

HIGHER EDUCATION COURSES EXPECTED BY THE ENTERPRISES THE BUSINESS ACTIVITIES OF WHICH ARE RELATED TO SMART SPECIALISATIONS OF THE REGIONS (ON THE EXAMPLE OF THE SILESIAN VOIVODESHIP)

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Abstract: The first objective of the research was to analyse employers' expectations with a focus on employers whose companies are related to the smart specialisations of the region of Silesia. The second objective of the research was to confirm the need for and development of the conceptual model of regional integration network (information network) of the system of education, higher education and companies, the region's authorities... in order to shape the supply of and demand for course-specific education; its priority would be to develop human resources for the regional industry in the perspective of economic changes. The hypothesis that "The creation of integration network of information for improving the effectiveness of development of major studies in higher education is desired by system of education, higher education, companies and public authorities" was confirmed on the basis of secondary and primary data.

Keywords: higher education courses, smart specialisations of regions, IT system

1. Introduction

The most important factor and requirement of competitiveness and effectiveness of the company's activities is its ability to innovate. This ability is determined by the competence and skills of managers, employees and co-workers of the company. Their knowledge and competence affect the changes of the offer and structures of business models. Employer organisations and the National Training Fund (KFS) suggest that the education system and higher education should adjust the competencies of their graduates to the requirements of the dynamically changing economy and job market and draw conclusions from the arrangements of the Voivodeship Social Dialogue Councils (www.dialog.gov.pl) on education priorities at the regional level.

The first objective of the research was to analyse employers' expectations with a focus on employers whose companies are related to the smart specialisations of the region of Silesia.

Deficit occupations in Silesia and even in the individual poviats of the voivodeship were analysed. On the basis of the document "Occupational Barometer of 2016", it was concluded that the deficit of occupations is associated with the industry located in the voivodeship and in particular poviats (barometrzwodow.pl). Analysts of "Barometer" took into account the variety of occupations (e.g. in 2016 banks and financial institutions of the largest cities of Silesia showed demand for specialists, the shortage of whom could be observed on the labour market, as shown in the map of Silesian Voivodeship below). However, in their analysis they focused on the professions which one can be learn in the vocational school, vocational high school or technical high school.

