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ANALYSIS OF THE COMPETENCE GAP AMONG VOCATIONAL SCHOOL GRADUATES IN THE AREA OF SMART SPECIALIZATION IN POLAND

Abstract: The main goal of the paper is to determine whether there is a gap between the demand for competences of graduates of vocational schools and their supply. The article is composed with several sections. The subsequent parts of the paper contain the essence of competences and the competence gap, general description of the research, assessment of the importance of professional competences in the context of employability of graduates of vocational schools and also assessment of the preparation of graduates of vocational schools in the Świętokrzyskie Voivodeship to start work in their profession. Conclusions and references are placed in the final part of the article.

Keywords: competence gap, vocational school graduates, smart specialization

1. The essence of competences and the competence gap

In the contemporary world, the quality of human resources and their use on the labor market becomes a more and more important determinant of organizational development. The growing role of the quality of labor resources is associated with demographic and globalization processes, as well as with the development of new and innovative fields of the economy. As a result, human resources become the main asset of a company and significantly determine the competitive advantage on the market. Its main condition is the possession of competent employees. Therefore, skillful determination of employees' competences and their development is a condition for

implementation of goals and appoints the direction of organizational development.

The literature on the subject does not agree on what the employees' professional competences are. The multiplicity of approaches results mainly from the fact that the issue of competences is analyzed by specialists representing different scientific disciplines: management, psychology or sociology.

The problem of competences was first considered in literature at the turn of the 1960s and 1970s, which was reflected in the publications of R. White and D. C. McClelland. However, in-depth interest in competences was initiated in the 1980s by R. E. Boyatzis, who defined competences as the person's ability to behave in ways compliant with the requirements of their job position, specified by organizational environment parameters, which in turn yields the desired results (Armstrong, 2011). In addition, E.

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Boyatzis emphasizes that the demonstration of competences at work is affected by the organization of a given business activity, namely: culture, structures, maturity of a given organization, or the position of the contractor. Another significant factor is the environment, which is defined by the following aspects: economic, political, social, religious, and environmental. However, the level of competences and also the possibility of their development is in all cases determined by: proficiency and professional experience, recognized, procedural and functional knowledge, as well as the possession of certain cognitive skills ensuring independent execution of a new task, and which are related to memory and detection of dependencies, deduction (Boyatzis, 2008). In the opinion of E. Boyatzis, competences may vary, and the level of their diversity is shaped by: cognitive competences, such as system thinking and recognized action patterns, competences related to emotional intelligence, including self-awareness, self-control, as well as social competences, including social awareness and management of mutual relations through empathy and teamwork. The notion of competences in the concept of E. Boyatzis thus assumes consideration of the sphere of motivation to work, its variability, conditions of its implementation, especially the possibility of raising or adaptation to increasingly higher work standards.

A similar employee-oriented approach is presented by D. Thierry, Ch. Sauret and N. Monod. They define competences as the employee's ability to act in a way leading to achievement of the intended goal under given conditions, by means of specific measures. Furthermore, competences constitute the body of knowledge, skills, experience, attitudes, and the employee's readiness to act under particular conditions, and thus also the ability to adapt to these changing conditions (Thierry *et al.*, 1994).

M. Armstrong is also a supporter of interpreting competences from the point of view of the employee, and believes that competences constitute the potential contributing to achievement of results (Armstrong, 2000). Following this trend, T. Oleksyn defines employee competences broadly as their interests, abilities and dispositions, education and knowledge, experience and practical skills, internal motivation, attitudes and behaviors important in professional work, health and psychophysical condition, formal empowerment with the right to act on behalf of a given organization, held values and ethical principles (Oleksyn, 2006). A broad definition of competences is also presented by A. Pocztowski, who emphasizes that it is a notion broader than qualifications, covering all fixed features of a person, forming a causal relationship with the achieved high or above-average results of work, which have a measurable dimension (Pocztowski, 2007). It is worth referring to the notion of qualifications, which cover the employee's ability to perform a specific job, confirmed by relevant documents, e.g. diplomas, school-leaving certificates, or documented job experience. Having qualifications does not determine having competences. At the same time, the employee needs personality traits, attitudes and behaviors that enable proper use of the available knowledge and skills in effective performance of any entrusted tasks.

In the perspectives presented so far, competences are examined from the point of view of the employee - this is the so-called American approach. However, competences are also connected with the job position. This is the so-called British concept, which was created for the needs of the National Vocational Qualifications project (NVQs), which was aimed at enabling better adjustment of educational programs to the needs of the labor market, and which focuses on the job position and on defining tasks and results from the point of view of the requirements formulated by particular jobs for their contractors.

