Grażyna MICHALCZUK, PhD, Professor of the University of Bialystok
Faculty of Economics and Management, University of Bialystok
e-mail: g.michalczuk@uwb.edu.pl

Julita FIEDORCZUK, MA
The Faculty of Economics and Management, University of Bialystok
e-mail: fiedorczukjulita@uwb.edu.pl.

DOI: **10.15290/ose.2017.05.89.08**

MACROECONOMIC PERSPECTIVE OF INTELLECTUAL CAPITAL – NATIONAL INTELLECTUAL CAPITAL (NIC)

Summary

Intellectual capital at the macroeconomic (country) level is a new area of research that focuses on understanding, measuring and reporting of intangible assets that can have an influence the creation of national wealth. The concept is abstract, unequivocal and complex, which causes individual authors to differentiate their interpretation of this economic category. The paper presents an analysis of approaches to defining and classifying national intellectual capital (NIC). This enables the authors to identify various perspectives on the topic.

Key words: national intellectual capital, NIC structure, taxonomy of NIC division, capital in macroeconomic perspective, NIC categorization.

JEL Classification: E01, E22, J24, O11, O34

1. Introduction

Capital is one of the key and at the same time unequivocal categories to which both theory and practice attach different meanings. On the one hand, it is a body of *past work accumulated* over time. On the other hand, it reflects the abilities to generate future value. The ability to increase its value and the ability to create new values are the potential properties of capital [Woźniak-Sobczak, 2006, p. 40]. According to M. Dobija, the capability to multiply itself with the passage of time is a natural attribute of capital. As an abstract concept, capital is multiplied using various assets, which is reflected in the principle of economic equilibrium [*Teoria rachunkowości*…, 2005, p. 36]. While analyzing the

nature of capital, Dobija developed an interesting conception: the significance of capital in economics is the same as that of energy in physics[1].

Nowadays, attitudes to the notion of capital occur together with the changes in the functioning of economies. Apart from material capital, a new form is mentioned – intellectual capital. Although these two complement each other, it is still chiefly material capital that is reflected in economic models.

In this context, there emerges the problem of where to place the category of intellectual capital in the hitherto prevailing terminology. This issue becomes more complex when intellectual capital is considered in the macroeconomic perspective. Then it is referred to as national intellectual capital (NIC).

The concept of intellectual capital in the macroeconomic perspective is now in an early stage of development[2]. This is determined mainly by the complex and non-uniform character of national intellectual capital, various levels of aggregation, the degree of precision of particular approaches, as well as by different structures of theoretical models [Michalczuk, Fiedorczuk, 2017, p. 216].

The aim of the paper is to present and systemize the approaches to conceptualization and categorization of intellectual capital in the macroeconomic perspective. The paper attempts to organize the present body of knowledge regarding the definition and categorization of national intellectual capital (NIC). This is done through analysis of the literature concerning the problem of national intellectual capital in the light of the so far developed approaches to definition, taxonomy, and methodology.

2. The essence of national intellectual capital (NIC)

Capital is a basic category of economic sciences. It is in the focus of interest of economics, finances and management. This is mentioned, among others, by S. Flejterski, who emphasizes the fact that capital is the main concept of economic sciences and economic practice [Flejterski 2010, p. 12]. And yet, despite its importance, it still remains a fairly unexplored factor whose composition, structure, fluidity, and origin are changing. Consequently, it is difficult to define 'capital'[3], because like most economic categories, it is a conceptual synthesis of a certain part of economic reality. The capital itself is an abstract notion and, according to A. Herman, it becomes a term only after it has been defined, whereas its definitions have been changing over centuries along with the progress of

[1] Thorough studies of the manifestations of concepts and metaphors related to energy in economic thought were conducted by P. Mirowski [1989]. The value and the usefulness of capital through the prism of physical understanding of energy were considered, among others, by T. Veblen, W.S. Jevons, I. Fisher, W. Pareto, and L. Warlas. Their concepts were based on perceiving mechanics as a model for economic sciences. I. Fisher presented a table including analogous physical and economic categories, where energy was the equivalent of usefulness [Cieślak, Dobija, 2007, pp. 7-9].

[2] This is because intellectual capital in a macroeconomic perspective was regarded as a factor that determines a country's wealth as late as in the 1990s [Labra Sanchez 2013, p. 584].

[3] As the conceptual category of economic sciences it is widely used, but simultaneously it is defined in a number of ways. On the one hand, it constitutes the key category, whereas on the other hand, it is an unequivocal category to which various conceptual range is ascribed.

civilization [*Czym jest*…, 2008, p. 4]. It is the way in which a certain category is defined that informs one of its scope and meaning. However, defining it is far from simple[4] because, like other economic categories, capital is subject to evolution, which translates into various approaches to both the definition and the interpretation of the concept.

The efforts to implement the achievements of economic sciences have resulted in the development of several expressions including the word 'capital'. Such terms as 'social capital', 'cultural capital', 'intellectual capital', or 'organizational capital' are used more and more frequently. This terminological diversity of the category has provoked a debate regarding not only the definition of these increasingly significant concepts but also search for the factors determining these 'capitals'.