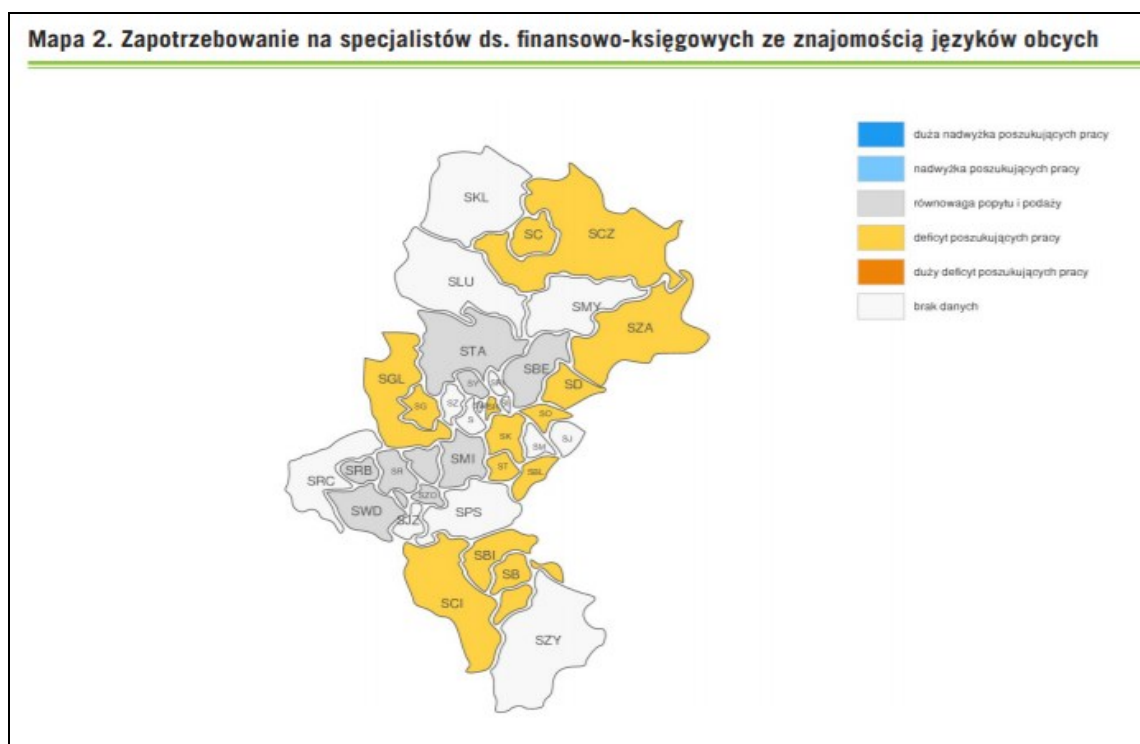


Figure 1. Map: the demand for specialists according to poviats of the Silesian Voivodship¹ in 2016. Adapted from: https://barometrzwodow.pl/userfiles/Barometr/2017/slaskie/Raport_wojewodztwo_slaskie.pdf.

There is a need of analyses that would allow universities to develop the offers of courses for students of the first and second-degree studies as well as of postgraduate studies. Numerous analyses show that there is a shortage of engineers in all industries related to production and heavy industry. For example, the study "Talent Shortage" carried out by Manpower in 2015, shows that engineers are the third most sought-after professional group in Silesia (after qualified physical workers and sales representatives). Investments in automotive, aviation and rail sectors are continuously increasing the demand for engineers in Silesia. The most popular engineering studies in the case of the Silesian University of Technology include: civil engineering, automatic control and robotics and transport. At the AGH University of Science and Technology: mechatronic engineering, automatic control and

¹ Voivodship the highest-level administrative subdivision of Poland, corresponding to a "province" in many other countries.

robotics and civil engineering, and in the case of Częstochowa University of Technology: mechanical engineering, electronics and telecommunications, and management and production engineering. Employers sign contracts with technical universities to organise studies intended for them (Fiat, Chrysler Automobiles signed such contracts with the Silesian University of Technology). Wielton and Rosomak also run courses within master's degree studies at the Silesian University of Technology.

The CSO data show that the number of students at technical universities in Poland increased only slightly from 2 893 000 in 1999 to 3 014 000 in 2015 (including 24 957 students at the Silesian University of Technology in 2015 (www.polsl.pl)). A variety of educational offers on the market (even of the leading universities), does not always coincide with the needs of the regional labour market. Disorganised information flows, that shape the supply of and demand for course-specific education, hinder the decision-making process. Analysis of the structured information (barometr.zawodow.pl) about the demand of the labour market is not enough for the decision-makers. The information is incomplete, out of date, and often false. Improvement of the information reliability will occur when the authorities of the regions and poviats, universities, high schools, entrepreneurs, students and pupils will participate in the process of shaping the supply of and demand for course-specific education. Organising the knowledge flow in a regional educational area will provide added value for all of the above-mentioned links of the network.

The second objective of the research was to confirm the need for and development of the conceptual model of regional integration network (information network) of the system of education, higher education and companies, the region's authorities... in order to shape the supply of and demand for course-specific education; its priority would be to develop human resources for the regional industry in the perspective of economic changes.

2. Concept of information network created to improve the effective shaping of courses in higher education

Joining the network of information will be beneficial for individual entities:

- companies – by transferring the data about the demand for employees with specific education to the network, will be able, in return, to obtain information (about courses, dedicated courses, graduate students) useful for the development of future and current own personnel of organisation/institution,
- schools, because they will be able to participate in the process of shaping the supply, promote the courses that are the most desirable in the region among students, and in return share information about the preferences of graduating students,

- universities that will be able to shape the supply of and demand for course-specific education more accurately,
- authorities of the regions and poviats, which will have an impact on the development of supply of and demand for course-specific courses in accordance with regional development policy and smart specialisations of the region,
- students will be able to learn what directions of professional development are desired in the region in which they live.