In the Polish reality, this approach is represented by H. Król, who understands competences as dispositions regarding know-how, skills and attitudes, ensuring implementation of professional tasks at an effective or outstanding level, according to standards specified by the organization for a given position (Król *et al.*, 2006).

Currently, the most common perspective of viewing competences in the theory and practice of management is the American perspective. This approach provides significantly greater possibilities of adapting to a changing situation. Flexibility in adapting to the situation, to a specific and variable organizational context, causes competences to manifest while performing specific work. Professional work usually forces continuous updating of competences. This applies particularly to functioning under conditions of uncertainty and variability, which are connected with choices and making decisions, and not only with workmanship, where activities are of an algorithm nature.

In connection with the presented discussion, it can be stated that, in the Polish perspective, competences are examined both in relation to the employee and to their position. However, it should be emphasized that many authors consider both concepts at the same time. The mixed approach is represented, among others, by G. Filipowicz. In his opinion, competences constitute dispositions regarding know-how, skills and attitudes, allowing for pursuing professional tasks at an appropriate level (Filipowicz, 2004). A similar perspective is presented by T. Rostkowski, who deems competences to be knowledge, skills, dispositions and attitudes of employees, which - when used in the process of work - are used to pursue the strategy of the organization (Rostkowski, 2014).

To sum up the above discussion, it can be stated that the mixed concept of interpreting competences from the perspective of the employee and their position is complete and correct. Undoubtedly, the compliance of competences with the job requirements is a necessary condition for an effective process of improving the quality of work (Nowakowska *et al.*, 2011). Furthermore, the definitions of competences presented in the subject literature are not homogeneous, are interpreted differently and consist of various components. However, the key elements of competences may be considered to consist of knowledge, skills and attitudes, which - when used in the process of work - are used to pursue the strategy of the organization.

It is worth presenting the understanding of the key elements of competences, i.e. knowledge, skills and attitudes.

Knowledge is understood as a set of reasonable judgments, i.e. descriptions of facts, theories and rules of conduct, constituting a result of cognitive human activity. Knowledge is absorbed in the process of learning. It is the basis for activities in the area of work and organization of the society (Sławiński *et al.*, 2011).

Skills mean the ability to adapt the knowledge and use know-how in order to perform tasks and solve problems (Sławiński *et al.*, 2011). Skills determine the differences in the outcomes of learning and effectiveness of actions between people with identical motivation, similar preparation, and acting under similar external conditions.

The third criterion determining competencies covers attitudes, which can be identified as a component of personality, expressed in the tendency to behave in a certain way towards certain stimuli. Attitude is a disposition of a person to exhibit a specific type of behavior towards a given object, resulting from knowledge, opinions and feelings.

The functioning of contemporary companies and their demand for labor change very rapidly. Technological growth and innovations lead to changes in the structure of demand for labor, but also to modification of the segmentation on the labor market. The dynamics of changes in the labor market

become faster and faster, which also means quick outdating of the existing competences and growing demand for new competences. Changes in the content and methods of work in traditional professions, as well as in the characteristics of new professions cause consequences within know-how and skills of using new technologies or new tools. An imbalance appears in the demand and supply of competences, which, in turn, affects the operation of enterprises. In general, employers are looking for employees with competences differing from those owned by the people looking for jobs. This phenomenon, meaning the difference between required and possessed competences, is called the competence gap.

At this point, we may indicate many reasons for the occurrence of the competence gap. The most frequent reason for its occurrence are intersectoral structural transformations. Failing branches do not have sufficient number of jobs available for employees with low qualifications. Jobs appear in emerging industries, but in this case, there are no qualified employees capable of meeting the requirements of jobs, most often related to modern technologies. The competence gap may be deepened by the maladjustment of curricula to the needs of the labor market. As a result, the job market is entered by people with competences, of which there is an excess, or which are not necessary at a given place and time. Thus, it is particularly important for enterprise competitiveness to monitor the demand for competences, including identification of trends regarding changes of the demand for labor. Therefore, it becomes important to create a possibility to identify the employers' demand for professional qualifications and the supply of qualifications earned through various forms of learning and confirming the achieved results of learning. This would allow employers to acquire competent employees and would facilitate evaluation or modification of the results of learning and education achieved in various educational institutions (among others, vocational schools, universities and training institutions), focused on the needs of the labor market. This approach would also support studying people in planning their personal and professional development.

