (Schumpeter 1939). Finally, according to him,
26 economic growth indicates a progressive but slow change of the entire economic
27 system, while the economic development arises from changes driven by
28 innovations, where the economic system can be considered as a supporter of that
29 process. Additionally, he states that education is one of the most important factors
30 responsible for innovations that are subsequently providing competitiveness.

31 There are several studies that we would like to highlight, which are linking
32 innovations with economic growth and development, beginning with Ulku in
33 2004, whose research is about the economic growth and innovations between 20
34 OECD and 10 non-OECD countries, followed by Pessoa (2010), who conducted a
35 research concerning the costs of R&D in the relationship between economic
36 growth and innovations. And while Ramadani et al. (2013) conducted an
37 investigation concerning the impacts of innovations on development, Czarnitzki
38 and Toivanen (2013) devoted a study about the relationship between economic
39 growth and research and development investments in two developed European
40 countries. In addition the study of Norris et. al. (2010) should be mentioned, who
41 researched about the innovations impact on financial performances within the
42 manufacturing industry, while Jin et. al. (2019) conducted a research about the
43 effects of innovation capability on business performance. When referring to

²Health information system

³Central and Eastern Europe

1 intellectual capital, the literature is mostly trying to define its term while literature
 2 about its impact on business performances is very restricted. According to
 3 Andrikopoulos and Kaimenakis (2009), intellectual capital as a company's hidden
 4 value was detected in the early 80s of the twentieth century. Thus, the pioneering
 5 theoretical studies that can be considered as the ones that increased the interest
 6 from scientists in the subject, and the ones that resulted in creating the theoretical
 7 framework of intellectual capital to be considered in the following: "*Mobilizing*
 8 *Invisible Assets*" by Itami (1987), "*The Invisible Balance Sheet*" written by Sveiby
 9 (1989) and from Stewart (1997) "*Intellectual Capital: The New Wealth of*
 10 *Organizations*". Further, some authors that should be emphasized when analyzing
 11 and discussing intellectual capital are Obeidat et al. (2016), Černe (2011), Pratama
 12 (2020), Abbas (2015), Abdulaali (2018), Kianto (2017), Moro-Visconti (2020) and
 13 Alkhateeb et. al. (2018).

14 To present all the aspects of innovations and intellectual capital, and their
 15 relationship, the study will be mostly based on qualitative empirical study of the
 16 literature analyses. This includes also analyses with descriptions and
 17 conceptualizations.
 18

20 **Intellectual Capital and Innovations**

22 *Intellectual Capital*

24 Despite a strong interest in the topic and concept of intellectual capital within
 25 the literature, there is still not a generally accepted definition of the intellectual
 26 capital term. However, the main structural differentiation of the concept is defined.
 27 For this reason, this study will base on the literature and explanations of various
 28 notable authors by focusing on all the common elements when the term
 29 'intellectual capital' is defined. Additionally, most of intellectual capital definitions
 30 explain it as a metalevel concept of knowledge and actions that results in
 31 competitiveness, development and value creation for entities. According to many
 32 authors such as Feiwei (1975), Chang and Hsieh (2011), Černe (2011), and Ivinić
 33 (2022), intellectual capital is not a value per se, and it means more than
 34 exclusively "*pure intellect*", hence it can be considered as a degree and a process
 35 of "*intellectual actions*" from having certain knowledge and skills into using it and
 36 converting it into new value-added. Alkhateeb et. al. (2018) state that it can be
 37 considered as one of the most influential factors that nowadays has a notable effect
 38 on development and organizational performance. Further, according to Kym and
 39 Moon (2021), intellectual capital can be related as the most significant resource
 40 possessed by the entity responsible for competitiveness and comparative
 41 advantages.