The development of the concept of the model would require to carry out a series of research and analysis, and in particular:

- the development of a detailed list, which would include potential members,
- the recognition of the information needs of potential members and external stakeholders (students, employees of the regional companies),
- the identification of the key members and their motivation to join the proposed network, as well as explore the possibility of any conflict situations in the network,
- the development of the principles of operation of the network including the processes of tacit knowledge and standard data flow, preparation of their statistical processing and information sharing (the development of the model of regional network of the system of education, higher education and companies in order to shape the supply of and demand for course-specific courses),
- the description of roles, skills and competencies of each link within the systems in the context of the network that is being created,
- the identification of potential system integrator/flows coordinator/information broker,
- the preparation of transparent rules of knowledge exchange that would affect the building of trust within the network,
- the examination of the network operation conditions (current and potential knowledge flows and their determinant, possible sources of funding the network, the necessary technical infrastructure, critical mass – the number of institutions and companies necessary to launch the network, personal resources, etc.),
- the identification and indication of the organisational units/work stations, which will be a part of the network,
- the recognition of the personal motives of people potentially responsible for the creation of the network,
- research of the impact of trust on relationships in the proposed network of systems integration,
- the development of a way to recruit key members (leaders) of the community and the newly incorporated organisations,
- the development of a plan for the adaptation of the structure and process control of the information flow,
- the preparation of the system of incentives to participate in the network,

- the development of a "marketing plan for critical mass acquisition" (conducted by the broker) that focuses on key members, potential new members and external stakeholders,
- the development of a monitoring and continuous improvement of activities (including the implementation of the pursued objectives (e.g.: the number of regional university graduates employed)).

The above-mentioned tests should be repeated. It is necessary to apply the IT/artificial intelligence system and to join selected institutions to the system.

3. Research methodology

The first objective of the research was to analyse employers' expectations with a focus on employers whose companies are related to the smart specialisations of the region of Silesia.

The second objective of the research was to confirm the need for and development of the model of regional integration network (information network) of the system of education, higher education and companies, the region's authorities... in order to shape the supply of and demand for course-specific education; its priority would be to develop human resources for the regional industry in the perspective of economic changes.

For the purposes of the article, a study limited to the confirmation of the main hypothesis was conducted i.e. the creation of integration network of information which aims at improving the effectiveness of development of education courses in higher education is desired.

Detailed hypothesis were also confirmed:

- The key condition for the process of creation and functioning of an efficiently running integration network is to identify the link that could serve as the initiator and the broker, responsible for supporting the development of the network.
- An important aspect of the processes of creation and development of the network is the selection of a suitable communication platform and communication tools that would ensure the effectiveness of the exchange of information and knowledge within the network.
- Increasing the density of the integration network is dependent on the creation of organisational culture based on openness and trust.

The basis of the scientific research includes:

- The analysis of secondary sources for the development of the concept of a network of cooperation in the area of the system of education, higher education, labour market and public administration,
- The analysis of the primary sources – data from direct interviews conducted among representatives of the tested systems, in order to create a database of determinants and

assumptions for the creation of the integration network of systems intended for the course-specific education.

Method of sampling and sample size. For the purposes of the implementation of the test, the sample size is as follows: two universities (national and private), five high schools (including one academic high school), ten companies from the energy, automotive, aerospace and biomedical engineering sectors, authorities of two poviats). The research was carried out among the organisations located in the Silesian Voivodeship, between the end of December 2016 and the beginning of January 2017. The following research aimed at the development of a model of information flow should be deepened and based on a bigger sample of the studied organisations.

A measurable result of the previous work is a confirmation of the above-mentioned hypotheses and, above all, the main one that the integration system is desired by all interested parties.

The measurable and documented effect of the implementation of the future project will include:

- The concept of the integration network of systems, containing objectives, scopes of tasks and ways of their implementation.
- The database of determinants and assumptions for integration network of systems (including: identification of problematic aspects of communication between network systems, and an indication of the marketing communication tools to support the flow of information between the them).

