www.ees.uni.opole.pl
ISSN paper version 1642-2597
ISSN electronic version 2081-8319
Economic and Environmental Studies
Vol. 18, No 2 (46/2018), 909-924, June 2018

Foresight of Information Society – the Knowledge-Based Economy. An attempt at measuring with the use of the example of spatial diversity of Poland's voivodships (2009-2015)

Wacław SZYMANOWSKI
Katedra Metod Ilościowych WNE UW-M w Olsztynie, Poland
Gabriela BRUDNIAK
Katedra Metod Ilościowych WNE UW-M w Olsztynie, Poland

Abstract: The aim of the article is to present a new approach to forecast trends of long-wave development: economy, society, education and culture. This approach is called Foresight. There have been many attempts to define Foresight. The lack of an unambiguous definition of this concept leads to many approaches to its measurement, which have not yielded the right results so far. Better results are defined by the concept of Knowledge-Based Economy KBE), which is based on the following pillars: human and social capital, technical infrastructure, research and development and institutional and legal factors. The analysis of these pillars helps to gain a competitive advantage (region, industry, national economy). The applied Knowledge Assessment Methodology (KAM), developed by the World Bank in 1999, is one of the methods for measuring the degree of development of KBE. It is connected with the development of a set of indicators describing the functioning of individual socio-economic dimensions, grouped in four categories: economic and institutional, education and human resources, information system and new technologies, information technologies. The second part of the article presents the analysis of the fourth pillar – information technologies, as an example of the impact of the development of information technologies on the growth of individual regions (voivodships). Synthetic indexes for voivodships of Poland in 2009-2015 were calculated. The research results present a significant spatial difference in the development of information technologies. Changes in this diversification of voivodships was presented for 2015 in relation to 2012 and 2009.

Correspondence Address: Wacław Szymanowski, Katedra Metod Ilościowych, Wydział Nauk Ekonomicznych, Uniwersytet Warmińsko-Mazurski w Olsztynie, ul. Michała Oczapowskiego 4, 10-719 Olsztyn, Polska. Tel.: +48 501 757 338. E-mail: waclaw.szymanowski@uwm.edu.pl

Keywords: Foresight, Knowledge-Based Economy, information technologies, Information Society, TOPSIS, ranking of voivodships

***JEL codes*:** *O35, Z13*

DOI: https://doi.org/10.25167/ees.2018.46.27

1. Intruduction

Currently, business entities operate in an increasingly turbulent environment. It is connected with the intensification of competition on the global market, which becomes an international, regional and national market (Nazarko 2013: 10-17). It is devoid of monitoring and protection. As Peter Drucker (2003: 261) stated in "The Age of Discontinuity": the reason for this was the emergence in the 1960s of the phenomenon of discontinuity in basic trends and the impossibility of measuring them using extrapolation methods. The emergence of a society and an economy of industry-based generation and delivery of information using computer techniques are phenomena that accompany this discontinuity. These are factors that have an increasing impact on the economic growth, while at the same time changing profoundly the existing socio-economic structures. This makes it necessary to look for new tools to measure these trends, such that they should be accepted by the participants of production and exchange of this information. *Foresight* is such a tool. Thus, it is necessary for:

1. Generating, collecting, processing information sets into knowledge;
2. Creating research teams in decision-making centres in an uncertain complex and globalized world;
3. New tools for predicting the future and identifying the stakeholders of selected solutions and recommendations for their implementation.

Foresight is a research area (in the management sciences) and a practical venture, popularized in the world in the last two decades of the 20th century (Kononiuk 2012: 95). It creates a new approach to predicting the future. Foresight's research is aimed at:

- indicating and assessing future events, needs, opportunities and threats related to social and economic development;
- preparing appropriate pre-emptive activities in: science, technique (other disciplines), concerning discussions about the future;

- using the results to formulate recommendations, i.e. to create and then implement the policy: scientific, technical and innovative of the state or region.

In order to generate, collect and process information sets into future trends, we need to analyse data about the past and we can indicate future needs and opportunities, concerning of KBE development. Therefore, a detailed analysis of all four pillars of KBE in the maximum long time series is the stage preceding the Foresight research. The research results presented in the second part of this work are just such a preliminary stage, concerning the fourth pillar of KBE - information technologies.

The beginning of Foresight research was the application in 1969 in RAND CORPORATION of multiple polling of large expert groups, called the Delphi Method. National Foresight programs were initiated in Japan in the 1960s in the area of future technologies. This method allowed informing opinion-forming circles and creating a discussion on the results obtained in order to formulate recommendations for decision-makers. It was used to create development strategy in many countries around the world, as well.