E. Mączyńska claims that the evolution of the concept of 'capital' is visible, among other things, in the fact that numerous forms and adjectives related to this word have entered the language [*Czym jest*…, 2008, p. 4]. Intellectual capital is one of these new forms. N. M. Sharif underlines that intellectual capital is located one step higher than other capitals; it constitutes a meta-resource. Naturally, it denotes more than just hidden knowledge related to human capital or literal knowledge that is an element of information capital. Intellectual capital can, therefore, be regarded as a refinement of all the other resources [*Knowledge Cafe*…, 2006, p. 66].

The category of intellectual capital has been popularized as a result of the transition from an industrial economy based on traditional production factors to a knowledge-based economy. As regards the changes taking place in the economy, there is an ongoing debate among economists focused around the question of what intellectual capital actually is and how it differs from capital perceived in the traditional way, i.e. from material (real and financial) capital. However, it is difficult to answer a question formulated in this way owing to the fact that, despite numerous attempts, no single, comprehensive definition of intellectual capital has been agreed on.

Intellectual capital is a category the basis of which is its microeconomic approach referring to the intellectual capital of a company[5]. All the questions regarding its definition, taxonomy, measurement or reporting are considered in this context. The development of the concept of knowledge-based economy has contributed to the fact that the importance of intangible resources for national economies has begun to be more appreciated. It emerged that wealth is generated not only by material capital. Intellectual capital is increasingly regarded as a source of wealth. As a result, the concept of intellectual capital has been transferred onto the macroeconomic level[6].

---

4 The concept 'capital" is of key importance in the theory of economics. However, despite the fact that this term has been used by economists from the times of A. Smith to the present day, one universal definition has still not been elaborated. More information: [Dobija, 2002].

5 These days intellectual capital is indispensable for each company. It determines its competitiveness, development and investment potential, creating additional possibilities of presenting it as a strategic resource [Wójcik-Jurkiewicz, 2011, p. 321].

6 The notion of national intellectual capital was born in Sweden, where in the mid-1990s, for the first time in the world, the scale of studies on intellectual capital was extended to the national level. The process of adaptation on the macroeconomic level is the contribution of L. Edvinsson. As a director responsible for intellectual capital in Skandia, in 1993, Edvinsson developed a scheme aimed at enhancing the company's value (Skandia Value Scheme). On its basis, he devised Skandia Navigator

National intellectual capital (NIC) is also a notion that still has not been clearly defined, despite considerable efforts made in this regard. The reason is that this category is complex and internally non-uniform [Marr, Chatzkel, 2004, pp. 224-229].

Y. Malhotra defines intellectual capital as knowledge assets of individuals, companies, institutions, communities, and governments that reflect both the present and future potential sources of generating wealth and improving living standards [Malhotra 2003, p. 3]. These assets are essential for economic growth, maintaining competitive advantages, as well as for the development of society and improvement of the quality of life. N. Bontis sees it in a similar way, as for him, the term denotes hidden, intangible, intangible values inherent in people, companies, institutions, communities, and regions that constitute both the present and future potential sources of wealth [Bontis 2004, pp. 14-15]. This approach to defining NIC focuses on the multi-layered structure of intellectual capital carriers, i.e. man, formal groups (e.g. companies) and informal groups (e.g. society).

D. Andriessen and C. Stam define NIC as accessible intangible resources that ensure a relative advantage over other countries, which (when used appropriately) may cause generation of material benefits in the future [Andriessen Stam 2004, p. 4; 2008, p. 490].

L. Edvinsson and C. Yeh-Yun Lin associate national intellectual capital with information, knowledge, intellectual property and experience, which can be used for creating prosperity and which are the roots of the future abilities to gain wealth and achieve advantages over other countries [Edvinsson Lin, 2008, p. 254]. Navarro, Ruiz and Peña define national intellectual capital as intangible capital found in a country's inhabitants (knowledge, skills, qualifications, personal development for achieving objectives, cultural values, conditions of domestic labor market, foreign labor force), as well as structural, economic and social capital that makes possible the creation of future benefits for the country [Navarro Ruiz Peña, 2014, pp. 263-264].

The overview of the most representative concepts of national intellectual capital (apart from the aforementioned ones) is shown in Table 1.

– a tool of management and reporting on intellectual capital [Ondari-Okemwa 2011, p. 140]. The first appendix to Skandia's annual financial report, "Visualizing intellectual capital in Skandia", was published in 1994, whereas in 1995 two supplements were issued: "Renewal and development intellectual capital" and "Value-creation process: intellectual capital"; in 1996 further supplements were published: "Power of innovation: intellectual capital" and "Customer value" [Bontis, 1998, p. 74] On their basis, and within the framework of establishing in Sweden the Year of Innovations in 1996, as well as owing to the functioning of Skandia Future Centre (L. Edvinsson became the Director), Skandia Navigator was modified to the national level [Edvinsson, 2004, p. 157] Having been adjusted to the macroeconomic conditions, the model was used in the first (on the global scale) reports on the state of national intellectual capital in Sweden: "Welfare and Security" [Stenfelt et al., 1996] and „Invest in Sweden" [Rembe, ISA, 1999], [Lin, Edvinsson 2011, p. 8].