4. The integration network (information network) of systems of education, higher education, companies and the authorities of Silesia for the shaping of the supply of and demand for course-specific education – research results

Strategic challenges of innovative development of the Silesian voivodship play a significant role in the development of the strategy of innovation giving this strategy a particular, specific and appropriate character of the analysed region. The key strategic challenges for this strategy of innovative development of the Silesian voivodship are:

- risk management within the financing of innovative activity of companies,
- the stimulation of the innovation potential of groups of companies and industrial corporations,
- the elimination of the information asymmetry and knowledge management in the system of public support for innovation,
- the diffusion of innovation in the public service sector,

- the development of the knowledge economy infrastructure,
- the creation of smart markets for technologies of the future,
- shaping the culture of innovation.

There are two objectives of the development of the knowledge economy infrastructure. Firstly, the strategic objective 1.1 – Ecosystem of innovation of Silesia, based on dynamically changing innovative environments. Secondly, the purpose of this research, namely the development of the concept of the integration network of systems of education, higher education, companies and public administration for the purpose of shaping the supply of and demand for course-specific education, focused on the human resources development for regional industry in view of economic changes. Joining the network will be beneficial for individual entities of the systems. Transferring the data to the network will enable them to obtain specific information helpful in the development of future and current own personnel of the institution/organisation. Public administration units will be able to plan and organise the development of human resources for the region more efficiently.

The existing urgent problems that require the network development are described from the point of view of universities. It is primarily their responsibility to shape the supply of and demand for course-specific education.

Problems with the shaping of *supply* of course-specific education at universities

- **concerning the first-degree studies**

Overview of the structure of course-specific education (participation of students of particular courses within the total number of students) with data on the demand for work indicates slow and selective adaptation to changes in demand. Specialists in technical sciences are sought for on the market (specifically by the companies, as the work demand is mostly their field of research), however, universities, barely take that information into account when changing the offer. National universities, in their autonomous decisions on the shaping of demand, adhere to the knowledge on modern technologies and base on the experience of foreign universities (as the most important catalyst for innovation of the Polish industry and not necessarily of the regional industry). Private universities are preparing their offer adjusting it to the needs of high school graduates. Their financial situation is also significant. The selectivity of major studies is largely based on the costs of education. Detailed data show that the main expansion pertained mostly the courses that were and are "trendy", but also cheap, and thus easier to sell (because of what they are more available to buyers) in a impecunious society. Based on available data, it is difficult to say whether the structure of directional study corresponds to, or does not correspond to the expectations of the market. However, the data showed that there is an unmet demand for professionals in the construction, transport, communications and industrial processing sectors. Information about the needs of the regional employers is available, however, it is related to graduates of vocational schools mainly, and not to professionals – graduates of national and private universities. Perhaps the

changes will improve the labour market recognition and consequently – lead to greater compliance of the universities' offer with the needs of the labour market. Meanwhile, however, consulting firms (e.g. Manpower Professional, Sedlak & Sedlak), recruitment portals (e.g. pracuj.pl) and employers associations (among them: PKPP Lewiatan) are trying to fill the information gap (at the national level). Educational decision-makers (including the Ministry of Science) use occasional, one-off expertises. There are some courses (offered by a small number of universities, i.e. aviation) for which the demand for graduates in the labour market should be studied on the national scale but there are also some courses (offered by each of the technical universities, e.g. computer science) which formation would require the assessment of their demand on the regional labour market.

- **concerning the second-degree and postgraduate studies and training**

Informal contacts between universities and employers do not provide a complete picture of the demand for employees training. Only large companies (particularly international companies) cooperate with universities in the scope of employees' training. Managers of small and medium-sized companies are often not aware how much and how quickly the technologies in their industry change and how beneficial the acquisition of a specialists in production management or logistics can be.