2. The concept of Information Society - measurement problem

Changes in the technical and organizational development of telecommunications technologies, successive since the end of the 20th century, have resulted in changes in social, economic, cultural and other spheres of modern life. This development has enabled the widespread use of information in the production of goods and the provision of services. A new paradigm emerged, based on the fact that knowledge, along with land, capital and labour, becomes a new resource, supporting decision making on the macro and micro scales. On the other hand, the practice applied by developed countries, based on the exchange of information, ensuring a long-term increase in added value, has become widespread. Thus, these processes are focused around the effects of the impact of technical progress on economic growth, assigning a particular role to information and communication technologies.

At the same time, the society of mass production and consumption of material goods transformed into a society characterized by an increase in the share of services in economic development. This is the result of an increase application of information and telecommunications technologies to the widespread use of information in production and in the provision of services.[1] As a result of the new form of information transfer, civilization changes take place.

In the 1960s and the 1970s, attempts to measure and make quantitative assessment of the impact of information technologies on the concept of the integrated Information Society growth concerned the impact on economic efficiency.[2] Even then, there was a lack of a unified concept of Information Society (IS), which led to many different measurement methodologies,[3] for example: Information Index – Johoka index, Japan, 1968, Information Flow Census (IFC), USA, 1976 (Goliński, 2011: 79). In works of Machlup (1962: 12), the IT industry was defined by estimating the share of its employees in the total employment. The results of Porata's work moved in a similar direction, based on the input-output table that became the basis of the OECD's works (Goliński 2011: 88). The summary of the discussion of the 1990s about IS was a typology, adopted by Webster, including technological, economic, professional, spatial and cultural approaches. Differences in the approaches to IS cause a lack of uniform, satisfying, understanding of IS concept, which creates: "measurement problems [...] which is the central reference for every deserving of acceptance definition [...] of a new type of society (Webster 2006: 21). The conclusion of M. Goliński (2011: 139) that "a broadly accepted definition of Information Society is impossible," seems correct. Nevertheless, a wide group of stakeholders interested in quantitative research of IS was established. The area of research results from the technological progress characterizing the ICT industry. Built by OECD in 2005, the conceptual model of IS statistics, in conditions of constant development of ICT, results in the lack of unification of the concepts, number and content of generated indicators. This creates a difficult problem of monitoring the role of ICT in the economic growth by standardizing these indicators by international institutions. Their substantive value depends mainly on the accuracy of selection

[1] The social consequences are: the level of development of communication means, access to electronic services and products, creation of Internet communities; the economic consequences are: formation of new professions due to new technologies, impact on business activity; the cultural consequences are: wide access to cultural goods via the Internet, electronic entertainment, virtual reality.

[2] In the 1990s, the concept of Information Society was synthesized, which was influenced by: commercialization of computer and Internet techniques, active role of the state in creating national and supranational institutions - creating a scientific community of information and knowledge exchange, and global competition for military and economic primacy (see Goliński 2011: 96-99), which was the reason for the emergence of the Foresight approach.

[3] We can distinguish two approaches to researching information economics: Japanese - analyzing the demand side, involving study of the penetration of information into various areas of life, and American - defining information as one of the factors of production and distribution.

of the indicators used.[4] This leads to the popularization of various models of IS development, whose substantive value depends on the accuracy of selection and readability of the indicators used. A large number of the indicators caused their comparison to be impossible. This resulted in an increase in the popularity of complex Indexes of the SI and simple interpretation.[5] Synthetic indexes facilitate the interpretation of the analysis results of socio-economic phenomena in the multidimensional space of variables, thanks to the replacement of a large set of features, with one synthetic feature. This transition is made thanks to the aggregation of variables. This leads to the ordering of the examined objects by values of an aggregate variable and making comparisons both in space and in time. A relative ease of synthetic indexes interpretation allows researchers to clearly present the ranking of the SI development level in the regions and countries. Synthetic indexes perform increasingly important socio-economic functions, therefore, the following are involved in their creation: international and national institutions, commercial companies, social organizations and scientific units. One should agree with M. Goliński (2011: 212) that synthetic indexes are burdened with subjective choices of their creators and often do not explain phenomena related to IS in more detail than individual partial indices. Their choice is determined by the availability of statistical data and therefore should play a complementary role in the area of research on their use to formulate and make important political or investment decisions.

3. Origin of the Knowledge-Based Economy concept and the possibilities of its measurement

The second concept used in this article is that of Knowledge-Based Economy. Knowledge, as mentioned above, becomes the fourth resource to creating added value. It is based on the best usage of intangible resources, which is a factor determining development. The share of this resource in highly developed countries is close to 20% of the newly created added value.