The purpose of the article is to determine whether there is a gap between the demand for competences of graduates of vocational schools and their supply. The presence of the competence gap would indicate that this market is imperfect and requires the application of appropriate corrective mechanisms, enabling reduction in these disproportions, resulting in reduction in unemployment on the one hand, as well as better satisfaction of the employers' demand for competences of vocational school graduates on the other.

2. General description of the research

The primary purpose of the research was to identify the competence gap among graduates of vocational schools studying the areas of smart specialization. Smart specializations are the areas of business activity, where development most heavily impacts competitiveness and innovativeness of a given region. The list of smart specializations included in the research covered (Table 1):

- Health and Health-promoting Tourism (Wellness Tourism),
- ICT Technologies,
- Metal and Casting Industry,
- Modern Agriculture and Food Processing,
- Resource-efficient Construction Industry,
- Sustainable Growth of the Power Industry,
- Trade Fair and Congress Industry.

The empirical research covered the area of the Świętokrzyskie Voivodeship located in the southern part of Poland (Figure 1).

Table 1. Characteristics of smart specializations in the Świętokrzyskie Voivodeship

Smart specialization	Characteristics
Health and Health-promoting Tourism (Wellness Tourism)	Wellness tourism was among the main directions of economic development of the region because of unique medicinal water resources, mainly sulfide/hydrogen sulfide brines and iodine bromide, specific, mild microclimate and clean air. The most famous spas are: Busko-Zdrój and Solec-Zdrój. It is here that the spa facilities of a broad therapeutic profile, equipped with specialized and constantly improved equipment, are growing most rapidly. Accommodation and recreational facilities with spa facilities and long-term care facilities are established across the region. The investments related to using the thermal and sulfide water sources in the area of Kazimierza Wielka can become a huge chance for further development of the spa industry. They have chemical properties similar to waters from Busko-Zdrój and Solec-Zdrój and yield a remarkable 300 m³ per hour.
Information and Communications Technologies	The smart specialization of ICT has been enumerated as horizontal in Świętokrzyskie due to the rising number of companies from that branch, ready, willing and able to follow the path of innovation. Those companies may provide the service to other entities, attract strategic investors and make well paid workplaces. In the region, the necessary telecommunications infrastructure has been prepared, which is currently being modernized. There are also computer laboratories and cluster initiatives integrating the sector. The following years will be devoted to supporting companies and institutions in the area of IT, innovative solutions and leading R&D activities.
Metal and Casting Industry	It derives its potential from traditions dating back to the times of the Old Polish and Central Industrial District. It comprises nearly one thousand five hundred active enterprises and about ten thousand workplaces. The products of the metal casting plants of the Świętokrzyskie region effectively compete on the European and world markets. Currently the products of this industry account for nearly 30% of the value of total export of the region. The industry offers customers a diverse range of products manufactured using modern machinery, laboratories for quality control and also automation and robotics of production. The plants of metal-casting industry benefit from the latest technologies and still continue to invest in innovative solutions that enable the expansion of the offer.
Modern Agriculture and Food Processing	The region occupies a leading position in Poland in terms of fruit and vegetable production, and especially the production of apples. Meat, dairy, flour milling, confectionery and fruit and vegetable processing industries are dynamically developing. New processing plants with modern technological facilities are established. Export potential of the industry, which successfully finds new markets, is increasing. Alongside the recognized and leading food companies, small, specialized establishments appear that offer technologically advanced products, including freeze-dried food.
Resource-efficient Construction Industry	Thanks to the presence of rare mineral resources, the region is one of the largest manufacturers of plaster, cement and aggregates. The above is reflected in the presence of large business entities with both domestic and foreign capital. More and more products in the construction sector, such as window frames, construction ceramics and finishing elements are gaining recognition on foreign markets. Well-known real estate developers and finishing works companies operate in the region. The long tradition, combined with the scientific and research potential of the Faculty of Civil Engineering and Architecture at Kielce University of Technology, contribute to the development of ecological and passive building, which contributes to the further success of this industry.