TABLE 1

Approaches to defining national intellectual capital (NIC)

Author	Definition
Pasher (1998)	Hidden, intangible national resources that ensure competitive advantage and high potential economic growth.
Schneider (2007)	Intangible national resources embedded in socio-cultural models, openness to the world, initiative, acceptance of change, willingness to adopt new technologies, etc. – all this determines a country's competitiveness.
Prime Minister's Strategic Advisory Board (2008)	All the intangible resources of people, companies, societies, regions, and institutions that can be a source of both present and future national prosperity (when used appropriately).
The World Bank (2008)	Assets that manifest themselves, among other things, in the relations between entrepreneurs, innovations, R&D sector, software, quality, human capital, efficient institutions, communication technologies, etc., which (when used appropriately) are a key source of economic growth on the global scale.
Węziak-Białowolska (2010)	Directly unobservable attributes of a region's inhabitants, companies, institutions, organizations, societies, and administration units that are both present and potential sources of improvement in future social and economic prosperity.
Edvinsson, Lin (2011)	Knowledge, wisdom, skills, and experience that guarantee competitive advantages of a country over other countries and that determine potential for further growth.
Käpylä, Kujansivu, Lönnqvist (2012)	Knowledge that creates value in society and can be perceived as one of the forms of complementing natural capital and production.
Lazuka (2012)	All the intangible values that ensure comparative advantages and increase prosperity.
Salonius, Lönnqvist (2012)	A set of assets that support a nation in pursuing the objectives related to economic, social, and environmental development.
Phusanvat, Comepa, Sitko-Lutek, Ooi (2012)	Intangible values generated by society, as well as resources in the form of relationships with consumers, suppliers, and with the system's philosophy and organization.
Seleim, Bontis (2013)	Knowledge-based resources that constitute a foundation for national growth and development, as well as national competitiveness and capacities.

Source: [Pasher, Shachar, 2007, p. 10; Schneider 2007, pp. 129-140; ZDSP, 2008, p. 6; The *Measuring knowledge*…, 2008; Węziak-Białowolska, 2010, p. 24; Edvinsson, Lin, 2011, p. 254; Käpylä, Kujansivu, Lönnqvist, 2012; Lazuka, 2012, p. 76; Salonius, Lönnqvist, 2012, pp. 331-342; Phusavat et al., 2012, pp. 868-869; Seleim, Bontis, 2013, p. 132].

The definitions presented above are examples of approaches to the conceptualization of national intellectual capital. They are characterized by a discrepancy in terms of terminologies and concepts, which is undoubtedly a result of the individual approach adopted by particular authors as regards the understanding of the category of intellectual capital and considerable scope for ambiguity [Michalczuk, Fiedorczuk, 2017, p. 216]. Despite these discrepancies, the definitions interpret national intellectual capital as a collection of intangible resources which determine the achievement of a certain 'result', e.g., a country's wealth, growth of the global economy, present and future welfare, improvement of living standards, increased competitiveness, competitive advantages, or economic growth. Furthermore, according to Käpylä, Kujansivu and Lönnqvist [2012, p. 345]:

1. The main distinguishing feature of national intellectual capital is an invisible, intangible and hidden form of capital (intangible resources), although Ruiz, Navarro and Penã [2011] believe that national intellectual capital may also assume a visible and tangible form. This explanation of intellectual capital in the macroeconomic perspective constitutes the so-called traditional approach [Ruiz, Navarro, Penã, 2011, p. 261], comprising financial indicators, e.g. expenses on education per one inhabitant or investments in the R&D sector in relation to GDP;
2. The resources of intellectual capital are found mainly in human beings, i.e. in the country's inhabitants and include, among other things: knowledge, wisdom, experience, skills, creativity; additionally, they are aggregated in larger groups of entities: companies, societies, institutions, administration units, regions, governments;
3. The essence of national intellectual capital is explained using expressions referring to the present state – i.e. 'present wealth, potential, prosperity and benefits' and to the future (prospective character of the usefulness of intellectual capital) – 'improvement in the future', 'future growth', 'future benefits and prosperity', 'potential source of generating wealth'[7];
4. While defining NIC, authors use both static expressions (wealth, benefits, prosperity, living standard, value) and dynamic expressions (future improvement, future growth, becoming wealthy, achievement of advantage).

Intellectual capital is composed of intangible resources that constitute a potential for future development based on knowledge economy, provided that they are appropriately identified and used. It determines each country's capacity of performing functions of high added value, including the ability to create innovations and entrepreneurship.

3. Categorization of national intellectual capital (NIC)

The specific characteristics of intellectual capital regarding mostly its lack of physical dimension and (in many cases) also lack of a financial scale lead not only to difficulties

[7] Only the definition of NIC proposed by Phusavat et al. in 2012 presents the approach only from the perspective of the present time, whereas the definition provided by Bontis in 2004 clearly emphasizes the perspective of the past – 'roots to prosperity'.

in defining it, but also have an impact on the range of NIC categorization. This is reflected in the diversified approach to capturing the structure of intellectual capital, with particular authors focusing on the numerous aspects of the notion [Michalczuk, 2013, p. 87]. The adopted taxonomy enables them to specify the definition of national intellectual capital by aggregating intangible resources according to certain components. Undoubtedly, the basis for the existing categorizations of intellectual capital were provided by those developed at the microeconomic level (of organizations).