The concept of Knowledge-Based Economy was defined in the mid-1990s. The Knowledge-Based Economy (KBE) is an economy in which production and distribution uses knowledge and information (Organization for Economic Cooperation & Development - OECD

[4] OECD 2005, 2009; UN Statistical Commission 2007, UNCTAD 2009; World Bank 2010; EUROSTAT 2010, Regulation of the European Parliament and of the Council 808/2004, 1006/2009.

[5] The popularity of composite indices is influenced by: growing availability of statistical data in the form of databases, increase in demand for evaluation tools, media attractiveness of research for stakeholders, and relative ease of their construction.

1996). The KBE is also understood as an economy in which production and distribution uses knowledge as the main factor in creating wealth growth (value added) and employment in all industries (APEC 2000). Even more, the KBE is presented as an economy in which knowledge is: created, acquired, transmitted and effectively used by: enterprises, organizations, individuals and communities. The KBE is not focused on the narrow industry advanced technologies or ICT technologies, but rather creates a framework for Foresight research to create trends in the areas of: education, information infrastructure and innovation systems, that can help initiate the Knowledge-Based Economy (OECD 2001). Thus, the KBE is an economy focused on products and services, with a market value dependent on knowledge resources, about the dominant role of the services sector in generating GDP and employment.[6] Therefore, the cooperation of the government, scientific and business sectors plays an important role. In the most developed countries, the role of knowledge, information, its availability and use in industry and administration is increasing. The complexity of knowledge, techniques and technologies is accompanied by the development of innovation in the services sector (OECD, 2005, 2009). The pillars of the KBE are: human and social capital, technical infrastructure, research and development, as well as institutional and legal factors that allow gaining a competitive advantage (region, industry, national economy). The share of the KBE in the economy is evidenced by the number of employees in sectors that are the carriers of development, as well as in: education, science and R&D, high-tech industries, Information Society services sector.

4. Knowledge-Based Economy measurement methodology

The main purpose of this part of the article is to present the objects diversity measurement methodology using the example of diversity of voivodships of Poland in the information technologies development aspect. To achieve the goal one of the four partial synthetic indexes describing the state of the Knowledge-Based Economy (KBE) was used.[7]

The data used were obtained from the Local Data Bank of the Statistical Office in Olsztyn.[8] The research covers the years 2009-2015, which allows carrying out an analysis of the

[6] An overview of concepts related to KBE is provided in M. Goliński's study (Goliński, 2018)
[7] The results of research on all four groups of indicators of Knowledge Based Economy, but only for 2009 are presented in Roszkowsa,s and Piotrowska,s study (Roszkowska and Piotrowska, 2018)
[8] Bank Danych Lokalnych. Available at: https://bdl.stat.gov.pl/BDL/start. Accessed 14 December 2017.

dynamics and development of the level of Poland's spatial diversity in view of information technologies with a division into voivodships. Thanks to this, the presented research results may help to create and monitor regional innovation strategies.

The problem of measuring of the level of the KBE development is a very difficult task due to its complexity. Currently, we only have indirect and partial growth indicators based only on knowledge. Measuring the KBE is still a challenge to economists. It depends on how to define the KBE, as well as on the availability of data. Traditional statistics do not provide clear answers. The search for optimal measures and methods for assessing the KBE is the subject of research.

The Knowledge Assessment Methodology (KAM) methodology is one of the holistic methods for measuring the level of KBE development, related to the development of a set of indicators describing the functioning of particular socio-economic dimensions. It was developed by the World Bank Institute in 1999. This method is the most widespread and constantly improved. Under this method, the KBE measurement was based on a set of indicators grouped in four categories:

- economic and institutional,
- education and human resources,
- information system and new technologies,
- information technology.

In this study, the last category of those proposed in the KAM has been analysed. Synthetic indexes for voivodships of Poland in 2009-2015 were calculated. They represent the fourth pillar of KBE – development of information technologies. The selection of explanatory variables, based on the KAM, is adapted to regional conditions. It depends on availability, reliability and completeness of statistical data on a regional basis. Potential variables were presented in Table 1.