Table 1. Characteristics of smart specializations in the Świętokrzyskie Voivodeship (continued)

Smart specialization	Characteristics
Sustainable Growth of the Power Industry	Sustainable energy development is a horizontal specialization, which cuts across other specializations. It fits into the overall development trends in Poland and in the world where more and more workplaces in the renewable energy sector are being created. Through the use of wind, hydro and solar power the energy efficiency of buildings will increase and CO_2 emissions will be reduced. The reduction of electricity cost will improve the competitiveness of companies present in Świętokrzyskie and the investments connected with well-balanced energy development will increase job opportunities, especially in the construction sector.
Trade Fair and Congress Industry	The Trade-Congress Line was created in the Świętokrzyskie Region due to the activities of the Targi Kielce Exhibition and Congress Center Ltd. At present, Targi Kielce Exhibition and Congress Center comprises 90,000 m2 of exhibition space, with 217,000 visitors from 60 countries, 6,000 exhibitors as well as 175,000 m2 of the exhibition space leased. The Targi Kielce calendar comprises 70 events - trade shows, exhibitions and 700 conferences, including PLASTPOL – Poland's most international trade show, the world famous MSPO which is ranked third among Europe's defense industry expos, AUTOSTRADA-POLSKA and AGROTECH - the agricultural fair which enjoys greatest attendance. In Świętokrzyskie Region operates a cluster connecting 89 companies from the Trade-Congress Line, unique in Poland and Europe. New buildings with modern educational and training facilities are being constructed all the time. The whole sector generates around 0.5 billion of yearly income, which constitutes around 5% of the region's GDP.

(prepared by the authors on the basis of: *Uszczegółowienie inteligentnych specjalizacji województwa świętokrzyskiego. Załącznik 1 do Planu Wykonawczego do RIS3*. Retrieved from http://www.spinno.pl/logotyp-ssi/viewcategory/271-uszczegolowienie-inteligentnych-specjalizacji-wojewodztwa-swietokrzyskiego; *Inteligentne specjalizacje szansą na sukces gospodarczy regionu*. Retrieved from http://www.2014-2020.rpo-swietokrzyskie.pl/pobierz-publikacje/item/301-inteligentne-specjalizacje-szansa-na-sukces-gospodarczy-regionu; http://www.spinno.pl/en/the-smart-specializations)

Figure 1. Location of the Świętokrzyskie Voivodeship on the map of Poland (pl.wikipedia.org)

The research was conducted using the survey method, including a structured interview technique, which was chosen as a tool enabling rich data collection. The interview technique helps motivate the respondents to provide answers and additional explanations. The research tool was an original questionnaire, created by the author basing

on the existing literature on the subject. The choice of the research sample was deliberate. The research encompassed managerial staff of micro, small, medium and large enterprises representing all the smart specializations of the Świętokrzyskie Voivodeship. 650 enterprises were surveyed. The research was conducted between June and August 2016. The territorial scope of the research covered the Świętokrzyskie Voivodeship in Poland. The research carried out under the project „Modern Vocational School – Modern Region" – project co-founded from European Social Fund, Regional Operational Programme for Świętokrzyskie Voivodeship 2014-2020 commissioned by the Świętokrzyski Union of Private Employers Lewiatan.The analysis covered results of surveys conducted among representatives of companies in the Świętokrzyskie Voivodship. The full dataset consisted of 650 surveys. The number of surveys with breakdown into industries is presented in Table 2.

Table 2. Number of surveys with breakdown into industries

Industry code	Industry	Number of surveys
HlHT	Health and Health-promoting Tourism	71
ICTT	ICT Technologies	92
MtCI	Metal and Casting Industry	101
MAFP	Modern Agriculture and Food Processing	99
RsCI	Resource-efficient Construction Industry	122
SGPI	Sustainable Growth of the Power Industry	80
TFCI	Trade Fair and Congress Industry	85

The industry codes presented in Table 2 will be used during further research.

The surveys were collected in 14 counties (*powiat*) of the Świętokrzyskie Voivodship. The number of surveys from particular counties are presented in Table 3.

Table 3. Number of surveys with breakdown into counties

County	Number
Busko	37
Jędrzejów	26
Kazimierza	10
Kielce	164
Końskie	44
the city of KIELCE (city county)	205
Opatów	7
Ostrowiec	35
Pińczów	12
Sandomierz	25
Skarżysko	23
Starachowice	31
Staszów	24
Włoszczowa	7

The structure of survey collection depending on the size of the company is presented in Table 4.

Table 4. Number of surveys depending on the size of the company

Size of the company	Number of surveys
Micro (up to 9 employees)	404
Small (from 10 to 49 employees)	164
Medium-sized (from 50 to 249 employees)	63
Large (more than 250 employees)	19

The surveys were conducted in two stages and covered:
- assessment of the importance of professional competences of vocational school graduates studying the areas of smart specializations,
- assessment of how well graduates of vocational schools are prepared to start work in a profession consistent with their education profile.

