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THE ASSESSMENT OF INTELLECTUAL CAPITAL IN POLISH REGIONS

Urszula Bronisz, Wim Heijman and Johan van Ophem

¹*Maria Curie-Skłodowska University, Faculty of Earth Science and Spatial Management
Lublin, Poland, e-mail: u-bronisz@tlen.pl*

²*Wageningen University, Social Science Agricultural Economics and Rural Policy
P.O. Box 8130, 6700 Wageningen, The Netherlands, e-mail: wim.heijman@wur.nl*

³*Wageningen University, Social Science, Economics of Consumers and Households
P.O. Box 8130, 6700 Wageningen, The Netherlands, e-mail: Johan.vanOphem@wur.nl*

Abstract: In a knowledge-based economy intangible assets are indispensable to achieve competitive advantages. Resources like intellectual capital are perceived as crucial factors especially for regional growth. Intellectual capital is comprehended as a multidimensional concept, defined and explained in many various ways, depending on the context and further application. The purposes of this article is to consider the role and importance of the intellectual capital for regional development and competitiveness and to try to use it for an estimation of regional advance progress. On the basis of literature review the article provides a framework to analyse the intellectual capital and its main components. The central attention of the paper focuses on the evaluation of the intellectual capital in Polish regions and its influence on regional performance. The paper surveys the empirical examination of 16 Polish regions in terms of intellectual capital and simultaneously assesses the level of intellectual capital in rural areas. The article provides the insight into the role and value of the intellectual capital in Polish regions.

Keywords: Intellectual capital, intangible assets, knowledge based economy, Polish regions

Introduction

In a globalised and strongly competitive world, organizations, regions and nations have to develop new forms of economic value and comparative advantage. In the age of knowledge the key source of economic vitality and growth are intangible assets. They play an inevitable and prominent role in enhancing competitiveness. The relevance of the phenomena of the intellectual capital (sometimes denoted as IC) as a fundamental source of sustainable competitive advantage is highlighted and widely acknowledged (Bonits 2004, Edvinson 2002, Tallman et al. 2004, Shiuma et al. 2008).

Recent years proved that the primary spatial units within which knowledge and innovation are produced are regions. They are perceived as central units of economic study, where political and social processes and interactions occur (Amin, 1994; Clavel, 1998; Giddens, 1998; Harvie, 1994; Sharpe, 1993; Tomaney and Ward, 2000). Regions are recognized as a part of global system of interactions where private and public sector meet. That is why, in order to meet the challenges of today's global economy, regions should permanently strengthen their competitive capabilities. In the knowledge – intensive world, under conditions of increasing international interdependencies intellectual capital becomes perceived as a cornerstone of growth and development.

The central objective of this article is to assess and to map intellectual capital in 16 Polish regions that correspond to the EU NUTS II level. Although, the notion of IC is defined in many various ways, depending on the context and its further application we tried to develop the intellectual capital ratio as a single figure. In order to illustrate regional and rural performance in terms of intellectual capital we created an index consisting of several different variables. The paper focuses on the evaluation of the intellectual capital in 16 Polish regions and simultaneously in rural areas and its influence on regional performance. However, one should be aware of the fact that there are many typologies and definitions of rural areas (Eurostat, GUS, OECD), and this is the reason for the difficulty to clearly separate rural and urban areas. Regions in Poland are significantly differentiated but in accordance with the Polish typology (CSO, 2009) in 2009, 93,2% of Polish area was classified as rural and only 6,8 % as urban. At the same time, the share of the population in the total population was as follows: rural areas : 39,0% and urban : 61,0%. Unfortunately, we are not able to evaluate the intellectual capital separately in rural and in urban areas. That is why we will focus mainly on regions. Undoubtedly, there is need for cooperation between the urban and the rural, paying attention to the complementary and synergic relations deriving from the exchange of externalities produced in each.

The paper is structured into five parts. The first provides both the insight in theoretical background and conceptual understanding of phenomenon of intellectual capital. On the basis of literature review this paper provides a framework to analyse the intellectual capital and its main components. The next part deals with the methodology of the survey. In the following part the outcomes are presented and in the last part the final conclusions are drawn.