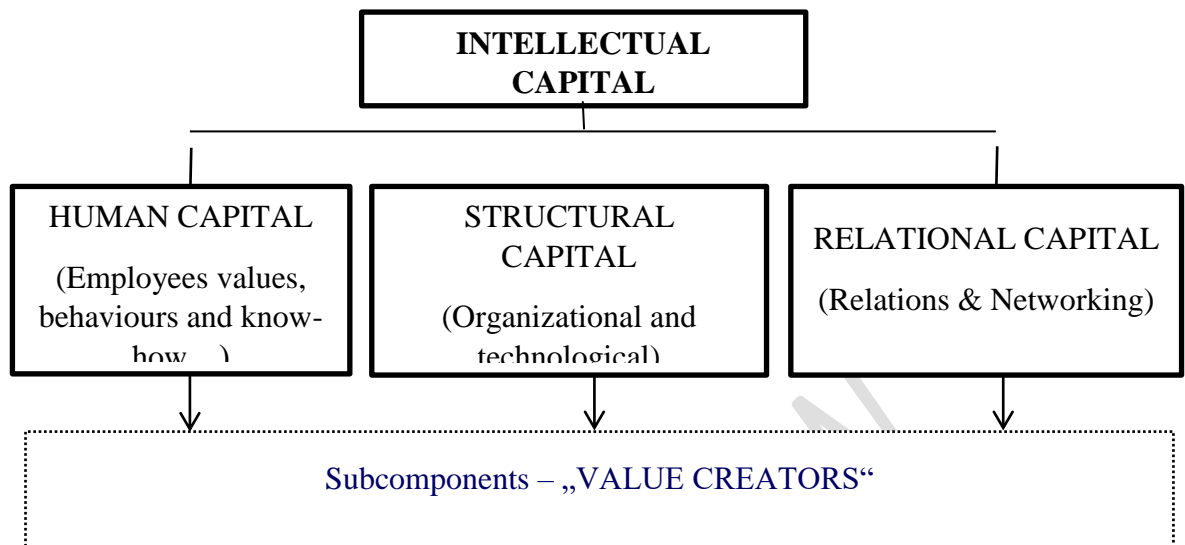
42 Many authors such as Khan (2014), Sardo and Serrasqueiro (2017), Abdulaali
 43 (2018) and Kym and Moon (2021), consider that intellectual capital presents an
 44 intangible asset within an organization that "delivers" new concepts, enhances
 45 competitiveness and assists in the creation of future benefits and wealth for a
 46 business entity. Additionally, many authors describe intellectual capital as a

1 strategic asset that delivers growth and sustainability for the organization in a
2 competitive market. Thus, intellectual capital is a hidden part of a company asset
3 whose value varies during time and has a structure whose components differ
4 among industries. However, it is a company's treasure that needs to be detected,
5 well managed, defined and structured in order to gain comparative advantages and
6 high efficiencies (Ivinić 2022). Some other definitions concerning intellectual
7 capital that we would like to highlight to create a framework for linking
8 innovations and intellectual capital are the following. According to Choong
9 (2008), intellectual capital is a holistic or "*meta-level*" ability of a company to
10 regroup, prepare and coordinate knowledge and, according to Sullivan (1999),
11 convert it into profit. Or, as Roos et.al. (1997) illustrated, intellectual capital is a
12 package of functional knowledge that, through practical transition has an impact
13 on company performances and results. Furthermore, one of the most indicative
14 and illustrative definitions in the context of intellectual capital is the one by
15 Edvinsson and Malone (1997), that "intangible assets are those that have no
16 physical existence but are still of value to the company." Furthermore, one of the
17 easiest ways for presenting a intellectual capital concept is a metaphorical
18 depiction of a tree whose life and fruits rely on invisible and hidden roots (Arenas
19 and Lavanderos 2008). Consequently, the roots are representing the abilities of
20 future earnings while fruits are new ideas and additional values.

21 Finally, the scope of the exposed definitions about intellectual capital is to
22 find the nexus and patterns that can be related with innovation. Another step in
23 linking the terms of intellectual capital and innovation is analyzing the structure of
24 intellectual capital. Consequently, figure 1 is presenting the structural
25 differentiation of the term. According to several authors (i.e. Sundač and Švast
26 2016), innovations are one of the fundamental parts and a subcomponent of the
27 main Intellectual Capital component of Human Capital, which plays one of the
28 most important roles in the creation of innovations.