The internal structure of intellectual capital is perceived by particular authors in various ways, as illustrated in Table 2.

TABLE 2.
Characteristic of the components of national intellectual capital according to various authors

Author	NIC components
Rembe ISA (1999)	– human capital, i.e. the level of education and schooling of inhabitants and emigrants, living standard, average life expectancy, etc.; – structural capital, including market capital (tourism, honesty level, balance of trade, also regarding intellectual property) and organization capital, i.e. process capital (information regarding entities from services and production sectors, share of public expenses in GDP, business leadership, information technology level, computers connected to LAN network, and renewal capital (expenses on R&D in relation to GDP, number of original start-ups, trademarks, patents, factors important for development of higher education).
Malhotra (2003)	– human capital, i.e. combination of knowledge, wisdom, innovation and individuals' capability to perform national tasks, including values, culture, and philosophy; – structural capital, including market capital (the country's trade and market relations maintained across global markets) and organizational capital (organizational skills, formation of structures, software, databases, patents, trademarks and other types of support for innovations and productivity through both division and transmission of knowledge), with division into process capital (processes, activity and infrastructure related to creation, division, transmission and popularization of knowledge), as well as renewal and development capital (patents, research and development, trademarks, startup companies).
Bontis (2004)	– human capital, i.e. knowledge, education, individuals' competences used to accomplish national objectives and tasks; – structural capital, including: market capital (national abilities and success in ensuring attractiveness and competitive solutions for the needs of foreign customers, in comparison with other countries) and organizational capital, which is composed of process capital (a storehouse of nation's dead knowledge that is present in technological structures, as well as in information and communication structures which generate software, databases, laboratories, organizational systems, maintaining and externalizing the effects of human capital work), as well as renewal capital

	(national skills and current investments in development/renewal, with the aim of sustaining competitive advantages).
Pasher Shachar (2004, 2007)	– human capital, i.e. individuals' knowledge, wisdom, experience, intuition and skills necessary to accomplish national tasks and objectives, as well as cultural values and national philosophy; – structural capital, including market capital (national intellectual assets and markets with which international contact is maintained, e.g. international relations with foreign markets), as well as organizational capital, which consists of process capital (cooperation and knowledge transfer based on intellectual structural assets, e.g. information systems, software, databases, organizational structure) and renewal and development capital (ability to develop certain solutions, e.g. R&D, patents trademarks, startup companies).
Andriessen Stam (2004, 2008)	– human capital, i.e. the attributes of society (knowledge, competences of individuals, education level – all used for the achievement of national objectives); – structural capital, i.e. 'dead' reserves of knowledge in the form of technological, information and communication systems, which include hardware, software, databases, laboratories, and organizational structures; – relation capital: a country's external relations, i.e. society's ability to ensure attractive and competitive environment.
Prime Minister's Strategic Advisory Board [*Raport o kapitale intelektualnym*, 2008]	– human capital, which comprises all the citizens' potential expressed by their education, life experience, attitudes and skills, and which may help improve present and future prosperity; – structural capital, which comprises the potential stored in tangible elements of the infrastructure of a national system of education and innovation – educational, scientific and research institutions – as well as in IT infrastructure and intellectual property; – social capital, which comprises society's potential expressed by the existing standards of conduct, trust and involvement that, by supporting cooperation and exchange of knowledge, contribute to increased national prosperity; – relation capital, which comprises the potential related to the country's image abroad, level of integration with the global economy, attractiveness for foreign customers – trade partners, investors, and tourists.

Węziak-Białowolska (2010)	– human capital, i.e. knowledge and education, skills and abilities of people, as well as their personality traits related to initiative, inclination to innovate and willingness to acquire knowledge in the course of both formal and informal education – defined as 'orientation at personal development'; – social capital, which comprises a set of social and legal norms, as well as shared values and customs shaping the world of social and economic relations and expressed chiefly in the level of social trust and the appropriate quality and quantity of formal and informal interpersonal networks of relations, as well as the relationships between various kinds of organizations, institutions and companies; – structural capital, which comprises social infrastructure (a set of public devices satisfying social, educational, and cultural needs of population), as well as technical infrastructure (living and working conditions: transportation and communication infrastructure, and especially telephone infrastructure and Internet access); – development capital, i.e. a reflection of the inclination to innovate through the level of present investments and the widely perceived level of exchange and application of knowledge aimed at optimal use of potential and crucial for future national wealth.
Edvinsson Lin (2008, 2011)	– human capital, i.e. individuals' knowledge, wisdom, experience, intuition, and abilities to accomplish national objectives and tasks, as well as the culture and philosophy of a nation; – market capital, comprising resources intrinsic in international relations. It is a combination of a country's capabilities and successes in ensuring attractive and competitive solutions for the needs of foreign customers, investments made by the country, and achievements in the field of foreign relations, including exportation of high quality products and services; – process capital: structural intellectual resources, i.e. information systems, software, databases, laboratories and national infrastructure, e.g. infrastructure connected with transportation and logistics, information, communication and computers, as well as technological skills, cyber security, and knowledge transfer; – renewal capital, which comprises national skills and real investments made with the aim of increasing the competitive force of markets in the future and stimulate future growth.
Phusavat Comepa Sitko-Lutek Ooi (2012)	– human capital, which denotes the quality of education systems and school management, local access to research and training services, cooperation between employers and employees, flexibility in wage setting, practices associated with employing and dismissing workers, wages and productivity, professional management, brain drain, availability of scientists and engineers; – market capital, i.e. the intensity of local competitiveness, range of dominant market, effectiveness of anti-trust policies, costs of agricultural policies, occurrence of trade barriers, popularization of foreign ownership, degree of orientation at customers, value and range of chain, market size;

