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Marta PENKALA<sup>1</sup>

## THE ROLE OF HUMAN CAPITAL IN THE INNOVATION MANAGEMENT PROCESS

The high dynamics of contemporary economic conditions, technological progress, and global competition make human capital extremely important in the context of implementing innovations that enable the broadly understood development and competitiveness of an organization. At every stage of the innovation life cycle, human capital, including the knowledge, skills, and experience of employees, plays a key role. This article aims to examine the importance of human capital as a factor supporting creativity and generating ideas, contributing to the creation and implementation of innovative solutions in organizations. It defines the concepts of human capital and innovation and characterizes the results of selected reports of national institutions regarding the analyzed constructs. Moreover, the importance of human capital in the context of organizational innovation and management of innovative processes is emphasized.

**Keywords:** human capital, capital, human capital management, innovation, innovation management process.

### 1. INTRODUCTION

Human capital management is important in ensuring the effectiveness of the organization and covers a wide range of activities, such as recruitment, training, development, and motivation. Through effective human capital management, organizations have the opportunity to create solid teams, increase productivity, creativity and efficiency, which may result in increased competitiveness and sustainable development. Moreover, the importance of human capital results from the fact that it is the main factor for the development of the innovation ecosystem, which can result in the promotion of a culture of creativity and the creation of innovative concepts. Therefore, investing in effective human capital management should be one of the organization's priorities, because employee involvement, their knowledge and skills are key factors in the effective functioning of the entity.

Moreover, innovation is an important element in the functioning of the organization because it enables development, adaptation to changes in the environment and building a competitive advantage in the variable and unpredictable environment in which a specific entity acts. Innovation management in an organization plays a key role in shaping its strategy, culture and performance. This process requires the establishment of appropriate

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<sup>1</sup> Marta Penkala, Silesian University of Technology, Poland; e-mail: marta.penkala@polsl.pl.  
ORCID: 0000-0001-7876-7525.

processes and structures that support the generation, implementation and monitoring of innovative solutions. Moreover, encouraging the creation of an environment conducive to creativity often results in the creation of an innovative culture. Moreover, through effective innovation management, organizations can adapt to the changing environment and build a lasting position on the market.

## 2. LITERATURE REVIEW

### 2.1. Human capital

In recent years, both human capital and other intangible forms of capital have become not only the subject of analyzes by researchers, but also journalists, employees of public organizations and politicians have also expressed interest in this issue. This is since one of the key elements of the development of any organization is human capital, which is subject to interpretations in the literature on various levels and to various extents. Due to this and the interdisciplinary nature of this concept, it is impossible to create a universal definition that would be widely accepted.

The origins of the idea of human capital can be traced back to antiquity. Xenophon believed that “a specialized craftsman will do something better than an ordinary producer” (Stankiewicz, 1987), so it should be concluded that, apart from the distinction between the work of masters and their slaves, Xenophon also took into account the division of labor based on professional skills and indicated on the relationship between increasing productivity and employees having specific skills (Romanow, 1999). However, the genesis of the concept of human capital in the context of the role that humans played in various types of economic processes and investments in this type of capital has its origins in the economic theory presented by W. Petty and A. Smith.

W. Petty claimed that the basic factors influencing national wealth are land and work. He also noted that within the labour factor, capital is extremely important, because the professional qualifications and skills possessed by employees make it more efficient (Domański, 1993). In turn, A. Smith emphasised the need to increase investment in the sphere of education and to treat people and their skills separately as capital. He argued this primarily by saying that the competences a person has are his property but are also part of the capital of the society to which he belongs (Jagoda, Klimeczak, 2011; Kalita, 2015). The presented considerations allow for a division between two main approaches. The first of them was presented by W. Petty, whose perception of man as capital led to determining his value on this basis. However, the second trend, whose precursors include A. Smith, separately analyses the human being and the capital contained in him in the form of knowledge, skills, and predispositions.

The creators of the modern concept of human capital, including G.S. Becker, T.W. Schultz, and J. Mincer referred to I. Fisher's capital theory in their views. This researcher claimed that human capital is a set of knowledge, health, energy, and strength that characterises every person, and its components can be developed through investments in personal improvement and the acquisition of knowledge and new abilities (Stalończyk, 2012; Khaykin et al., 2020). G.S. Becker, on the other hand, treated human capital as the concentration of knowledge, skills, experience, and health that bring results in the form of increased efficiency and abilities of an individual or society. He believed that increased financial outlays within the above-mentioned categories can lead to an increase in individual efficiency, which will have a positive impact on society as a whole and overall

economic growth (Teixeira, 2014; Leoni, 2023). A similar attitude regarding investments in education and training was presented by T.W. Schultz, who believed that these investments contribute to economic growth as well as the income and well-being of employees. In turn, J. Mincer defined human capital by the value of investments in education, training and other forms of personal development and health, because these factors influence the increase in productivity and human potential in the labor market (Wieczorek-Szymańska, 2010; Magnac, 2024).