In the course of implementation of the survey, the evaluation covered competences within theoretical knowledge and practical skills. The study results allowed for formulating final conclusions.

3. Assessment of the importance of professional competences in the context of employability of graduates of vocational schools

In this section of the survey, representatives of companies were asked to assess the importance of:
- knowledge,
- practical skills,

necessary to start work in the industries represented by them. The assessment was performed using a point scale from E1 (minor importance) to E5 (vital importance). The distribution of assessments concerning the importance of knowledge in preparing a candidate for employment is presented in Table 5.

Table 5. Assessment of the importance of theoretical knowledge in preparing candidates for employment

Assessment of the importance of knowledge	Number of answers	Percentage of answers
E1	23	3.53
E2	15	2.31
E3	66	10.15
E4	136	20.92
E5	410	63.08

The same entrepreneurs, while assessing the importance of practical skills in the candidate's profile, gave answers presented in Table 6.

Table 6. Assessment of the importance of practical skills in preparing candidates for employment

Assessment of the importance of practical skills	Number of answers	Percentage of answers
E1	14	2.15
E2	13	2.00
E3	56	8.62
E4	127	19.54
E5	440	67.69

By treating the assessments of the importance of knowledge and practical skills as numeric values ranging from 1 (the lowest grade) to 5 (the highest grade), we can calculate the average value from the differences between the assessment of the importance of knowledge and practical skills. The ratio so determined had the value of -0.1092. This means that entrepreneurs attribute more value to the graduates' practical skills than to their theoretical knowledge. The distribution of differences between the assessment of knowledge and skills is presented in Figure 2.
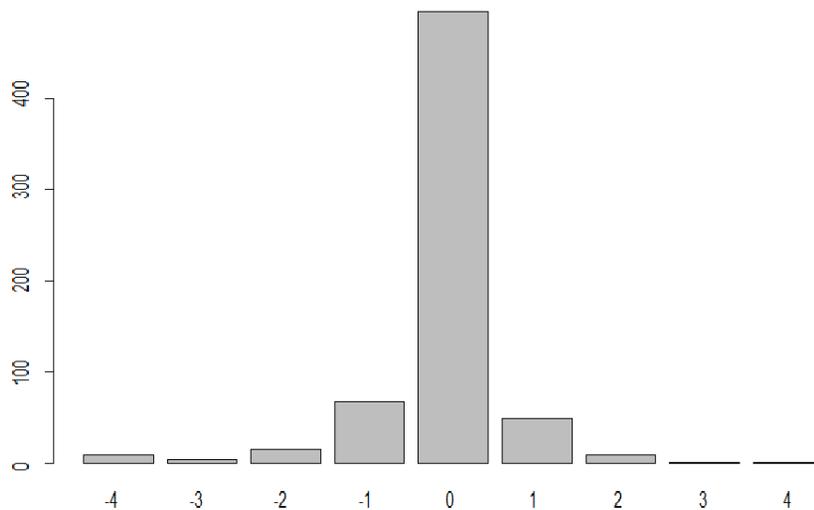

Figure 2. The distribution of differences in the assessment of the importance of knowledge and practical skills of candidates for employment

The identified general regularity is visible among representatives of all industries included in the research (Table 7).

The next step of the analysis covered examination - by means of the χ^2 test – of whether the assessment of the importance of knowledge and the assessment of the importance of practical skills in the candidate's profile depends on the industry represented by the evaluator, the company's size and the region, where it operates. At the assumed level of importance $\alpha = 0,05$, in no case did we manage to reject the hypothesis about independence of variables describing the indicated characteristics.

Table 7. The difference in the assessment of the importance of knowledge and practical skills of candidates for employment among the industries included.

Industry	The difference in the assessment
Health and Health-promoting Tourism	-0.14084507
ICT Technologies	-0.10869565
Metal and Casting Industry	-0.17821782
Modern Agriculture and Food Processing	-0.08080808
Resource-efficient Construction Industry	-0.06557377
Sustainable Growth of the Power Industry	-0.10000000
Trade Fair and Congress Industry	-0.10588235

Thus, it may be concluded that, regardless of the industry, the size and the region the company operates in, the expectations concerning theoretical knowledge and practical skills possessed by candidates are very similar. At the same time, it should be pointed out that employers searching for employment candidates assign greater meaning to practical skills than to theoretical knowledge.

4. Assessment of the preparation of graduates of vocational schools in the Świętokrzyskie Voivodeship to start work in their profession

The next stage of the survey concerned assessment of the preparation of vocational school graduates in the Świętokrzyskie region to start work in a profession consistent with their obtained education. During the study, the analysis covered both theoretical preparation as well as and practical skills of the graduates.