Theoretical orientation

Over the past few years there has been increasing focus on the issue called knowledge paradigm. In the economy based on information and knowledge the intangible assets gained in importance and become perceived as the undeveloped source of future success and a key determinant of development and competitiveness. The concept of intellectual capital is a new way of thinking about new forms of economic value. Knowledge is considered as the key factor of success and foundation of competitive advantage. (Bradley 1997a, 1997b, Bonits 2002, 2004, Daley 2001, Edvinsson 2002, Edvinsson and Stenfelt 1999, Malhotra 2000 and Pasher 1999). Knowledge is perceived as the crucial factor of competitiveness and widely comprehended development. Knowledge is like light, weightless and intangible (World Bank 1998). New knowledge-based economy requires new European policies. One of the ambitious program aimed at making EU the most competitive and dynamic knowledge based economy was the Lisbon Strategy. This aim required higher investment in R&D, improvement of lifelong learning, people mobility and social cohesion (European Commission 2005). In this perspective the Europe 2020 Strategy was established, which outlined 3 mutually reinforcing priorities, one of them defined as “*smart growth: developing an economy based on knowledge and innovation ...It’s about more jobs and better lives. It shows how Europe has the capability to deliver smart, sustainable and inclusive growth, to find the path to create new jobs and to offer a sense of direction to our societies.*” (European Commission 2010, p. 3).

Intellectual capital is comprehended as a multi-dimensional concept that is reflected in variety of definitions, different components and features of intellectual capital. One of the widely accepted definition explain it as the difference between the market value and the book value of the firm (Brooking, 1997a, b; Daley, 2001; Harvey and Lusch, 1999; Lev, 2001; Nevado Pen˜ A and Lopez Ruiz, 2002; Pasher, 1999; Petrash, 1996; Sveiby, 2000). Another often used describe IC as the “package useful knowledge”, combination of non-material or intangible assets that create added value for its owner (company, organization) (Bradley, 1997a; Edvinsson and Sullivan, 1996; Stewart, 1997).

According to Bontis (2004, p. 14) IC is “*hidden values of individuals, enterprises, institutions, communities and regions that are the current and potential sources of value creation*” whereas, Andriessen and Stam (2005, p. 3) define

it as “*all intangible resources available to a country or a region, that give relative advantage, and which in combination are able to produce future benefits*”.

Intellectual capital has also been defined as the combination of intangible resources and activities that “*allows organization to transform a bundle of material, financial and human resources in a system capable of creating stakeholder value*” (European Commission 2006, p. 10). According to Edvinsson (2004) in the economy of knowledge values created by countries, regions, organizations and individual are directly connected to their knowledge and intellectual capital. But the key point is to show that the intangible factors create value and determine the growth and competitiveness. Although, in the literature the term intellectual capital is not used in precisely the same way and there is not one interpretation, a significant number of researchers and practitioners have focused on key factors to be regarded as components of intellectual capital. Undoubtedly, intellectual capital is perceived as a dynamic and qualitative category. Different kinds of approaches to intellectual capital have been developed. Nevertheless, one of the widely used is the typology created by Bontis (Bontis, 2002; 2004). He singled out three main components of intellectual capital: human capital, structural capital and relational capital. Each of distinguished components contain a series of assets that are measured by means of a series of indicators. Human capital represents anything related to the people and comprises variables concerning the potential of people, like their educational background, life experience, attitudes, skills and tacit knowledge. Structural capital encompasses both the organizational framework and the tangible elements of social and technical infrastructure designed to ensure the high quality of life. And finally, the relational capital illustrates the potential related to the external image, cooperation, attractiveness and networks.