	– innovation capital, i.e. ownership rights, intellectual property protection, access to cutting-edge technologies, absorption of technologies at company level, FDIs and transfer of technologies, innovation capacity, quality of scientific and research institutions, companies' expenditures on R&D, as well as governmental procedures related to technologically advanced products; – process capital, which encompasses transparency of policies, ethical behavior within companies, quality of audits and reporting, quality of entire infrastructure: roads, railways, ports, air transport infrastructure, energy safety, access to Internet in schools, access to loans, access to venture capital, quality of local supplies, state of clusters' development, character of competitive advantages, refinement of production processes.
Seleim Bontis (2013)	– human capital, which comprises non-uniform and non-individual attributes of people that describe the quality and amount of knowledge of both an individual and the community; – structural capital, i.e. institutional knowledge, codified experiences, information which a country can accumulate and which is crucial to national innovative capacities; – relation capital, which denotes knowledge present in global economic relations. This type of capital represents the relationships with foreign partners and governments, as well as the those established as a result of international undertakings.
Navarro Ruiz Peña (2014)	– human capital, including knowledge, skills, personal development directed at achieving objectives, as well as qualifications, cultural values, national conditions on the labor market, resources of labor force from abroad; – structural capital, i.e. a 'non-human' structure related to business, bureaucracy, image, participation in international markets, technologies, innovations and sustainability, which enables a country to generate benefits in the future; – process capital, i.e. information systems, as well as managerial, bureaucratic, and organizational structures; – relational and trade capital, i.e. the quality of trade balance with division into positive (exports of advanced technologies) and negative information on this subject; – marketing and image capital, i.e. national and foreign image as well as international relations; – research and development capital, i.e. capacity for innovation, research and development by means of investments, and the efficiency with which the existing resources are exploited, using available information); – socio-environmental capital, i.e. social commitment to perform the tasks of the welfare state related to the inhabitants' living standards, the natural environment and sustainable development (e.g. access to medical care, average life expectancy, environmental protection).

Source: authors' own work on the basis [Amidon, 2002, pp. 56-57; Malhotra, 2003, pp. 23, 25; Bontis, 2004, pp. 21-24; Pasher, Shachar, 2004, p. 7; 2007, p. 11; Andriessen, Stam, 2004,

p. 4; 2008, p. 490; ZDSPRM, 2008, p. 6; Węziak-Białowolska, 2010, pp. 48, 51, 53; Edvinsson, Lin, 2011, p. 4; Phusavat et al., 2012, pp. 889-890; Seleim, Bontis, 2013, p. 132; Navarro et al., 2014, p. 264].

The existing concepts of national intellectual capital differ from one another in terms of their components. The first attempts at classification were based on the assumption that intellectual capital consists of two segments, i.e. human capital and structural capital[8]. Gradually, more complex models of national intellectual capital were developed, and increasingly detailed spheres related to the functioning and resources of a nation began to be taken into account. This is a result of differences in understanding, and the consequently different interpretations of intellectual capital by particular authors. The diversity of the ways in which intellectual capital is defined and described justifies the necessity to organize the approaches to its categorization [Michalczuk, 2013, p. 93]

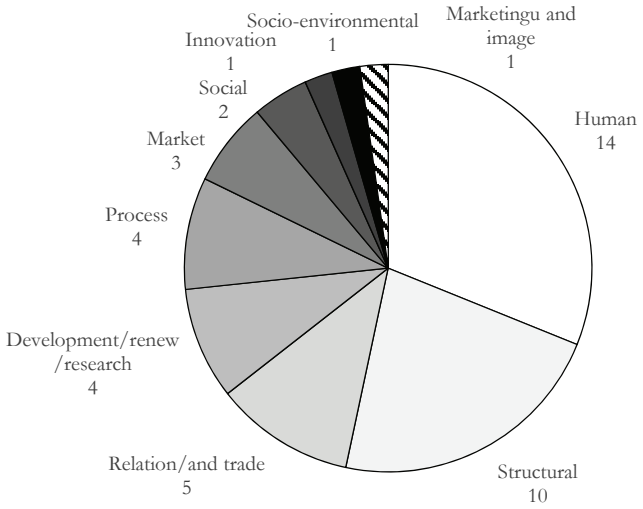
Undoubtedly, the aforementioned concepts regarding NIC taxonomy have one common feature – they all emphasize its key component – human capital. The differences between these concepts, on the other hand, are related to the range of aggregation and definition of other components of intellectual capital within the framework of which intangible resources are identified. According to most authors, depending on the accuracy of aggregation, intellectual capital reflects intangible resources comprised within two or four components. The most elaborate division is offered by Navarro, Ruiz and Peña, who distinguish as many as six components, besides human capital.