4.1. Assessment of the theoretical preparation of graduates of vocational schools

The respondents were asked to take a stance on the following statement: *graduates of vocational schools in the Świętokrzyskie region have sufficient theoretical knowledge to begin working in their profession.* Interpretation of possible answers is presented in Table 8.

The obtained answers are presented in Table 9. The answers are presented in a graphic form in Figure 3.

Table 8. Interpretation of possible answers in the survey concerning education quality of vocational schools in the Świętokrzyskie Voivodship

Answer code	Meaning of the answer
E5	strongly agree
E4	somewhat agree
E3	no opinion
E2	somewhat disagree
E1	strongly disagree

Table 9. The respondents' answers concerning the degree of their agreement with the opinion: *graduates of vocational schools in the Świętokrzyskie region have sufficient theoretical knowledge to begin working in their profession*.

Grade	E1	E2	E3	E4	E5
Number of answers	68	100	251	181	50
Cumulated	68	168	419	600	650
%	10.46	15.38	38.62	27.85	7.69
% Cumulated	10.46	25.85	64.46	92.31	100.00

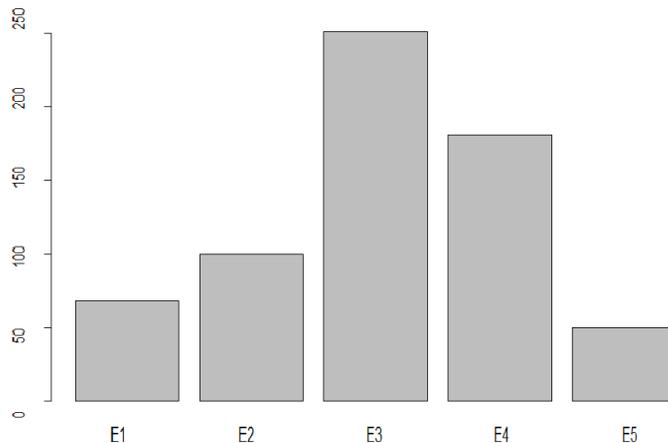**Figure 3.** Assessment of the theoretical preparation of the graduates of vocational schools in the Świętokrzyskie Voivodeship

The conducted χ^2 test indicated existence of a dependency between the grade given to theoretical knowledge of the graduates and the industry represented by the respondent. No association was observed between the assessment of theoretical preparation of the graduates and the region or the size of the company.

4.1.1. Research on the degree of diversity of grades given to theoretical knowledge of the graduates depending on the industry

The selected contingency table between grades given to theoretical knowledge of the graduates and the industry is presented in Table 10.
The Cramer's V coefficient amounting to 0.151 indicates a weak correlation between the variables.

During further analysis of the contingency table, we used correspondence analysis, the main objective of which is to describe the dependencies between values of two qualitative variables describing the analyzed set of objects. In the context of the correspondence analysis, the diversity of values of the analyzed variables is called inertia. From the calculation perspective, execution of the correspondence analysis consists in singular value decomposition of the contingency table and creation of a new coordinate system (its axes are called principal components), presenting particular variable values included in the research. Subsequent principal components are increasingly less significant, and thus describe an increasingly smaller part of total inertia of the analyzed set. A graph showing

the location of variable values in a two-dimensional space set out by the first two principal components is referred to as a perceptual map. Its analysis allows for visual evaluation of the dependencies occurring between values of variables. It is important to remember that the perceptual map describes the set's inertia in a simplified manner, as it ignores the diversity described by the third and the subsequent principal components.

Table 10. Contingency table between grades given to theoretical knowledge of the graduates and the industry

Answer code	HlHT	ICTT	MtCI	MAFP	RsCI	SGPI	TFCI
E1	1	9	15	7	17	12	7
E2	7	12	26	5	19	18	13
E3	26	38	41	48	41	25	32
E4	30	28	18	25	33	22	25
E5	7	5	1	14	12	3	8

The conducted correspondence analysis allowed for determining the four principal components with characteristics presented in Table 11.

Table 11. Inertia of principal components designated during the analysis of dependences between the assessment of theoretical preparation of the graduates and the industry

	1	2	3	4
Value	0.066666	0.015402	0.007785	0.001649
Percentage	72.86%	16.83%	8.51%	1.8%

It should be noted that the first two components describe 89.69% of inertia.

Characteristics of the provided answers is presented in Table 12.