Methodology

In order to present the performance of intellectual capital in 16 Polish regions we tried to design a framework that enable the investigation of intellectual capital. With the purpose of establishing the intellectual capital of a region we used data for the following 43 variables that a priori might have some connection with the broad concept of intellectual capital:

- v1 R&D expenditure in business sector
- v2 R&D expenditure in government sector
- v3 R&D expenditure in higher education sector
- v4 Employment in R&D - Researchers
- v5 Employment in R&D - technicians and equivalent staff
- v6 Employment in R&D - other supporting staff
- v7 Tertiary students per 10000 population
- v8 Participants of doctoral studies
- v9 Participants of postgraduate studies
- v10 Academic teachers

- v11 Life long learning (people aged 25-64)
- v12 The share of registered unemployed persons in the population age
- v13 Number of population (persons)
- v14 The share of population by economic age group in % of total population - population at pre-working (up to the age of 14)
- v15 The share of population by economic age group in % of total population - population at working
- v16 The share of population by economic age group in % of total population - population at post-working age
- v17 Migration
- v18 The balance of arrivals and departures for work
- v19 Average number of retirees and pensioners
- v20 Entities registered in REGON per 10 000 Population
- v21 Entities newly registered in public sector
- v22 Entities newly registered in private sector
- v23 Enterprises with access to the Internet
- v24 Enterprises with their own web page
- v25 Enterprises using Internet in their relation with public administration
- v26 Theatres and musical institutions
- v27 Cultural centres, clubs and lounges
- v28 Infant schools
- v29 Ascertained crimes in completed preparatory proceedings
- v30 Number of sport clubs
- v31 Number of dwelling completed/ per 10000 population
- v32 The population per hospital bed
- v33 Number of non-profit organisations
- v34 Number of nurseries
- v35 Number of tertiary education
- v36 Patent applications
- v37 Patents granted
- v38 Subscribers per 1000 population - radio
- v39 Subscribers per 1000 population - television
- v40 Foreign tourists accommodated
- v41 Accommodation facilities
- v42 Foreign assets in R&D
- v43 Participation in local election

In order to investigate which of the 43 variables listed above are related to the concept of intellectual capital a principal component analysis (PCA) was carried out. The usual criteria in PCA were applied: Eigen value larger than one, loadings on components eventually larger than 0.8 and, theoretically sound labelling of at least the main component. The final result is given in Table 1.0. The component intellectual capital could be discerned, which explains about 91 percent of the total variance. The 15 variables listed in this table have high loadings (weights) on the component which can be clearly labelled as intellectual capital. The scree plot indicates once more that the 15 variables can be headed under one component. The component consists of various dimensions of intellectual capital. It shows the importance of technological development (e.g. R&D, patents granted), the university institute (students, teachers) but also the

importance of social capital institutions as not for profits, participation in local elections, and number of theatres and musical institutions.

All the statistical data and indicators it contains are based on sources available in database of Eurostat and Polish Central Office of Statistics.

Table 1. Intellectual capital, factor loadings and relative weights of its relevant variables*

Variable	Factor loading	Relative Weight**
R&D expenditure in business sector	.954	.067
R&D expenditure in government sector	.924	.065
R&D expenditure in higher education sector	.947	.066
Employment in R&D -technicians and equivalent staff	.994	.069
Participants of doctoral studies (persons)	.979	.068
Participants of postgraduate studies (persons)	.970	.068
Academics teachers (persons)	.946	.066
Number of population (persons)	.911	.064
Employment In R&D-technicians and equivalent staff	.982	.069
Entities newly registered in private sector	.945	.066
Theatres and musical institutions (number)	.960	.067
Non-profit organisations (thousands)	.949	.066
Number of tertiary education students	.982	.069
Patents granted	.952	.066
Participation in local election (%)	.930	.065

*Explained variance 91.238 per cent.