29

1 **Figure 1.** *Dissection of intellectual capital structure and value creators*



12 *Source: Graphical presentation of intellectual capital components, extended for the subcomponents*
 13 *area, according to F. Ivinić, 2022*

14

15 The intellectual capital structural dissection is presented in Figure 1. Based on
 16 the literature studied, intellectual capital is formulated from the structure that
 17 contains three main components - Human Capital, Structural Capital and
 18 Relational Capital. Further, each of these components is formed by their
 19 corresponded value creators i.e. subcomponents.

20

21 *Innovations*

22

23 What can be considered as innovation, what all types of innovation are and
 24 what impact innovation has on the economy and its growth are some of the main
 25 questions this study seeks to answer.

26 According to many macroeconomists and by definition of the European
 27 Central Bank (2017), innovations are vital drivers of the economic progress and
 28 growth that benefits consumers, industries and the entire economy. Further, how
 29 they explain, innovations in economic terms represent the application and
 30 development of new ideas and technologies that improve services or goods or lead
 31 to their more efficient production with the outcome. In the end, innovations
 32 contribute to economic growth and profitability. Furthermore, already back in the
 33 50s according to Prof. Abramovitz (1956) from the Stanford University and Prof.
 34 Rosenberg (2004), there are only two ways of increasing outputs: 1) by increasing
 35 the input unit that is used in the production process, or 2) by being smart and
 36 finding new and more efficient ways of production, where the input remains same
 37 or decreases while the output increases.

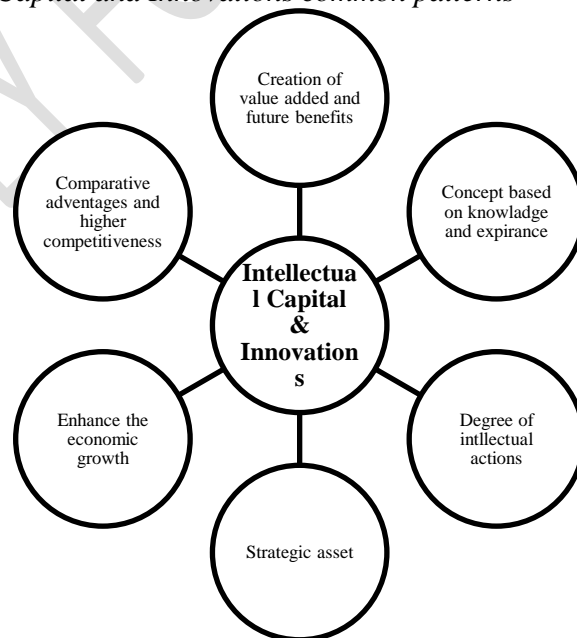
38 According to Sarangi et.al. (2021) and the conclusion from their research
 39 analysis concerning the relationship between innovations and economic growth in
 40 the G20 countries in the period from 1691 - to 2019, the long-term economic
 41 growth is highly influenced by innovations. Furthermore, innovations are playing
 42 an important role for business entities in remaining competitive on the market

1 (Pradhan et.al. 2016) and gaining additional and higher comparative advantages.
 2 Additionally, according to the calculations from the U.S. Chamber of Commerce
 3 Foundation (2015), already in 2015 roughly 50% of the US annual GDP growth
 4 can be linked with increases in innovation. According to many authors, the clear
 5 and appropriate question is whether innovation drives economic growth or is the
 6 opposite and the economic growth is responsible for the dynamic of innovations.
 7 The relationship flows both ways and according to Maradana et. al. (2017), both
 8 answers can be well-supported by different theoretical arguments. Further,
 9 innovations can be of a great help for adapting faster to social and economic
 10 changes and remain competitive. Innovations are not exclusively related to
 11 economic growth, they can be linked with many other socio-economic
 12 improvements such as helping in the reduction of poverty, better education and
 13 health systems, better and more efficient infrastructure, etc.
 14
 15

16 **Relationship and Impact between Intellectual Capital and Innovations**
 17

18 Based on the literature analyzed and everything sketched by now in this
 19 study, it is likely to conclude that there is a positive relationship between
 20 intellectual capital and innovations. According to several authors (i.e. Geissdoerfer
 21 et al. 2018, Rosenberg 2004, Uppenberg 2009, Sarangi et.al. 2021), the discovery
 22 of new technology occurs thanks to innovations which create products, processes
 23 and systems that improve productivity and efficiency within the economy, backing
 24 new income channels and new values. Further, the study offers figures 2, 3 and 4
 25 with the scope of offering an efficient visualization and analysis of the relationship
 26 between intellectual capital and innovations.
 27