The problem with the shaping of demand for course-specific studies results also from the difficulties that universities have with making education more practical (referring to training, workshops and apprenticeships). Entrepreneurs declare reluctance to accept students for apprenticeships, fearing an outflow of information to the competition and loss of time spent for apprentices. The admitted students (possibly not prepared enough by the university for an apprenticeship) perform the simplest tasks for the company, instead of focusing on creation of added value as educated professionals. This situation dissuades students from enrolling in the second-degree studies, it neither contributes to an increase of practical skills of graduates nor to the strengthening of ties between a student and his potential employer.

Employers' research showed, apart from inadequate adjustments of the course-specific education (insufficient number of graduates, and hence of the course-specific studies and of apprenticeships within the fields of those studies), also inadequacy of graduates' qualifications (e.g. the lack of: ability to work in a group and communicate, knowledge of foreign languages and IT tools, learning skills, desire for improvement, the ability to function between science and practice). These inadequacies point to the need for the introduction of an integrated/systemic studies planning (including the maintenance of balance between lectures, classes, seminars and design classes, with a greater participation of professional specialists), and to the need for a wider use of new methods and teaching techniques by university teachers.

Problems with shaping the *demand* of course-specific education at universities**• concerning the first-degree studies**

In the Higher Education Strategies' chapters devoted to educational activities one of the operational objectives reads: Improvement of the preparation of candidates for studies through a better coordination of activities in the systems of higher education and education in general. Rewrite such as - Both the too low Gross Enrollment Ratio and the results of the matriculation examination and entrance exams are problematic. The lack of coordination of the systems activities weakens the chance to increase the interest in high school graduates in technical courses (which are desirable on the labour market). The lack of cooperation does not result in changes of education programs and methods in these disciplines at a lower level of education, (the PISA test results also indicate the need for system integration). Public administration units as well as school are rarely interested in integration of the systems (they are busy with curriculum implementation and do not respond to promotional campaigns such as: universities' open days or guest presentations by universities' representatives). Popularisation of university patronage over high schools or even the creation of so-called academic high schools linked to universities are the solution to this problem.

• concerning the second-degree and postgraduate studies and training

About 53% of the graduates of the first-degree studies continue their education at a higher level. Most of the surveyed, among the important reasons to opt out of further education, mention the already discussed problem of making education more practical. Therefore, it can be stated that the extension of offers of various forms of training, workshops and apprenticeships will contribute to the growth in demand for the second-degree studies.

There are problems with the promotion of the the second-degree and postgraduate studies and training. Many universities, especially national, lack money for marketing activity intended for entrepreneurs and companies' employees. Despite various informal contacts of universities' authorities and their individual departments with companies as well as many initiatives such as: Student Careers Offices, Alumni Associations, the information about university education offer does not reach the persons potentially interested in supplementary education or employees' training. The demand for the second-degree course-specific education and training, increases only slightly, as a result of the promotional activities. The sharing of information with employers (about technology development in the industry in which they operate), managers (about new methods of management) on a current basis is needed, which will inspire them to increase their own and their workers' qualifications by acquiring knowledge at a university. A new provision which enters into force in January 2018 may be a solution. It indicates that both the acquisition of the results of scientific research and expert opinions, reviews, advisory services and parallel services should come from a science unit (konfederacjalewiatan.pl).

The described issues concerning the shaping of the supply of and demand for the course-specific education affect mainly universities. Design and implementation of the regional

integration network of systems would enable the identification and mitigation of these problems for the benefit of the remaining systems and their individual links (institutions and organisations).

The essence of research is to develop a concept of integration network of systems of education, higher education, business and public administration. The concept of the structure of the integration network of systems will be developed on the basis of assessment of possibilities of: ways of shaping the supply of and demand for course-specific education by the entities of the integration network, network management methods, information distribution within the network, methods for motivating to share information, ways to create task forces, ways of financing tasks, mapping of the processes within the integration network.

The secondary data analysis presented above will not be sufficient to effectively organise the network. Not only the information integration, but also social recognition impact the success of the project. The essence of the future research project will be the collation of goals and values of individual users after recognition of conflict of interests of all groups – users of the system. And then the creation of a campaign model that will alleviate conflicts and lead to the recognition of the benefits of the proposed solution for the region.