**The relative weights sum up to unity.

Source: Own calculation

Results

In the analysis of performance of intellectual capital in Poland the highest scores achieved the Mazowieckie region. In the top of the ranking with comparable outcome ranged from 156,40 to 123,48 we could find Małopolskie, Śląskie, Wielkopolskie and Dolnośląskie. The middle-ranked regions were Pomorskie, Łódzkie and Lubelskie. And finally, the lowest positions were taken by Opolskie, Lubuskie and Świętokrzyskie. Undoubtedly, the absolute leader is Mazowieckie, the capital region where economic concentration goes together with the political centre of the country. Mazowieckie owes its high position to its very dynamic growth, both economically and socially. Undoubtedly, the development of Polish regions is determined by inherited tendencies in terms of industry sectors or institutional development, but the relevance of less tangible assets like knowledge, education or information technologies is not to be underestimated. The analysis allowed us to construct the index of regional intellectual capital and then to compare the position of 16 Polish regions with their locations in the index

of regional competitiveness. Combining the intellectual capital outcomes with the competitiveness performance made possible to observe positive link between intellectual capital and competitiveness. Regions which achieved high scores in the index of intellectual capital are also highly classified in the index concerning regional competitiveness.

Table 2. Index of intellectual capital of 16 Polish regions

Region	Code	Index of intellectual capital	Rank
Łódzkie	LD	93,36	7
Mazowieckie	MA	405,67	1
Małopolskie	MP	156,40	2
Śląskie	SL	145,48	3
Lubelskie	LU	80,52	8
Podkarpackie	PM	62,13	10
Podlaskie	PD	43,81	12
Świętokrzyskie	SW	39,51	14
Lubuskie	LB	32,27	15
Wielkopolskie	WP	132,68	4
Zachodniopomorskie	ZP	63,16	9
Dolnośląskie	DS	123,48	5
Opolskie	OP	31,52	16
Kujawsko-Pomorskie	KP	61,94	11
Pomorskie	PM	95,62	6
Warmińsko-Mazurskie	WM	43,41	13

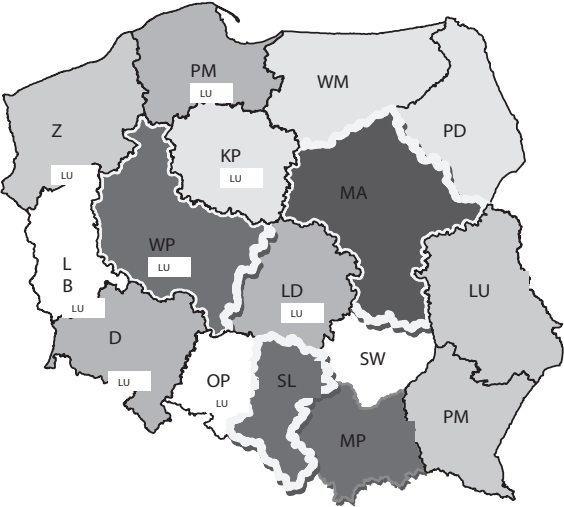


Figure 2. Map of intellectual capital in Polish regions
Source: own calculations

Source: Own calculations.

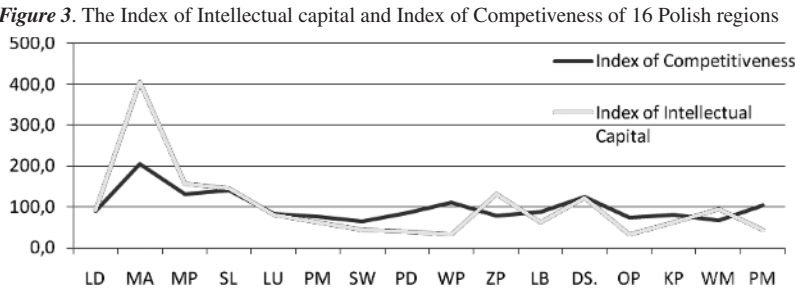


Figure 3. The Index of Intellectual capital and Index of Competiveness of 16 Polish regions
Source: Own calculations

Conclusion

In a globalised and strongly competitive world only regions with the ability to attract and keep intellectual capital can win. The development of scientific research, technological progress and innovation are crucial to attain high competitiveness. Knowledge and its quality, scientific research, technological progress, quantity and quality of human capital are considered as crucial factors for economic growth and high quality of life. Although, the ability of regions to adopt to fundamental changes in economic environmental rests on a range issues including their socio-economic structure, level of initial development and proximity to capital and innovation, as well as the way in which they are affected by national policy decisions (Gorzalak 2000) it is widely acknowledged that the development of regional competitiveness depends mainly on endogenous factors. In this respect we can presume that the

intellectual capital will be perceived as one of the most important factors for economic growth.