28 **Figure 2. Intellectual Capital and Innovations common patterns**

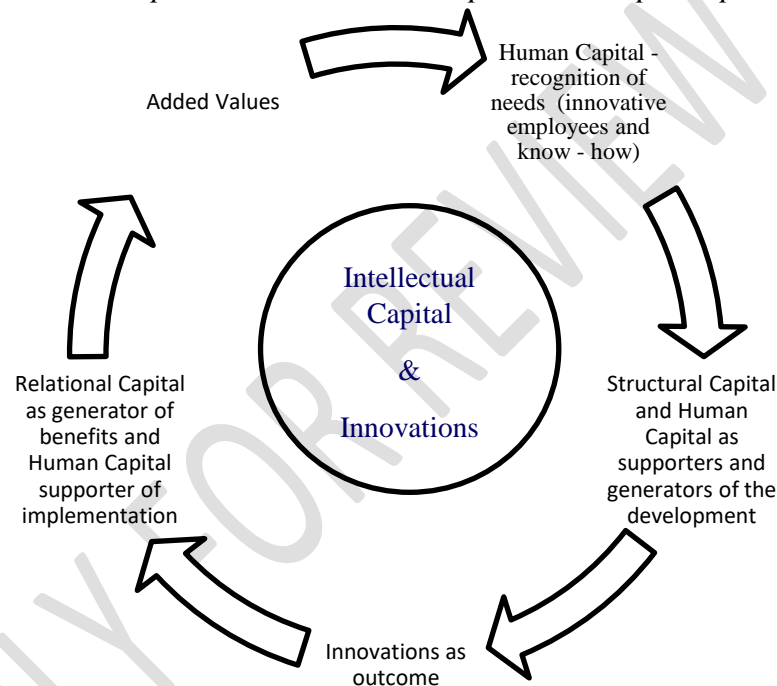


29

30 *Source: Authors graphical presentation of some intellectual capital and innovations common*
 31 *patterns*

1 In figure 2, the authors intend to highlight some patterns which can be related
 2 to the terms of intellectual capital and innovations. The aim is to provide a basis
 3 and framework for a better analysis of the study and to see whether the two terms
 4 can be linked or not. The conclusion is that intellectual capital and innovations
 5 have some of the main characteristics in common. Consequently, on the basis of
 6 the analyzed literature, the similarities between the two terms turn out to be the
 7 strongest: they are strategic assets, they are a product of intellectual activities, they
 8 are based on knowledge and experience, and they are seen as supporters of the
 9 economic growth, enhancing comparative advantages and competitiveness - they
 10 are „creators“ of future values.
 11

12 **Figure 3.** *Intellectual Capital and Innovations reciprocal development process*