Table 1. Variables explaining the level of information technologies development

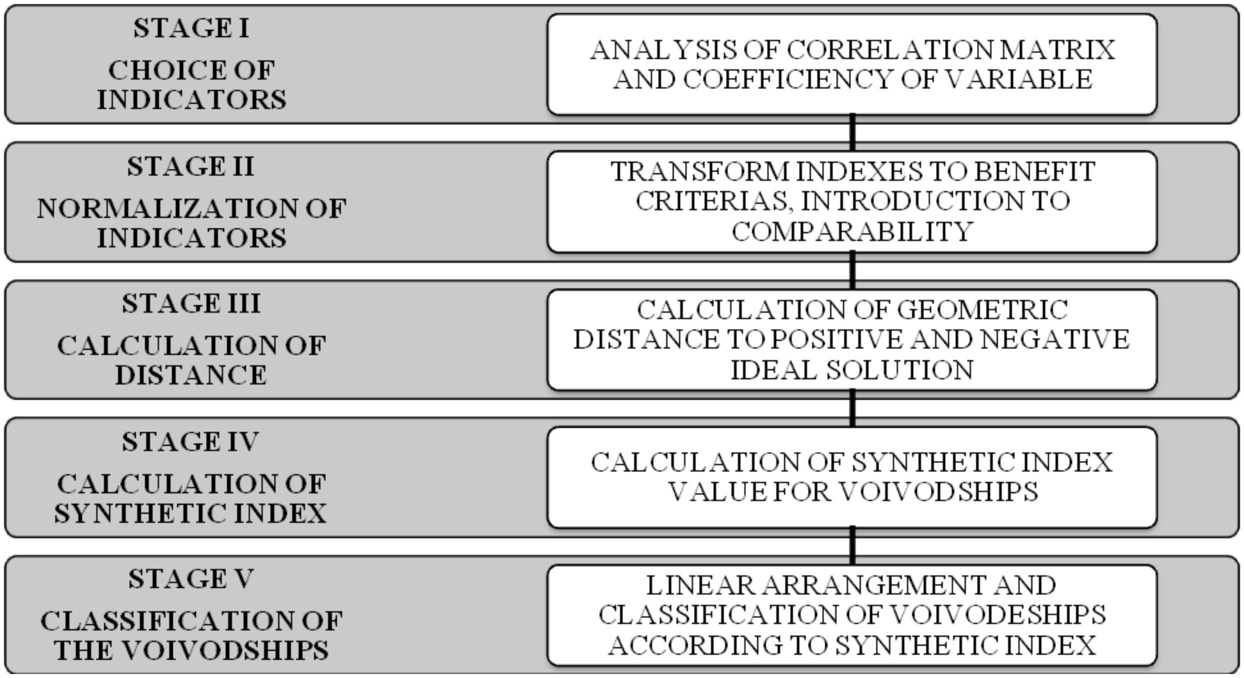
Symbol	Description of the variable
D1	indicator of computerization of high schools
D2	indicator of computerization of primary schools
D3	indicator of computerization of junior high schools
D4	percentage of households owning a mobile phone
D5	percentage of households owning a computer
D6	percentage of households with Internet access

D7	percentage of enterprises using computers
D8	percentage of enterprises with Internet connection
D9	percentage of enterprises with a broadband internet connection
D10	percentage of enterprises owning their website
D11	percentage of enterprises with LAN
D12	percentage of enterprises with Intranet
D13	the number of installed means of production automation
D14	percentage of enterprises using the Internet in contacts with public administration
D15	percentage of enterprises receiving orders via computer networks
D16	percentage of enterprises that place orders via computer networks

Source: author’s own elaboration based on: Roszkowska and Piotrowska, 2018

At the next stage, on the basis of the explanatory variables mentioned above, the value of the synthetic index describing the level of information technology development for voivodships should be calculated. This index, using the TOPSIS method, will be used for linear ordering of voivodships due to the researched fourth pillar of the KBE. TOPSIS is a method of linear ordering of multi-feature objects, proposed by Hwang and Yoon (1981), which has foundations in Hellwig's theory (Hellwig, 1968). It consists in determining the distance of each object from the positive ideal solution (PIS) and the negative ideal solution (NIS), and then on the line ordering of the objects. This method distinguishes five stages of conduct, presented in Figure 1 below.

Figure 1. Diagram of the TOPSIS method



Source: author's own elaboration

The first stage includes statistical verification of simple features – indicators selected on the basis of substantive premises, in accordance with the KAM. It is possible through the compilation of values of these indicators for particular voivodships into the matrix $[x_{ik}]$, where: $i \in \{1,2,\ldots,n\}$ is the "number of the voivodship" ($n = 16$), $k \in \{1,2,\ldots,m\}$ - "index number" (in this study m = 16). In order to eliminate overly correlated indicators, the correlation matrix of the value of indicators and the reverse matrix was analysed. The analysis of the coefficient of variation allowed to reject features that are not significant from the point of view of the linear ordering of voivodships.