Before carrying out the detailed study a potential benefits of the integration network of systems for the systems' links were formulated (table 1). Examples of informational inputs and outputs (valuable information for making decisions concerning the development of human resources) are described below.

Table 1.

The benefits of the integration network of systems for the network links. Exemplary informational inputs and outputs

Education system	
The benefits resulting from the functioning of the integration network	<ul style="list-style-type: none"> • Ongoing access to information about the current and future needs of the labour market, which will help choose an annual technical courses, • participation in the development of and access to the standard programs and education methods in technical disciplines in secondary education.
The data transferred to the computer system	<ul style="list-style-type: none"> • The number of people willing to continue education at a higher level, including particular technical courses (divided into the second and third grades of high school), • applied and implemented changes in the vocational training proposed at www.konferencje.men.gov.pl
The information generated by the system which constitutes the decisional value (for directors, teachers, students)	<ul style="list-style-type: none"> • The number of vacancies offered by technical universities in the region, • the number of financed ordered technical courses, • the number of high school graduates in the region willing to continue education at a higher level on individual technical courses, • the schedule of events: open days, Student Record Book days proposed by universities/technical departments.

Higher education system

The benefits resulting from the functioning of the integration network	<ul style="list-style-type: none"> • Regular access to information about the current and future needs of the labour market, which will be helpful in the preparation of the major courses offer. • Participation in the development of programmes and teaching methods in technical disciplines on the upper secondary level of education, which will translate into the quality of education. • More efficient and more effective promotional activities addressed to high school students and employers. • Making education more practical thanks to the regular access to training and apprenticeships.
The data transferred to the computer system	<ul style="list-style-type: none"> • Current and future offer of technical courses (divided into first- and second-degree studies and full-time or part-time studies). • Current and future offer of education on financed ordered faculties (broken down into first- and second-degree studies and full-time or part-time studies). • The number of current and future graduates of technical courses. • The information about events: open days, Student Record Book days. • The scientific industry reports (on the technology development) prepared in order to inspire employers to acquire knowledge at the university, to educate employees etc. • Database of experts/scientists facilitating individual contacts between industry managers and scientists and individual training.
Information generated by the system, which has a decisional value (for rectors, deans of faculties, university teachers, students)	<ul style="list-style-type: none"> • Industry clusters, helpful when proposing and organising training sessions • Employers' offers arranged according to industry sectors (job offers, training sessions and apprenticeships for students). • Individual job offers for experts/scientists (offers of: training, expert opinions, assessments).

Employers/regional industry employers' associations

The benefits resulting from the functioning of the integration network	<ul style="list-style-type: none"> • Access to knowledge on technology development in the industry. • Access to experts/scientists. • Easy access to the apprentices and trainees; opportunity to choose from among the best, recruitment cost reduction. • Industry mergers of companies around universities; helpful in training (also through benchmarking).
The data transferred to the computer system	<ul style="list-style-type: none"> • Company data, number of employees, industry sector. • The present and future demand of the regional labour market/individual employers for engineers, master's degree holders and engineers (according to course-specific education). • The need for employees' training.
Information generated by the system, which has a decisional value (for associations of employers, employers, managers and employees)	<ul style="list-style-type: none"> • The number of current and future graduates of technical courses. • The number of places on financed ordered technical courses.

Public administration

The benefits resulting from the functioning of the integration network	<ul style="list-style-type: none"> • The opportunity to participate in the process of shaping the supply of and demand for technical course-specific education, and thus the impact on balanced economic development of the region.
The data transferred to the computer system	<ul style="list-style-type: none"> • The information on activities supporting the technical course-specific education, undertaken with the education system in view. • The information on activities supporting the technical course-specific education undertaken with the labor market and companies in view.

Information generated by the system, which has a decisional value for the regional unit of public administration	<ul style="list-style-type: none"> • All of the above information may be used by the public administration units to take regulatory action.
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Note. Own elaboration, requires primary research, deepening and confirmation.