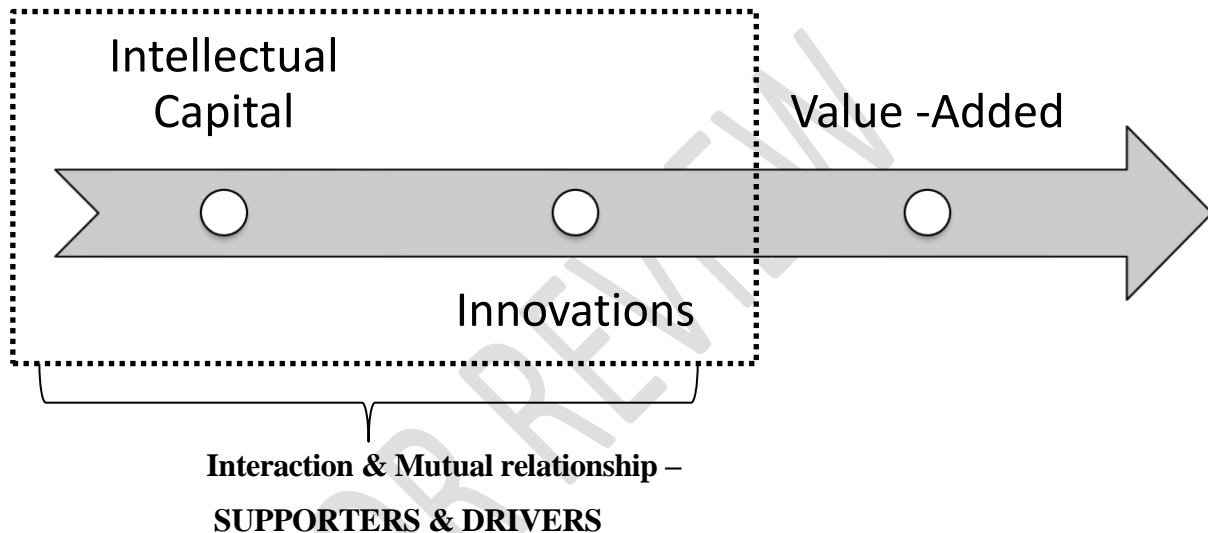
13

14 *Source: Authors graphical presentation of intellectual capital and innovations reciprocal*
 15 *development process*
 16

17 Figure 3 represents the intellectual capital and innovations process
 18 development. Consequently, based on the figure it is possible to conclude that
 19 there is a positive and reciprocal relationship between all intellectual capital
 20 components and innovations. Therefore, it is possible to state that innovations and
 21 all the innovation processes begin from human capital as one of the three main
 22 components of intellectual capital. Human Capital is the only one responsible for
 23 creating innovations and recognizing a need for innovations. Further, the creation
 24 and the development process of innovation is highly supported by another
 25 component of intellectual capital - i.e. Structural Capital. Finally, innovation as an
 26 outcome has to be monetized and efficiently distributed, all in line with the

1 strategy of a business entity. This role is intended for the relational capital as the
 2 final, third component of intellectual capital. Consequently, the relational and
 3 human capital are responsible for all the value-added that a generated innovation
 4 can generate. Finally, all the components of intellectual capital are playing an
 5 important role in the creation, development, implementation and management of
 6 innovations. Consequently, it is possible to conclude that the relationship between
 7 intellectual capital and innovation flows in both directions.

8
 9 **Figure 4.** *Intellectual Capital, Innovations and Value – Added relationship and*
 10 *interaction line*



11
 12
 13
 14 *Source: Authors graphical presentation of intellectual capital, innovations and Value – Added*
 15 *interaction*

16
 17 The presented Figure 4 represents the relationship and interaction line
 18 between intellectual capital, innovations and Value – Added. Consequently,
 19 intellectual capital and innovations have a mutually positive relationship that flows
 20 in both directions, where they are both supporters and generators of new and
 21 additional values. Within the figure, intellectual capital appears as first in the chain
 22 of value creations due to the simple fact that the first one recognizing a need for
 23 innovations is, as previously mentioned, the Human Capital. Anyway, once the
 24 need for innovation is recognized, the relationship and interaction between
 25 intellectual capital in its full form (with all the items and value creators) and
 26 innovations flows in both directions, intending to achieve new values.

27 28 29 **Classification of the Topic at the Current Times**

30
 31 If you look at the current situation in the world economy, the situation of
 32 global companies and on the world markets, their problems and challenges are
 33 raised almost in the same breath. Topics such as delivery bottlenecks due to the
 34 corona pandemic or escalating energy costs due to the war in Ukraine continue to

1 play a central role in the current media landscape (Allam et al. 2022: 1). But what
2 is also at the center of media attention is the struggle for human capital. Although
3 this is articulated more independently of crises due to its characteristics, it has
4 intensified again as a result of the crises mentioned. It is the competition for the
5 most suitable personnel, the search for adequate employees or summarized under
6 the heading widespread shortage of skilled workers (compare e.g. PwC's global
7 survey on "Hopes and Fears 2022").