Table 12. Characteristics of the provided answers

	E1	E2	E3	E4	E5
Mass	0.104615	0.153846	0.386154	0.278462	0.076923
ChiDist	0.418959	0.427649	0.138033	0.229146	0.547093
Inertia	0.018363	0.028136	0.007357	0.014621	0.023024

The calculated mass values indicate that the most often given answer was E3 (mass: 0.3862), and that the respondents chose the answer E5 the least frequently (mass: 0.0769). The principal axes system constructed during the analysis begins in a point corresponding to the most typical values of the considered features. Values in the *ChiDist* column inform about the distance between particular opinions expressed by the respondents and the beginning of the coordinate system, and thus indicate the degree of typicality of a given grade. On the basis of the obtained results, it may be stated that the E3 grade is more similar to the typical answer (distance: 0.138), and answers E5 and E2 most heavily differ from the typical answer (distances for them amount to, respectively: 0.5471 and 0.4276). Inertia values assigned to particular variants of answers indicate the extent to

which particular values affect the diversity of data. It can be noticed that the E2 answer (inertia: 0.0281) to the greatest extent contributes to variability of the whole set.

Table 13 presents characteristics of industries included in the research of the level of theoretical preparation of graduates of vocational schools.

Table 13. Characteristics of the industries

	HlHT	ICTT	MtCI	MAFP	RsCI	SGPI	TFCI
Mass	0.109231	0.141538	0.155385	0.152308	0.187692	0.123077	0.130769
ChiDist	0.424105	0.122096	0.428549	0.402635	0.155729	0.294777	0.098536
Inertia	0.019647	0.002110	0.028537	0.024691	0.004552	0.010695	0.001270

Special attention should be paid to HlHT, MtCI, MAFT, and SGPI industries, where representatives assessed theoretical knowledge of graduates in a manner differing from the average opinion.

The analysis of the dependencies between variables is illustrated on the perceptual map created on the basis of the values of the first two principal components (Figure 4).
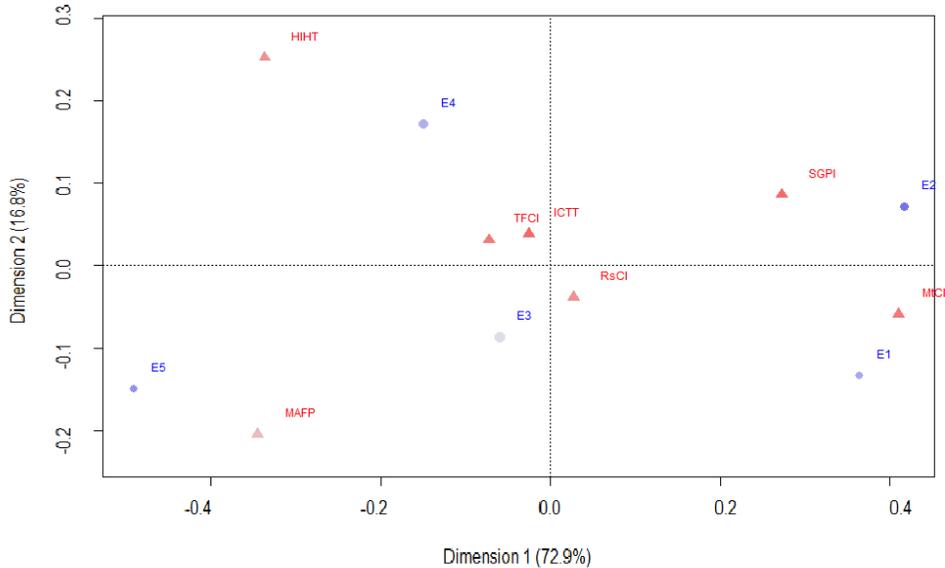

Figure 4. Perceptual map showing dependences between the assessment of knowledge of the graduates and the industry represented by the respondent