At the second stage, the indicators selected at the first stage were analysed in terms of the correlation sign of these simple features with the constructed composite feature, i.e. in the case of positive sign correlation they were regarded as benefit criteria, in the negative sign – cost criteria. All those were transformed to the benefit criteria in order to facilitate comparability and then they were normalized in accordance with the procedure:

for benefit criteria

$$z_{ik} = \frac{x_{ik} - \min_i\{x_{ik}\}}{\max_i\{x_{ik}\} - \min_i\{x_{ik}\}},$$

(□ SEQ Równanie * ARABIC □1□)

for cost criteria

$$z_{ik} = \frac{\max_i\{x_{ik}\} - x_{ik}}{\max_i\{x_{ik}\} - \min_i\{x_{ik}\}}.$$ (SEQ Równanie * ARABIC 2)

The third stage is the calculation of the geometric distance d_i^+ from the development the positive ideal solution (PIS) $z^+ = (1,1,\dots,1)$ and distance d_i^- from the negative ideal solution (NIS) $z^- = (0,0,\dots,0)$ for each voivodship, according to the formulas:

$$d_i^+ = \sqrt{\sum_{k=1}^{m}(z_{ik} - z^+)^2}, \qquad d_i^- = \sqrt{\sum_{k=1}^{m}(z_{ik} - z^-)^2}.$$ (SEQ Równanie * ARABIC 3)

The fourth stage is determining the synthetic index value of information technologies level advancement for each voivodship $i \in \{1,2,\dots,16\}$, according to

$$q_i = \frac{d_i^-}{d_i^- + d_i^+}.$$ (SEQ Równanie * ARABIC 4)

It should be noted that

$$\bigwedge_{i\in\{1,2,\dots,16\}} 0 \le q_i \le 1.$$ (SEQ Równanie * ARABIC 5)

At the last, fifth stage, the voivodships of Poland were linearly arranged due to the value of the q_i. Then, they were classified based on a statistical criterion using the arithmetic average $\bar{q}$ and the standard deviation s_q from the value of the synthetic level indicator of information technology advancement. The following typology of voivodships was obtained:

I class (high level) for $q_i \ge \bar{q} + s_q$,

II class (higher medium level) for $\bar{q} + s_q > q_i \ge \bar{q}$,

III class (lower medium level) for $\bar{q} > q_i \ge \bar{q} - s_q$,

IV class (low level) for $q_i \le \bar{q} - s_q$.

5. The results

The starting point for the research were independent variables – simple features, proposed by the KAM, presented in Table 1.

On the basis of statistical premises, these variables were verified due to their significance from the point of view of the analysis of the phenomenon, i.e.:

- low correlation, in order to avoid duplication of information – values on the main diagonal of the inverse matrix to the correlation matrix must be greater than 10,
- appropriate differentiation - coefficient of variation must be greater than 10%.

Finally, the set of variables describing a synthetic index of information technologies advancement level for voivodships of Poland in 2009-2015 depends on simple features presented in Table 2.

Table 2. Statistically significant simple features in the aspect of assessment of information technologies advancement level for voivodships of Poland

2009	2010	2011	2012	2013	2014	2015
D13 D15	D12 D13 D15	D13	D13	D13 D15	D13 D15 D16	D15

Source: author's own elaboration

The variables that have the greatest impact on the ranking of the voivodships of Poland in terms of the information technologies development in 2009-2015 are: the number of installed automation measures for production and the percentage of enterprises receiving orders via computer networks. These are simple features, unrelated to the "computerization" of the population, but related to industry.

In addition, all the simple features analysed are benefit criteria. This means that higher values of these indicators affect the higher position of the voivodship in the ranking.[9] The rankings of voivodships in 2009-2015 in terms of the information technologies advancement level, which were obtained by the TOPSIS method, are presented in Table 3.

Table 3. Rankings of voivodships of Poland in 2019-2015 within the information technologies advancement level

VOIVODSHIP	2009	2010	2011	2012	2013	2014	2015
DOLNOŚLĄSKIE	4	4	3	3	5	2	9
KUJAWSKO-POMORSKIE	7	13	9	9	13	10	12

[9] It may happen that the variables sets used for the construction of the synthetic index have an empty common part in various years. We can compare the rankings when the different criteria (variables) were used to construct them, because correlated variables have the same influence on the synthetic index value. In fact, the value of a synthetic index depends on a larger set of variables. Variables rejected due to insufficient variability do not affect the differentiation of the synthetic index value.

LUBELSKIE	16	11	15	12	10	11	15
LUBUSKIE	14	9	10	13	15	16	10
ŁÓDZKIE	6	7	5	4	7	6	3
MAŁOPOLSKIE	8	6	6	6	4	7	4
MAZOWIECKIE	1	1	1	2	1	1	1
OPOLSKIE	15	12	13	15	8	5	14
PODKARPACKIE	11	10	12	8	12	13	5
PODLASKIE	10	5	8	14	3	9	2
POMORSKIE	5	8	7	7	9	8	13
ŚLĄSKIE	2	2	2	1	2	3	7
ŚWIĘTOKRZYSKIE	9	15	14	11	16	15	16
WARMIŃSKO-MAZURSKIE	12	16	16	16	14	12	6
WIELKOPOLSKIE	3	3	4	5	6	4	8
ZACHODNIOPOMORSKIE	13	14	11	10	11	14	11