The concepts of the authors of the modern theory of human capital may have influenced researchers to distinguish many definitions of this construct, which are systematised in Table 1.

Table 1. Selected definitions of human capital

Author (year)	Definition of human capital
Begg (1992)	“Knowledge and skills embodied in people”
Bratnicki (1999)	People who have lasting connections with the company and identify with its mission, demonstrating the ability to cooperate, creativity, competence, motivation, and the ability to think logically.
OECD (2001)	Knowledge, skills, abilities, and other individual attributes that facilitate the creation of personal, social, and economic well-being.
Edvinsson (2001)	“The combined knowledge, skills, innovation and ability of individual company employees to efficiently perform tasks”.
Gilejko (2002)	“Qualification resources, level of education, adaptability, and universality of innovative attitudes of employees”.
Dziuba (2005)	“Source of innovation and development”.
The World Bank (2017)	Human capital encompasses the knowledge, skills, and health that individuals invest and accumulate over the course of their lives, enabling them to realize their full potential as productive members of society.
Gierszewska (2017)	The skills of managers and employees, their knowledge, abilities, and motivation, as well as their behavior and attitudes towards work.

Source: own study based on the literature.

Referring to the definitions of human capital presented in Table 1, it should be stated that this term is perceived in a multidimensional and heterogeneous manner. The diversity of interpretations may be related to the use of different types of human capital components and the scale and levels at which these concepts are analysed. This makes it difficult to practically apply the concept of human capital in a universal way, while allowing for a multidimensional view of its structure and its application in individual cases. Due to the above, it is not possible to indicate the same identification of human capital elements among the authors. However, it is possible to identify the presence of similar components, which are qualifications, social skills, and attitudes towards the organisation. Moreover, some authors create a correlation between human capital and innovation.

As B. Czerniachowicz and A. Wieczorek-Szymańska claim, to fully interpret the definition of human capital, it is crucial to consider the level at which this concept is treated: macroeconomic, organisation and individual. These scales are correlated with each other, and it is essential to recognize and evaluate the state of social capital at its various levels (Czerniachowicz, 2008; Czerniachowicz, Wieczorek-Szymańska, 2011).

In the context of the analyzed construct, it is also important to use tools aimed to measure it. However, the literature on the subject indicates difficulties that may occur in this matter (Dąbrowska-Karasińska, 2002; Skrodzka, 2009; Rutkowska, 2012; Górski, 2016). Among the important factors influencing this state is the lack of a systematic understanding of human capital and its components due to their multidimensionality and heterogeneity. Additionally, the unmeasurable nature of components of human capital contributes to the problems of constructing a universal measure. Despite the above-mentioned difficulties, in recent years there has been noticeable progress in various proposals for measuring this construct.

In the literature on the subject, attention is drawn to the fact that qualitative methods are mainly used to measure human capital. They cover a specific group of people or entire societies. The most frequently used are the analysis and assessment of the level of education of the society and the vital energy or level of health (Firszt, Jabłoński, 2022) by using human capital measures in the form of, e.g. the schooling universality index (Gleaser, 1994; Wolff, 2000), the number of years of education (Mankiw, Romer, Weil, 1992), life expectancy (Gupta, Mitra, 2004), health care expenditures (Gyimah-Brempong, Wilson, 2004). Measurement and analysis of this construct can be made from an external perspective, as part of the observation of the phenomenon at the macroeconomic level and investments in human capital at the organisational level, which emphasises the motivations that guide individuals when making decisions related to investments in their capital (Łukasiewicz, 2009).

Due to the key role played by human capital in all types of organisation, reports that enable analysis and assessment, management, and effective use of human resources are extremely important. Integrated reports are examples of documents containing important information regarding an organization's human capital. The literature on the subject emphasizes the importance of this type of reporting because it is a tool for communication between organizations and stakeholders who are interested in assessing the ability of a given entity to generate value in the long term (Walińska, et al., 2015).

Among the integrated reports developed by Polish enterprises, the following can be distinguished: Integrated Report 2022 of the TAURON Group, Integrated Report 2021 of the ORLEN Group, and Integrated ESG Report 2021 of the PGNiG Group. With regard to human capital, these documents contain information on, among others: key data and human capital management and the results achieved in this area.