After the presentation of the potential benefits to the respondents/decision-makers/managers, the study was conducted with the use of the interview method. Test results confirmed the main hypothesis: "The creation of integration network of information which functions in order to improve the effectiveness of course development in higher education is desirable by the interested persons". All of the respondents confirmed the need for the integration network described above. The region's public administration should be most interested. As stated: the role of public administration is not to choose between particular specialisations, but to involve different partners in the processes of their formulation, identification of complementary investment to the emerging specialisation and promotion of the integration network within the general technology of application between the different partners (Foray, 2009, p. 25). The veracity of detailed hypotheses was analysed:

- The key condition for the processes of creation and functioning of an efficiently running integration network is to identify the link that could serve as the information initiator and broker responsible for the support for the development of the network.

All of the respondents confirmed the need for appointment of the integration network's coordination body. Voivodship Social Dialogue Council (as it seems to the researcher) could act as the system's integrator. None of the surveyed respondents pointed to this authority. Three of the respondents pointed to this authority using its old name i.e. Regional Social Dialogue Committees (WRDS).

- An important aspect of the processes of creation and development of the network is the selection of a suitable communication platform and communication tools that would ensure the effectiveness of the exchange of information and knowledge within the network.

All respondents believe that if the network should come into existence, it must be accompanied by an IT solution i.e. a platform to which the data will be transmitted and from which they will be acquired "on-line".

- Increasing the density of the integration network is dependent on the creation of organisational culture based on openness and trust.

The respondents, in addition to the benefits of joining the network, saw a series of risks associated mainly with the transmission of information, which, as they think, can weaken their competitiveness (companies, research institutes, universities). The respondents did not negate the possibility of joining the network, however, they believe that the integrator will have difficulty in gathering regional partners around the vision of the future oriented towards a higher level of education that would lead to the development and prosperity of the region. Moreover, they fear that the transmission of data to the network will become an obligation,

and that routinely processed data will have little input. The respondents are waiting for solutions which enable the natural intermingling of the thematic systems with non-routine integration networks and cooperation between the actors of the regional education system in order to create the innovative region. A partnership in the training of creative staff is achievable, according to the respondents, only by means of mutual trust. The surveyed entrepreneurs underline that they want to be involved into the development process, actively check the actual education possibilities and to share their opinion on them. They want to consciously take part in the development of education programmes and assess their results.

The results of the subsequent research will include:

- The database of determinants and objectives for the development of the integration network of systems.
- The concept of the structure of the regional integration network of systems.
- The model of communication paths between the entities of regional cooperation network.
- The description for the IT tool creation. The basis of the solution will be the global World Wide Web network (which functions as a collective memory through the hyper-media architecture and strengthens the most frequently used connections). The tool will be prepared so that the competition between the universities, individual system units or groups of systems is not an obstacle in the network integration. The arrangement of units into groups and sharing their data with the use of statistical tools will protect the single information transmitted. The network will be based on a simple condition that the system's link will be allowed to use it only if it provides specific knowledge in return. The best way to convince the future customers of the network to use it will be to create documents that will be interesting for the user (users can be motivated to use the existing network resources and to add their data with promotional instruments outside of the network as well). In addition to the analytical function (by means of which you will be able to get information on: the current and anticipated needs of the labour market, courses offered in the region, high school graduates' preferences in the scope of the future courses, apprenticeships, workshops, and training for students of specific university courses, schedule for educational events, promotional information addressed to high school students, employers and employees who plan further training, industry innovations and new technologies carried out in the cities, at schools and universities, training for workers and companies), the tool will enable the users' interaction (e.g. a student, who, through the tool, can ask the tenderer to be accepted for the apprenticeship, or a company asking a scientist preparing information about the latest industry technologies or for experts recommendations). The model will be constructive and selective. The users will choose only those addresses that they will need. The designated integrator (individual system's integrators) will be able to forward the mail to recipient groups via Newsletter.

- The design of the promotion campaign (rising awareness about the global/regional benefits of the proposed solution, mitigating any conflicts between the systems). The effect of the implementation of the integration network must be a social system. This requires not only the integration of knowledge, but also integration, overview and publicising of the objectives and values of different users.