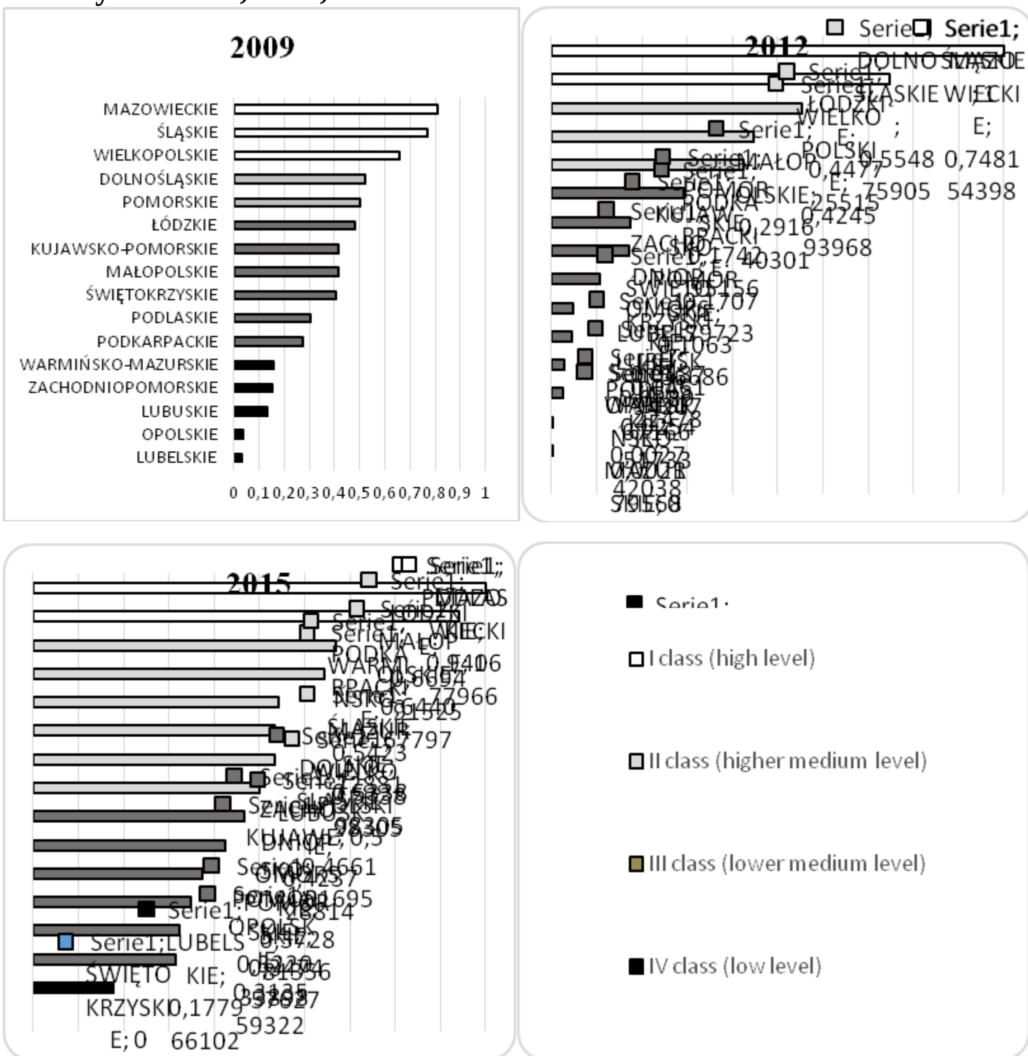
Source: author's own elaboration

In most voivodships, significant differences in the position in particular years can be observed. Only the Mazowieckie occupies a stable first position in all years, except 2012, in which it ranked the second.

The voivodships, which are characterized by the highest diversification of ranking places in terms of the information technologies advancement in 2009-2015 are voivodships: Podlaskie (difference of 12 places), Opolskie and Warmińsko-Mazurskie (10 places). The remaining voivodships are characterized by average diversity of ranking places - from 4 to 8. It is worth noting that Śląskie Voivodship, which held the stable second position in 2009-2012, recorded a drop in the ranking in 2012-2015. Warmińsko-Mazurskie and Podlaskie Voivodships regularly advanced in the ranking. It is evident that the Operational Programme Eastern Poland 2007-2013, co-financed from the EU funds, effectively impacted the promotion of ranking places of those voivodships.