The Integrated Report 2022 of the TAURON Group includes key data, e.g., the number of employees, the share of each gender among the employees, and the percentage of employees with details of their level of education. Moreover, in relation to human capital management, it considers activities undertaken as part of recruitment and implementation, personnel administration management, and entity efficiency, as well as employee and organisational development. Similar aspects are included in the Integrated Report 2021 of the ORLEN Group, but it mainly focuses on managing capital results. The ORLEN Group, striving to minimize the negative impact of demographic changes on the labor market, implements strategies for employee age management and creates plans for the development of skills that are currently important and forecast to be key to achieving business strategy goals.

Moreover, the above-mentioned reports emphasize that investments in the development of human resources have a positive impact on intellectual, social and productive capital, which in turn may translate into an increase in the financial capital of these enterprises. Furthermore, the PGNiG Group's 2021 ESG Integrated Report also draws attention to the

interdependence between human capital and natural capital and the correlation between human capital and innovative capital.

An interesting example of a report on human capital is a statistical analysis prepared by the Statistics Poland – “Human capital in Poland in 2016–2020”. The study aimed to identify the situation of human capital in Poland by analysing various indicators that describe it and influence its development. Due to their specificity, three main categories can be distinguished – quality-related, cost-related, and income-related. The first group of indicators includes various measures that describe Poland's inhabitants, which are associated with educational factors, health issues, and the labour market. The second group, described in the section on economic factors relating to the development of human capital, includes, among others, an analysis of the costs incurred in this respect by the state and local government units. The last category of indicators, with respect to income, focusses on the amount of remuneration of employees, which is linked to the degree of education.

The examples of reports presented prove that human capital can be analyzed due to various levels and perspectives. Moreover, it is correlated with other types of organizational capital. It should be emphasised that the production of human capital reports brings a number of benefits, both in the area of management and in the context of the overall strategy of the organisation. The reports enable analysis of the team's effectiveness, thanks to which strengths and areas requiring improvement are identified. In addition, they help identify future potential leaders.

## **2.2. Innovation and the innovation process**

Like human capital, innovations are of interest to researchers in many fields of science, but also to all types of entities in many countries. They are crucial for the development of the economy, technology, and societies. Innovation processes include a series of activities, stages, and decisions aimed at implementing new ideas, products, services, or processes or improving existing ones. From the organisation's perspective, introducing innovative solutions is associated with many benefits, including: enabling maintaining a competitive advantage, developing employees, and maximising interest in the labour market among potential employees, increasing efficiency, and focussing on sustainable development by minimising the negative impact on the environment and society. However, for society, innovations are important because they create the prospect of creating new jobs by generating the development of economic sectors and the possibility of creating new industries and markets. Importantly, the implementation of innovative solutions improves the quality of life and minimises the problems faced by modern societies. Moreover, innovations can contribute to a more efficient use of resources, both natural and human.

The origins of the term innovation should be noticed already in the fourth century AD, when this term began to be understood as a process of renewal or change (Gruszevska et al., 2018). Researchers additionally indicate that the origin of this word can be derived from the Latin “*innovatio*” (Tidd, Bessant, 2011), which means creating something new, as well as “*innovare*” (Topoła, Praszczyk, 2002), understood as renewal. In the literature on the subject, it is impossible to distinguish one universally accepted definition of innovation because researchers representing different fields of science use different criteria and perspectives when interpreting this term. Based on the literature review, Table 2 presents definitions of innovation presented by various researchers.

Table 2. Selected definitions of innovation

Author (year)	Definition of innovation
Schumpeter (1943)	The introduction of a new product, a new production process, a new source of raw materials, or a new market into the economy.
Pomykalski (2001)	“innovation is an activity that gives resources new opportunities to create added value for shareholders, consumers, and other interest groups”.
Leadbeater (2003)	“A long-term, interactive, and social concept, involving different people from different backgrounds with different competences”.
Griffin (2006)	“The directed effort of an organization to develop new products, new services, or finally to find new applications for existing products or services”.
Smith (2006)	“Innovation is a new idea, practice, or object”.
Knosala, Deptuła (2018)	“Any idea transformed into a specific action/thing that is characterised by a deliberately designed change of a novel nature, both in the strict sense and in general, intended to bring certain benefits”.
Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation (2018)	“An innovation is a new or improved product or process (or combination thereof) that is significantly different from an entity's previous products or processes and that has been made available to potential users (product) or put into use by the entity (process)”.

Source: own study based on the literature.