The occurrence of particular components of national intellectual capital in the analyzed models in terms of their taxonomy of division is presented in Figure 1.

Of the presented concepts, structural capital is the second most frequently mentioned component (apart from human capital). However, in particular approaches it has a different conceptual range. The taxonomy adopted by Rembe & ISA, Bontis, Pasher & Shachar and Malthor offers the most comprehensive definition. This is because structural capital aggregates: market capital and organizational capital (process capital and renewal/development capital). These are conceptual models of national knowledge assets, using the structure of NIC assets as defined by Edvinsson and Malone [1997], which divide national intellectual capital into two main components: human capital and structural capital. If other concepts distinguish intellectual capital, it has a narrow range and reflects mostly intangible resources accumulated in tangible elements of infrastructure, e.g. social, educational, innovative, technological, as well as information and communication structure. Meanwhile, the least frequently aggregated intangible resources include such components as social capital, innovation capital, socio-environmental capital, as well as marketing and image cpitals.

[8] They were modeled on the division proposed by L. Edvinsson in Skandia Navigator.

FIGURE 1.
Occurrence of a certain NIC component in analyzed models



Source: authors ' own work on the basis of Table 2.

To sum up, on the basis of the analysis of the presented approaches to both the definition and the categorization of national intellectual capital it can be said that the notion reflects heterogeneous and complex intangible knowledge-based resources that can constitute both a current and potential source of wealth and advantage over other countries (only if used appropriately). It is composed of intangible resources aggregated within the framework of the components shown in Table 3.

The taxonomy presented above is based on a three-element depiction of national intellectual capital. According to the authors of this paper, it is the most transparent taxonomy, and one which emphasizes detailed, but also crucial, spheres of each country's mode of functioning and resources. In this division, human capital is the most uniform and vital component. Not only does it provide a basis for creating the remaining elements of intellectual capital, but is also indispensable for obtaining benefits from real capital and financial capital. Its defining feature is that it is not in the possession of any country and be 'leased'. Other components reflect the so-called 'non-thinking' part of intellectual capital. They are the result of using knowledge which originates from people.

TABLE 3.

Taxonomy of National Intellectual Capital (NIC)[9]

Components	Characteristic
Human capital	Constitutes the key component, both the creative and thinking part of intellectual capital. On the one hand, it is the most homogeneous, but on the other hand, also the least permanent component of intellectual capital. Its carrier is a human being; additionally, it is created by such intangible resources as: knowledge, innate or acquired skills, competences, personality features, experience, wisdom, intuition, state of health, ability to communicate, level of satisfaction and living standards, as well as the intellectual efficiency of a society.
Social capital	Denotes mutual links and relationships between particular individuals in society, as well as between organizations, institutions, and companies. By performing the role of a connector between individuals, it determines the stability of relations and, consequently, reflects internal relations. It is created by such intangible resources as: sets of informal values and ethical norms, legal norms, social networks facilitating joint activity; they enable the members of a society to increase the efficiency of collective action and better achievement of shared objectives, as well as create the intangible components of heritage, culture and social attitudes towards various problems, e.g. environmental ones, tolerance for otherness, equal rights.
Structural capital	Involves a country's intangible macroeconomic resources in the form of knowledge stored in infrastructure, comprising organizational, communication, social, technological, IT, and process structures, as well as intangible resources – intellectual property (e.g. patents, trademarks, scientific achievements), innovations and R&D.
Relational capital	Means the value ensuing from the external relations of a country, links facilitating cooperation, including economy's attractiveness and competitiveness, the country's image in the eyes of trade partners, investors, and individuals.

Source: authors' own work.

Nevertheless, it must be emphasized that the creation of both present and future national wealth is not determined solely by the possession of particular intangible resources. This is mentioned, e.g., by Bontis, who claims that intellectual capital can be only a potential source of a country's wealth, but its possession does not necessarily guarantee the country's competitive advantage [Bontis, 2004]. Also Bal-Woźniak writes that the benefits achieved thanks to the ability to activate the existing intellectual capital and thanks to instruments used to multiply it make possible the accomplishment and

[9] Previously, NIC taxonomy was presented by the authors in the paper [Michalczuk, Fiedorczuk, 2017, p. 217]. On the basis of further research conducted by the authors, the taxonomy has been modified.

reinforcement of competitive advantages [Bal-Woźniak, 2005, p. 157]. In practice, this requires proper allocation of capital in material and intangible resources.

4. Conclusion

Intellectual capital reflects intangible resources, which, if appropriately used, determine the achievement of a certain 'result', e.g. national wealth, global economic growth, present and future well-being, improvement of life quality, increased competitiveness, competitive advantages, or economic growth. Therefore, all countries should strive to enhance their ability to create intellectual capital. It can be accomplished through long-term thinking, readiness to learn, trust towards market mechanisms, and openness to global competition.