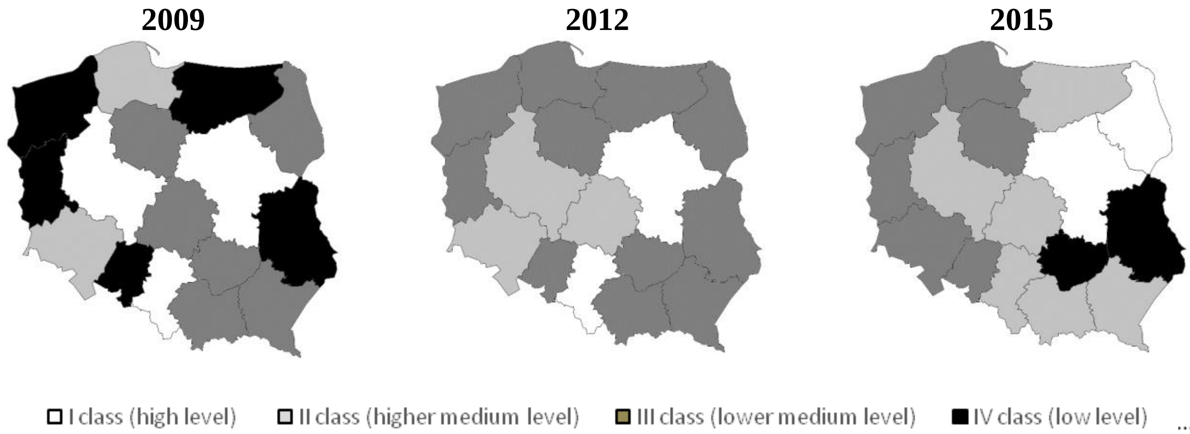
Below are the rankings of the voivodships within the fourth pillar of the KBE - information technology development in 2009 – the beginning of the crisis, 2012 – exit from crisis and 2015 – the last year in which complete data on information technologies is available: using the chart in Figure 3 and using the maps in Figure 4. The shades of grey show the affiliation of voivodships to one of four typological classes.

Figure 2. Ranking of the voivodships in terms of the development of information technology in the years 2009, 2012, 2015



Source: author’s own elaboration

Figure 3. Voivodships of Poland division into classes, according to a synthetic index of information technologies advancement level, calculated by the TOPSIS method in the years 2009, 2012, 2015



Source: author's own elaboration

The first class includes voivodships with a high level of information technology advancement. In 2009 (the beginning of the crisis), the following voivodships belonged to this class: Mazowieckie, Śląskie, Wielkopolskie, in the exit from the crisis (2012) - Śląskie, Mazowieckie, in 2015 - Mazowieckie and Podlaskie. The voivodships, characterized by the lowest level of information technology development, were qualified to the fourth class and these are: Lubelskie, Opolskie, Lubuskie, Zachodniopomorskie, Warmińsko-Mazurskie in 2009, Świętokrzyskie, Lubelskie in 2015. For the year 2012 this category was empty. It can therefore be concluded that the crisis did not deepen the disproportion between information technology development level in voivodships; on the contrary, it caused levelling of the situation (compare maps for 2009 and 2015 with that for 2012 in Figure 3). However, the unification did not cover voivodships with the highest level of information technology development (the first and the second classes), which are significantly different from the third class – the largest and relatively even (see Figure 3 - 2012). This proves that the period of crisis, i.e. the lack of financial resources, limits the size of knowledge resource and at the same time – the diversity of the level of information technology development in third-class voivodships.

6. Conclusions and further research directions

The obtained results constitute an analysis of one of the four pillars of the Knowledge-Based Economy. The conducted research showed disproportion between the voivodships in terms of information technology development level, and also confirmed that programs aimed at aligning the level between the voivodships bring tangible results.

The analysis of the four pillars can be the basis for assessment of using knowledge in the process of voivodships economic development. The presented research results, supplemented with the analysis of the remaining three pillars of the KBE, should be the initial stage for Foresight research, concerning predicting the future of the KBE development. And that may help to create regional innovation strategies and facilitate monitoring them.

It should be noted, however, that there is no one recognized method for measuring the level of the Knowledge-Based Economy, and the conducted research can only be one of the proposals in the literature on the subject.

Literature

Cieciura M. (2006). Podstawy technologii informacyjnych z przykładami zastosowań. Warszawa: Opolgraf SA.

Drucker P.F. (2003). The Age of Discontinuity; Guidelines to Our Changing Society. Newark: Transaction Publishers.

Goliński M. (2011). Społeczeństwo informacyjne-geneza i problematyka pomiaru. *Monografie i Opracowania nr.580.* Warszawa: Oficyna Wyd. SGH.