Analyzing the interpretations of innovation presented in Table 2, it is worth noting that it can be perceived as a one-time action aimed at introducing a specific solution, or as a long-term process involving various entities, such as public institutions, the private sector, non-governmental organizations, and society (Pomykalski, 2001). Moreover, innovation is treated as a change (Żero, 2018), and a benefit (Knosala, Deptuła, 2018). Furthermore, the authors also connect the concept of innovation with the development of knowledge (Dolińska, 2010).

As J.F. Jacko (2018) emphasised that novelty, effectiveness, and usefulness are the features that innovations should have. However, the components of innovation include cross-sector cooperation, idea generation, implementation and value creation (Cowan et al., 2009; Piersiala, 2023). Furthermore, integrating different disciplines such as social sciences, technology and the arts can lead to innovative approaches and solutions that integrate diverse perspectives. Organizations should implement initiatives and strategies that they deem most effective in delivering value to their stakeholders.

Closely related to the concept of innovation are innovation processes, the stages of which focus on identifying customer needs and innovation opportunities, generating ideas, working with information and knowledge about innovation, implementing innovation activities, and ensuring the successful expansion of innovation among customers (Şimşit et al., 2014). When trying to define the innovation process and its features, it can be said that the analysis of this term should begin with defining the perspective. The literature on the subject distinguishes various approaches to this concept; however, they contain common elements in the form of a sequence of actions that include the creation of an idea, the concept of creating a novelty, and its subsequent implementation (Knosala et al., 2014; Adams et al., 2006; D. Cropley, A. Cropley, 2014). However, the degree of complexity of

the innovation process depends on the entities participating in it and the intended goals and effects to be achieved within it. However, flexibility and adaptability are key factors in successfully managing the innovation process.

Measuring innovation and the data obtained as part of it are important for many entities, from those managing organizations, through stakeholders in the private and public sphere, to scientists and political decision-makers. In the past, companies have focused more on performance measures from a quantitative perspective, such as the number of new products or services per year (Markham, Lee, 2013). However, modern organizations are increasingly using a qualitative perspective to measure innovation, such as the organization's openness to change and risk-taking, or the impact of innovation on organizational culture.

Some authors identify the term "innovativeness" with the concept of innovation (Cho, Pucik, 2005). The literature on the subject indicates that it should be considered as organization's ability to create new and valuable elements, such as products, services, processes, business models or even new directions of organizational development (Hill et al., 2014). Moreover, innovativeness is viewed as a construct consisting of five dimensions, i.e. creativity, openness, future orientation, risk-taking and proactivity (Ruvio et al., 2014). From the perspective of enterprises, it should be stated that the role of innovation as a key source of competitive advantage is constantly growing, because the competitive success of an entity depends on the degree to which it is innovative (Bielski, 2000; Pomykalski, 2004; Penc, 2007). For this reason, measuring innovation is crucial for many organizations.

In the literature on the subject, there are many methods to measure the innovation of enterprises, but none of them has been considered universal. Key aspects of innovation activities that are the subject of literature research include financial indicators, market share, customer satisfaction, and flexibility in adapting to changing market conditions. However, it should be noted that there are also other important dimensions that are taken into account when assessing the ability to innovate in an organisation. These aspects include innovation strategy, knowledge management, organisational structure, company culture (Nappi, Kelly, 2018), and intellectual capital (Asiaei, Jusoh, 2015). Commonly used indicators measuring the innovativeness of enterprises include the number of innovations introduced and the variety of types, planned innovative solutions, or the number of patent applications and expenditure on research and development activities (Bielski, 2000).

Knowledge from activities undertaken to measure innovation is essential to develop solutions to social and economic challenges and issues that may be caused by demographic and climate change. Importantly, innovative activities should be supported primarily by people and institutions that make political decisions and influence the direction of actions within the government structure or public authority, because innovations are a key factor driving efficiency, economic growth, and the well-being of society (Mardiani et al., 2023).

Innovation reports are an important tool for analysing and assessing activities related to the approach to change and the introduction of new products. In organizations, such documents may cover various aspects of this matter, including strategies, results, expenses, barriers, successes, and development prospects. Reports on this issue on a national scale are equally important because they serve to assess and monitor a given country's progress in the field of R&D, innovation, and technology. On an organisational and national scale, reports can be based on benchmarking, as they are a valuable tool that allows one to understand one's position compared to others and to determine improvement areas in the field of innovation.