Despite the importance of intellectual capital, there is still no universal definition of the notion in macroeconomic perspective. The concept of intellectual capital on a national scale is still being developed through improving the existing definitions. New, interesting definitions of NIC have been created by Bontis and Adriessen, Stam, Lin and Edvinsson, and also by Malhotra. The definitions proposed by these scientists lay particular emphasis on the potential future value that can be obtained from applying knowledge and the intangible character of this capital [Fiedorczuk, Michalczuk, 2016, p. 410].

The definitions developed are divergent in terms of terminology and taxonomy, which no doubt is a result of the individual approaches of particular authors to the understanding of the category of intellectual capital and to a considerable scope for dichotomy. Research into NIC began to distinguish increasingly detailed spheres related to the functioning and resources of nations. This proves the complexity of the category of national intellectual capital and its heterogeneous nature.

Undoubtedly, the development of a universal definition and taxonomy of intellectual capital in a macroeconomic perspective would make it possible to order and classify the dispersed intangible generators of national wealth, of which we are frequently unaware. This is also indispensable from the perspective of proper measurement (quantification) of this capital and its reporting (description)[10]. The preparation of reports at the level of countries allows for showing the quality and level of intellectual capital for long-term development and building competitive advantages of countries. The estimation of the state and potential of intellectual capital would provide an opportunity not only for reconsidering the theoretical model of economic growth, but also the essence of the model of socio-economic development [Herman, 2008, p. 40].

The authors' participation in the preparation of the article

Grażyna Michalczuk, PhD, Professor of the University of Bialystok – development of the research concept, carrying out the research, developing results, data collection and

[10] NIC reports are prepared on a regular basis by such countries as Sweden (since 1999), Israel (since 2000), and Taiwan (since 2003).

literature analysis, preparation of the introductory section (theoretical), formulation of the summary – 50%

Julita Fiedorczuk, MA – development of the research concept, carrying out the research, developing results, data collection and literature analysis, preparation of the introductory section (theoretical), formulation of the summary – 50%

References

Amidon D.M., 2002, *The innovation SuperHighway*, Butterworth-Heinemann.

Andriessen D. Stam C., 2005, *Intellectual capital of the European Union,* 7th McMaster world congress on the management of intellectual capital and innovation, Hamilton.

Andriessen D. Stam C., 2008 *Intellectual capital of the European Union 2008: measuring the Lisbon Strategy for growth and jobs*, "'Journal of Knowledge Management", Vol. 7, Iss. 4.

Bal-Woźniak T., 2005, *Kapitał intelektualny fundamentalnym warunkiem powodzenia regionalnych strategii innowacji,* „Nierówności społeczne a wzrost gospodarczy. Kapitał ludzki i intelektualny", Zeszyt nr 7.

Bontis N., 1998, *Intellectual capital: an exploratory study that develops measures and models,* "Management Decision", Volume 36, Issue 2, DOI: 10.1108/00251749810204142.

Bontis N., 2004, *National Intellectual Capital Index. A United Nations Initiative for the Arab region*, "Journal of Intellectual Capital", Vol. 5, Iss. 1, DOI 10.1108/14691930410512905.

Cieślak I., Dobija M., 2007, *Teoretyczne podstawy rachunkowości kapitału ludzkiego*, Zeszyty Naukowe Akademii Ekonomicznej w Krakowie, nr 735.

Czym jest kapitał intelektualny?, 2008 „Kwartalnik Nauk o Przedsiębiorstwie", nr 1.

Dobija D., 2002, *Kapitał ludzki i intelektualny w aspekcie teorii ekonomii*, „Przegląd Organizacji" nr 1.

Edvinsson L., 2004, *The Intellectual Capital of Nations*, [in:] *Handbook of Knowledge Management 1*, C. D. Holsapple (ed.), Springer, Berlin Heidelberg.

Edvinsson L., Lin C., 2008, *National Intellectual Capital: A Comparison of the Nordic Countries*, "Journal of Intellectual Capital", Vol. 9, Iss. 4, DOI 10.1108/14691930810913140

Edvinsson L., Lin C., 2011, *National Intellectual Capital: A Comparison of 40 Countries*, Springer Science+BusinessMedia, DOI 10.1007/978-1-4419-7377-1.

Fiedorczuk J., Michalczuk G., 2016, *Narodowy kapitał intelektualny – konceptualizacja podejść*, Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, nr 449, DOI 10.15611/pn.2016.449.36.

Flejterski S., 2010, *Pozycja konkurencyjna banków krajowych a kapitał intelektualnych*, [in:] *Kapitał intelektualny jako generator konkurencyjności banków*, Prace i Materiały Wydziału Zarządzania Uniwersytetu Gdańskiego, nr 4/3.

Herman A., 2008, *Kapitał intelektualny i jego liczenie*, „Kwartalnik Nauk o Przedsiębiorstwie", nr 1.

Käpylä J., Kujansivu P., Lönnqvist A., 2012, *National intellectual capital performance: a strategic approach*, "Journal of Intellectual Capital", Vol. 13, Iss. 3, DOI 10.1108/14691931211248909.