8 In Germany, the economic heavyweight of the European Union, this topic is
9 even stated as "*one of the major challenges of the coming decades for all actors*
10 *from politics, business and science*". This elementary classification was not carried
11 out without reason, because "*skilled workers ensure innovation and*
12 *competitiveness, growth and employment, prosperity and quality of life*" based on
13 the Federal Ministry of Economics and Climate Protection (Federal Ministry for
14 Economic Affairs and Climate Action 2022). For Birri, the status of the staff has
15 even undergone a reciprocal development, which has blossomed from being a cost
16 block to becoming such an important component of a company valuation. Human
17 capital has thus experienced a new perspective in recent years, which, in addition
18 to being classified as an economic variable, also acts as a driving factor for
19 innovations and corporate developments. While in the past the focus on the
20 amount of the associated expenses still prevailed in the personnel factor and a limit
21 on wages and salaries as well as an optimization of the number of jobs was aimed
22 at, the new perspective is associated with the quality, the risks and the care of the
23 human capital, which should lead to better returns and productivity. Especially in
24 the context of the market value formation of a company, this topic is becoming
25 more and more of a defining component, in which the material values of a balance
26 sheet have to give way more and more. This means that intangible assets are not
27 only on the rise, they are now an integral part of a company valuation (Birri 2011:
28 25).

29 If we come back to the central question of intellectual capital as a driver for
30 innovations and future developments, it is not difficult to see that this trend is also
31 unmistakable. "*The competition of the future will be decided on the personnel*
32 *markets*" already stated Sprenger in 2010, but at that time hardly knew that this
33 trend would accelerate so much (Sprenger 2010). In Germany, for example, 16%
34 of the companies surveyed still classified the shortage of skilled workers as a
35 business risk, but today this topic is the central obstacle to development for
36 companies. How important the human capital factor, combined with the generic
37 term intellectual capital, must then really be perceived can best be determined by
38 looking at the causes of the prevailing shortage of skilled workers. As part of the
39 demographic change, the aging of society intensifies the bottlenecks in the skilled
40 labor sector. Based on initial projections in the strongest economy in the EU, the
41 working-age population (people between the ages of 20 and under 65) will fall by
42 3.9 million to 45.9 million in 2030. The extrapolation to the year 2060 even
43 predicts a decline of 10.2 million people of working age (Federal Ministry for
44 Economic Affairs and Climate Action 2022). These first numerical statements
45 only give an idea of the challenges companies will face in the medium and long
46 term. While Sprenger's thesis mentioned above already indicated a certain

1 explosiveness, McKinsey's slogan "War for Talent" as one of the largest
 2 consulting companies in the world is more than memorable (Axelrod et al. 2001).
 3 The previous trend of downsizing in times of economic crisis is becoming a
 4 mirage. The competition for the best employees is intense even in such times. This
 5 was also the finding of the Big Four accounting firm PricewaterhouseCoopers
 6 (PwC) in a survey during the Great Recession, when over 50% of the CEOs
 7 surveyed indicated a major challenge in the availability of people with the right
 8 skills (PwC 2010).

9 The previous explanations in this chapter have clearly expressed how IC has
 10 categorically developed in recent years. In addition to the actual recruitment,
 11 maintaining and passing on the experience and know-how of older employees in
 12 the long term represents the even bigger construction site. It shows that the human
 13 factor in today's companies with a high proportion of knowledge work - but
 14 therefore primarily in the tertiary sector - can no longer be readily substituted.
 15 Innovations can only be secured in the future by maintaining such knowledge
 16 resources.

19 **Conclusion**

21 Finally, based on the study analysis conducted, it is likely to conclude that
 22 nowadays innovations and intellectual capital are crucial and fundamental factors
 23 of competitiveness, value creation as well as for current and future financial results
 24 of business entities. The study is analyzing various literature, definitions and
 25 opinions from several authors concerning the terms Innovations and intellectual
 26 capital, aiming to connect the terms and highlight their general features. In
 27 addition, reference is made to current circumstances, which more than illustrate
 28 the importance of intellectual capital as an elementary part of human resources. In
 29 order for companies to continue to operate successfully in their markets, this
 30 resource must be maintained, secured or expanded in order to withstand future
 31 developments and be able to tackle innovations in a sustainable manner (especially
 32 based on chapter 4). Therefore, the study proves that there is a positive relationship
 33 (cit. mutual supporters and drivers of value creation) between innovations and
 34 intellectual capital and the connection between the two terms is more than
 35 justified.

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