Hellwig Z. (1968). Zastosowania metody taksonomicznej do typologicznego podziału krajów ze względu na poziom rozwoju i strukturę wykwalifikowanych kadr, *Przegląd Statystyczny nr. 15/4*. Warszawa: Komitet Statystyki i Ekonometrii Polskiej Akademii Nauk.

Hellwig Z., Siedlecka U., Siedlecki J. (1997). Taksonometryczne modele zmian struktury gospodarczej Polski. Warszawa: IRiSS.

Hwang C.L., Yoon K. (1981). Multiple Attribute Decision Making: Methods and Applications. Berlin: Springer-Varleg.

Kasperkiewicz W. (2001). Polska gospodarka wobec nowej gospodarki, maszynopis, materiały konferencyjne. Łódź: Uniwersytet Łódzki 19-20 maja 2001.

Kononiuk A. (2012). Foresight jako nurt badawczy w naukach o zarządzaniu – stan badań w Polsce i przykłady zastosowań. *Współczesne zarządzanie 4/2012.* Kraków: Wydawnictwo Uniwersytetu Jagielońskiego.

Machlup F. (1962). The Production and Distribution of Knowledge in the United States. Princeton: Princeton University Press.

Nazarko J. (2013). Regionalny Feresight gospodarczy. Metodologia i instrumentarium badawcze. Warszawa: Związek Pracodawców Warszawy i Mazowsza.

Plich K. (2009). Wiedza i innowacje w rozwoju gospodarczym: w kierunku pomiaru i współczesnej roli państwa, Warszawa: Instytut wiedzy i innowacji.

Roszkowska E., Piotrowska E. (2011). Analiza zróżnicowania województw polski w aspekcie kształtowania się gospodarki opartej na wiedzy. *W kierunku zrównoważonej gospodarki opartej na wiedzy w Polsce*. In Sochaczewski P. (ed.). Białystok: Wyd. Wyższej Szkoły Ekonomicznej.

Webster F. (2006). Theories of Information Society, Third edition. Routledge, London, New York.
Wysocki F. (2010). Metody taksonomiczne w rozpoznawaniu typów ekonomicznych rolnictwa i obszarów wiejskich, Poznań: Wyd. Uniwersytetu Przyrodniczego.
Tapscott D. (1998). Gospodarka cyfrowa, Warszawa: Wydawnictwo Business Press.
OECD (1996). The Knowledge-Based Economy. Paris. Available At: http://www.oecd.org. Accessed 20 December 2017).

Foresight Społeczeństwa Informacyjnego (SI) – Gospodarki Opartej na Wiedzy (GOW). Próba pomiaru na przykładzie zróżnicowania przestrzennego województw Polski w latach 2009-2015

Streszczenie

Celem artykułu jest przedstawienie nowego podejścia do prognozowania trendów długofalowych rozwoju: gospodarki, społeczeństwa, jego edukacji i kultury. Podejściem tym jest Foresight. Jego przedmiotem jest społeczeństwo informacyjne, którego zdefiniowania próbowano się podjąć wielokrotnie. Brak jednoznacznej definicji tego pojęcia prowadzi do wielu podejść do jego pomiaru, które nie przyniosły do tej pory właściwych wyników. Lepsze wyniki daje zdefiniowanie pojęcia gospodarki opartej na wiedzy, która oparta jest na następujących filarach: kapitale ludzkim i społecznym, infrastrukturze technicznej, działalności badawczo-rozwojowej oraz na czynnikach instytucjonalno-prawnych. Analiza tych filarów pozwala uzyskać przewagę konkurencyjną (regionu, branży, gospodarki krajowej). Zastosowana metodyka KAM (Knowledge Asessment Methodology), opracowana przez Instytut Banku Światowego w 1999 r., stanowi jedną z metod pomiaru stopnia rozwoju GOW. Związana jest z opracowaniem zestawu wskaźników opisujących funkcjonowanie poszczególnych wymiarów społeczno-gospodarczych, zgrupowanych w czterech kategoriach: gospodarcze i instytucjonalne, edukacja i zasoby ludzkie, system informacji i nowe technologie, technologie informacyjne. W drugiej części artykułu, jako przykład wpływu, rozwoju technologii informacyjnych na wzrost poszczególnych regionów (województw), spośród zaproponowanych w metodyce KAM, wybrano filar czwarty - technologie informacyjne. Obliczono wskaźniki syntetyczne dla województw Polski w latach 2009-2015. Wyniki badań prezentują znaczną różnicę przestrzenną w rozwoju technologii informacyjnych. Zmiany w tym zróżnicowaniu województw zostały przedstawione dla lat 2015 względem 2012 i 2009.

Słowa kluczowe: Foresight, Gospodarka Oparta na Wiedzy, technologie informacyjne, Społeczeństwo Informacyjne, metoda TOPSIS, ranking województw