Knowledge Cafe for Intellectual Entrepreneurship. Wiedza, Przedsiębiorczość, Bogactwo, 2006, S. Kwiatkowski, M.B. Kamiński (eds), Wydawnictwo Wyższej Szkoły Przedsiębiorczości i Zarządzania im. L. Koźmińskiego, Warszawa.

Labra R., Sãnchez M.P., 2013, *National intellectual capital assessment models: a literature review*, "Journal of Intellectual Capital", Vol. 14, Iss. 4, DOI 10.1108/JIC-11-2012-0100.

Lazuka V., 2012, *National intellectual capital: concept and measurement*, Lund University, School of Economics and Management.

Malhotra Y., 2003, *Measuring knowledge assets of a nation: knowledge system for development*, *Knowledge management measurement: State of research 2003-2004*, New York, [online], http://km.brint.com/KnowledgeManagementMeasurementResearch.pdf (date of access: 16.07.2017).

Marr B., Chatzkel J., 2004, *Intellectual capital at the crossroads: managing, measuring, and reporting of IC,* "Journal of Intellectual Capital", Vol 5, Iss. 2, DOI 10.1108/14691930410533650.

Measuring knowledge in the world's economies – Knowledge Assessment Methodology and Knowledge Economy Index, 2008, The World Bank, http://siteresources.worldbank.org/INTUNIKAM/Resources/KAM_v4.pdf, retrieved: 18.07.2017.

Michalczuk G., 2013, *Zasoby niematerialne jako czynnik wartości przedsiębiorstwa. Luka informacyjna sprawozdawczości finansowej*, Wydawnictwo Uniwersytetu w Białymstoku, Białystok.

Michalczuk G., Fiedorczuk J., 2017, *Analysis of conceptualization and taxonomy of division of national intellectual capital (NIC)*, "Entrepreneurship and Management", XVIII (1).

Navarro J.L.A., Penã D.N., Ruiz V.R.L., 2014, *Economic growth and intangible capitals: Europe versus Asia*, "Panoeconomicus", Vol. 3, DOI 10.2298/PAN1403261N.

Ondari-Okemwa E., 2011, *The strategic importance of identifying knowledge-based and intangible assets for generating value, competitiveness and innovation in sub-Saharan Africa*, SA Jnl Libs & Info Sci, No. 77(1), http://sajlis.journals.ac.za/pub/article/viewFile/56/48 (date of access: 11.06.2017).

Pasher E., Shachar S., 2004, *The intellectual capital of the state of Israel*, *Our Competitive Advantage – The Hidden Values of the Desert*, file:///C:/Users/User/Downloads/TheIntellectualCapital114.pdf (date of access: 15.07.2017).

Pasher E., Shachar S., 2007, *The intellectual capital of the state of Israel. 60 years of acheivements*, Ministry of Industry, Trade and Labour, http://economy.gov.il/RnD/Documents/intellectualcapital.pdf (date of access: 16.07.2017).

Phusavat K., Comepa N., Sitko-Lutek A., Ooi K-B., 2012, *Intellectual Capital: Implementation for Industrial Competitiveness*, "Industrial Management & Data Systems", Vol. 112, Iss. 6, DOI 10.1108/02635571211238491.

Raport o kapitale intelektualnym Polski, 2008, Zespół Doradców Strategicznych Prezesa Rady Ministrów, http://kramarz.pl/Raport_2008_Kapital_Intelektualny_Polski.pdf (date of access: 23.07.2017).

Salonius H., Lönnqvist A., 2012, *Exploring the policy relevance of national intellectual capital information*, "Journal of Intellectual Capital", Vol. 13, Iss. 3.

Schneider U., 2007, *The Austrian National Knowledge Report*, "Journal of Knowledge Management", Vol. 11, Iss. 5, DOI 10.1108/13673270710819852.

Seleim A., Bontis N., 2013, *National intellectual capital and economic performance: Empirical Evidence from Developing Countries*, "Knowledge and Process Management", Vol. 20, Iss. 3, DOI 10.1002/kpm.1412.

Teoria rachunkowości w zarysie, 2005, M. Dobija (ed), Wydawnictwo Akademii Ekonomicznej w Krakowie, Kraków.

Węziak-Białowolska D., 2010, *Model kapitału intelektualnego regionu. Koncepcja pomiaru i jej zastosowanie*, Oficyna Wydawnicza SHG, Warszawa.

Wójcik-Jurkiewicz M., 2011, *Kapitał intelektualny w teorii i praktyce rachunkowości*, Zeszyty Naukowe Uniwersytetu Szczecińskiego, Nr 668, Finanse, Rynki Finansowe, Ubezpieczenia, nr 41.

Woźniak-Sobczak B., 2006, *Czy wiedza jest elementem kapitału przedsiębiorstwa i wyznacznikiem jego wartości?*, [in:] *Zarządzanie wiedzą w organizacjach wobec nowoczesnej gospodarki*, A. Chodyński (red.), Wyższa Szkoła Zarządzania i Marketingu w Sosnowcu, Sosnowiec.