References

Andriessen D.G and Stam C. D. (2005) Intellectual Capital of the European Union, Paper for the 7th McMaster World Congress on the Management of Intellectual Capital and Innovation, January 19-21, 2005, Ontario, Canada.

Bontis N. (2002) National Intellectual Capital Index: Intellectual Capital Development in the Arab Region. Institute for Intellectual Capital Research, Ontario.

Bontis N. (2004) National Intellectual Capital Index: a United Nations initiative for the Arab region, Journal of Intellectual Capital, vol. 5, No 1, pp.13-39.

Bradley K. (1997a) Intellectual capital and the new wealth of nations, Business Strategy Review 8, 53–62.

Bradley K. (1997b) Intellectual capital and the new wealth of nations II, Business Strategy Review 8, 33–44.

Brooking A. (1997) The management of intellectual capital, Long Range Planning 30.

Central Office Of Statistics (2009), National Official Register of Territorial Division of the Country - TERYT

Daley J. (2001) The intangible economy and Australia, Australian Journal of Management 26 (Special Issue), 3-19.

Edvinsson L. and Stenfelt C. (1999) Intellectual capital of nations – for future wealth creation, Journal of Human Resource Costing and Accounting, Vol 4, No 1.

- Edvinsson L. and Sullivan P. (1996)** Developing a model for managing intellectual capital, *European Management Journal* 14.
- Edvinsson, L. (2002)**, "The knowledge capital of nations", *Knowledge Management*, April.
- Edvinsson L. and Malone, M.S. (1997)**, *Intellectual Capital: The Proven Way to Establish Your Company's Real Value by Measuring its Hidden Values*, Piatkus, London.
- European Commission (2006)** Reporting Intellectual Capital to Augment Research, Development and Innovation in SMEs, Report to the Commission of the High Level Expert Group on RICARDIS, June 2006.
- Gorzelak G. (2000)** Poland in Bachtler, J., Downes, R., Gorzelak, G. (Eds.) *Transition, Cohesion and Regional Policy in Central and Eastern Europe*. Ashgate Publishers, Aldershot, UK:
- Harvey M. G. and Lusch R. F. (1999)** Balancing the intellectual capital books: intangible liabilities, *European Management Journal* 17.
- Ilenau B.V., Isaic-Maniu A., Hertelieu C. (2009)**, Intellectual capital components as causes of regional disparities. A case study in Romania. *Romanian Journal of Regional Science, The Journal of the Romanian Regional Science Association*, vol. 3 No2.
- Lev B. (2001)** *Intangibles. Management, Measurement and Reporting*. Brookings Institution, Washington, DC.
- Malhotra Y. (2000)** Knowledge assets in the global economy: assessment of national intellectual capital, *Journal of Global Information Management* 8.
- Nevado Pen˜ A D. and Lo 'Pez Ruiz V. (2002)** *El capital intelectual: valoracio´n y medicio´n*. Prentice-Hall, Madrid.
- Pasher E. (1999)** *The Intellectual Capital of the State of Israel: A Look to the Future – The Hidden Values of the Desert*. Kal, Herzlia Pituach.
- Petrash G. (1996)** Dow's journey to a knowledge value management culture, *European Management Journal* 14, 365–373.
- Shiuma G., Lerrol A., Carduci D. (2008)**, The knoware tree and the regional intellectual capital index. An assessment of Italy. *Journal of Intellectual Capital*, vol. 9 No 2.
- Sveiby K. E. (2000)** *La nueva riqueza de las empresas*. Gestio´n 2000, Barcelona.
- Tallman, S., Jenkins, M., Henry, N. and Pinch, S. (2004)**, "Knowledge, clusters, and competitive advantage", *Academy of Management Review*, Vol. 2.
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