The development of the integration network of systems supported by the IT system and the motivation changing the attitude toward sharing information may lead to the expected development of the region's human resources in the future.

5. Conclusions

System approach was designed by Ludwig von Bertalanffy for the first time – he developed the general theory of systems and by N. Wiener – creator of cybernetics. Contemporary understanding of the system is derived from the works by T. Parson. This approach is manifested in the look at the nature of reality in the methodology of it being studied as well as in the methods of the impact on such reality. The essence of this approach is to treat the tested objects as open systems, in other words, the sets of related items in such a way that they form a new whole which stands out in a particular environment (Koźmiński, 1996, p. 693). System approach to the analysis of an organisation, imposes it to be treated as a compact structure with a variety of inputs and outputs. Inside this structure there are smaller elements (subsystems) which enable the conversion of inputs into outputs in line with the objectives of the system. Key elements of the organisation are the regeulation subsystem (management) as well as the implementation subsystem. Regulation subsystem consists of the following elements: organisational structure, fundamental values, objectives and tasks of the management system. The system approach, is not only the profitability of individual products, but also the interrelationship among departments, branches, branchings, which together form the structure of dependencies (Grontkowska, and Klepacki, 2006, p. 56).

Literature of the subject and, above all, numerous current developments on the management of education, higher education, projects such as "European funds for learning-learning for Poland", Actions 8.1.3 POKL, Services like: www.funduszeonline.pl, www.proregio.org.pl, www.naukawpolsce.pap.pl touch upon the issues of system integration. However, there are no networks and information technology tool integrating the system of education, higher education, employers and public administration operating in the region. There is also no integrator of the proposed network. In the theoretical perspective the original solution will be to develop the structure of integration system network. The scope of its tasks and the ways of their implementation will be developed. The new solution is the regional network of integration systems created to support the formation of supply and demand for

major studies. Reciprocity of services in the proposed network is evident and only the freedom of relationships created with it may be the obstacle. Utilitarian solution would be a prototype of information technology tool supporting the operation of network and the campaign promoting the solution. The tasks of efficient information and knowledge management are other than at the level of enterprises and the appropriate microeconomics-related implementation of solutions and instruments applicable to enterprises or other organisations is not enough. J. Zhao and P.O. de Pablos point it out, claiming that "management of knowledge in the region is more strongly focused on the management of innovative knowledge and the management of knowledge related to the region development, and it is targeted at such type promotion of innovativeness, stimulation of external effects, course and dissemination of knowledge as well as the increase in regional competitiveness in order to achieve the maximum level of benefits and it must be noted to deliver the benefits for the region as a whole" (Zhao, De Pablos, 2011, p. 39).

Bibliography

1. Foray, D. (2009). Understanding „Smart Specialisation”. In *The questions of R&D Specialisation: Perspectives and policy implications*. Seville: Institute for Perspective Technological Studies – Joint Research Centre.
2. Grontkowska, A., and Klepacki, B. (2006). *Ekonomika i zarządzanie przedsiębiorstwem w agrobiznesie*. Warszawa: Format-AB.
3. Koźmiński, A. (1996). *Zarządzanie. Teoria i praktyka*. Warszawa: PWN.
4. Zhao, J., and de Pablos, P.O. (2011). Regional knowledge management: the perspective of management theory. *Behavior & Information Technology*, 30, 1.
5. http://konfederacijalewiatan.pl/legislacja/wydawnictwa/_files/publikacje/2016/Raport_Efektowna_Edukacja_22_09_2016.pdf.
6. <http://www.dialog.gov.pl/dialog-krajowy/wojewodzkie-rady-dialogu-spolecznego/>.
7. https://barometrzwodow.pl/userfiles/Barometr/2017/slaskie/Raport_wojewodztwo_slaskie_web_v2.pdf.
8. https://barometrzwodow.pl/userfiles/Barometr/2017/slaskie/Raport_wojewodztwo_slaskie_web_v2.pdf.
9. <https://www.polsl.pl/impresy/70lat/Strony/liczby.aspx>.