The 2022 report of Jastrzębska Spółka Węglowa S.A. is an example of a publication that contains activities undertaken in the field of innovation, considering human and intellectual capital. In 2022, the R&D+I sphere focused on introducing innovative solutions in the areas of mining, coking, and environmental protection in the JSW Capital Group. The report also emphasised the importance of financial resources related to the undertaken R&D+I works (JSW SA, Integrated Report 2022). Another interesting example of the approach to innovation in the integrated report is the publication of the Azoty Group for 2021. In defining the mission and vision for 2030, the company emphasized the importance of an innovation strategy, the aim of which is to provide modern, improved, high-quality products and maintain a long-term advantage competitive. This strategy assumes taking actions as part of innovative projects, developing an innovation structure, supporting corporate ventures, and innovations focused on limiting the negative effects related to the implementation of regulatory risks (Grupa Azoty, Integrated Report for 2021).

However, on a national scale, the Polish Agency for Enterprise Development undertook to examine the level of innovation of enterprises in the years 2017–2023, assuming annual monitoring of activities undertaken in this area. During the study, various aspects of innovation processes in organisations were taken into account. As part of the report, companies were divided into three categories: innovative, ineffective in terms of innovation and inactive in terms of innovation. The second group also consisted of organisations that did not implement the innovation project due to interruption, abandonment, or lack of completion, which prevented the implementation of the innovative solution. The first and second groups were considered as innovative companies, while the second and third ones created a group of non-innovative companies. Among the 1,787 enterprises analyzed, the largest group were innovative companies – 1,488 organizations. Companies that were considered non-innovative indicated the lack of appropriate infrastructure and financial resources as the reason for not undertaking innovative activities (PARP, 2022).

Reports on innovation in various types of organizations and on a national scale are extremely important due to the possibility of identifying the degree of introduction of innovative solutions and monitoring the progress of the innovation process. Moreover, these documents allow better resource management and effective risk management by identifying potential threats related to innovative activities. It may result in better adaptation to market, technological, and social changes. Reports relating to the innovative solutions implemented can have a positive impact on relations with stakeholders by creating a positive image of the given organisation or country.

### **3. DISCUSSION AND CONCLUSION**

The analysis of the literature on the subject allows to conclude that both human capital and innovation are defined by researchers based on various criteria. The multiplicity of interpretations and, consequently, the lack of universal and widely accepted definitions, proves the great interest in these constructs, and the important role they play in modern economies and societies.

Considering the presented definitions of human capital, this term can be understood as a cost, resource, or investment. Moreover, attention should be paid to the presence of key elements of the expression analysed, which are qualifications, social skills, and attitudes towards the organisation. However, the analysis of the presented interpretations of the concept of innovation allows one to conclude that they refer to the introduction of new



elements, changes, and improvements in various spheres of life, covering areas such as business, technology, and society. They may constitute new products, services, procedures, or business models. It is important that these solutions are new, effective, and useful. Moreover, the innovation process includes several steps, starting from generating ideas, through research and development, to introducing innovations and adapting them to market conditions.

In the context of the considerations undertaken, it is extremely important to measure human capital and innovation on various scales – both within a given organization and the entire country or regions. These activities may be crucial not only for monitoring and assessing the progress of activities undertaken relating to these issues. They are also perceived as a valuable tool that allow understanding the entity's position in comparison to others and identifying areas requiring improvement and taking specific corrective actions in the context of the analyzed issues.

The evaluation of the literature on the subject leads to the conclusion that human capital plays an important role in managing innovation processes in organisations. Firstly, it is crucial for the organisation's prosperity and economic development. It is so because employees are the source of generating innovative solutions that translate into the efficiency and competitiveness of the entity. Second, the high level of employee competence and the innovations implemented as a result have a positive impact on the perception of the organisations that introduce them by stakeholders. As a result, it is possible to create new relationships that can contribute to the exchange of experiences and the creation of innovative solutions, also in areas different from before.

This article aimed to draw attention to the role of human capital in managing innovation processes. The important values of this study are:

- a) at the theoretical level: emphasizing the important role of human capital in managing innovation processes in organizations and the relationships between them;
- b) at the practical level: examples of reports from selected institutions regarding human capital and innovation may become an inspiration for other organisations to measure these phenomena as part of their activities. The study can further increase the organisation's awareness of investing in human capital and innovation. These phenomena are correlated and bring benefits not only to the employee or entity but may be important from the perspective of economic, technological, and social development.

However, the research results cannot be considered exhaustive. It is important to emphasise the need for further research on human capital and innovation at various scales in diverse types of organisations in the future. This is related to many changes that are currently taking place in economies, technologies, and societies, and the need to adapt solutions to emerging challenges.

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