It is important to remember that the obtained perceptual map takes account only of the first two principal components, which describe 89.69 of total inertia of the data set. In order to account for the value of all designated components, we conducted a taxonomic analysis of points corresponding to the assessments of the graduates' level of knowledge and to the industries. During its execution, we calculated the Euclidean distance matrix between the points, and then grouped them using the Ward's method. The obtained dendrogram is presented in Figure 5.
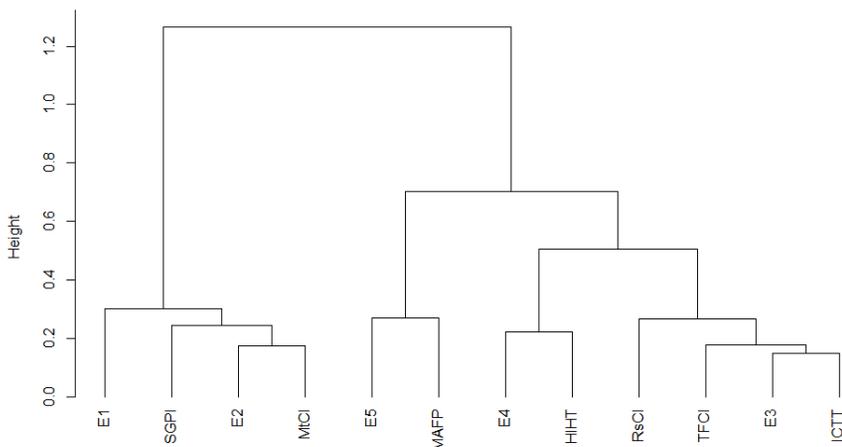
Figure 5. Dendrogram showing relations between the assessment of knowledge of the graduates and the industry represented by the respondents

The obtained results indicate that the representatives of MtCI and SGPI industries give very low grades to theoretical knowledge of the graduates of vocational schools in the Świętokrzyskie Voivodeship (grades E1 and E2). Knowledge of the graduates received the highest grade from representatives of the MAFP industry. Grades of representatives of the HlHT industry are the closest to E4. On the other hand, assessment of knowledge at the E3 level dominates in RsCI, TFCI and ICTT industries.

4.2. Assessment of practical skills of graduates of vocational schools

Assessment of practical skills of the graduates of vocational schools in the Świętokrzyskie Voivodeship was the next stage of the survey. In their course, we analyzed the respondents' answers concerning their agreement with the statement: *graduates of vocational schools in the Świętokrzyskie region have sufficient practical skills to begin working in their profession*. Answers were given using the scale presented in Table 8.
The way the answers were given is presented in Table 14.

Table 14. The respondents' answers concerning the degree of their agreement with the opinion: *graduates of vocational schools in the Świętokrzyskie region have sufficient practical skills to begin working in their profession*.

Grade	E1	E2	E3	E4	E5
Number of answers	106	166	246	100	32
Cumulated	106	272	518	618	650
%	16.31	25.54	37.85	15.38	4.92
% Cumulated	16.31	41.85	79.69	95.08	100.00

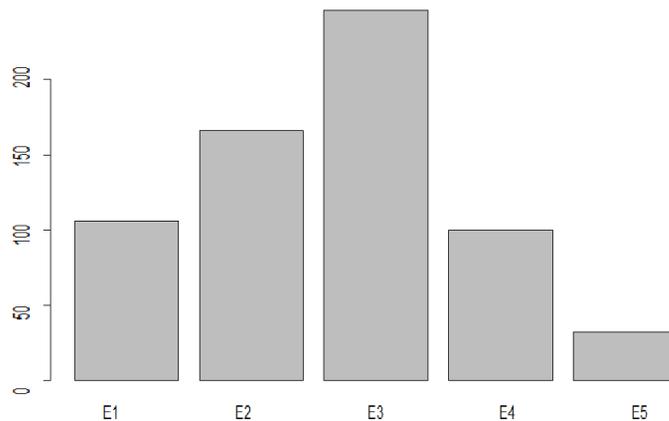The distribution of answers is also presented in Figure 6.

Figure 6. Assessment of practical skills of the graduates of vocational schools in the Świętokrzyskie Voivodeship

Like in the case of the assessment of theoretical knowledge, the assessment of practical skills of the graduates is also related to the respondents' industry. The χ^2 test did not indicate existence of any other relations.

4.2.1. Research on the degree of diversity of grades given to practical skills depending on the industry

The research on the dependences between the grades given to practical skills of the graduates and the industry represented by the respondents were based on the contingency table set out on the basis of the values of both of the abovementioned features (Table 15).

Application of the correspondence analysis allowed for setting out a new coordinate system convenient for the evaluation of dependences between the analyzed variables.

The inertias of principal components are presented in Table 16.

Table 15. Contingency table between grades given to practical skills of the graduates and the industry

	HlHT	ICTT	MtCI	MAFP	RsCI	SGPI	TFCI
E1	2	17	22	13	26	15	11
E2	22	16	38	13	32	23	22
E3	29	37	31	47	41	28	33
E4	13	18	9	14	17	13	16
E5	5	4	1	12	6	1	3

Table 16. Inertia of principal components designated during the analysis of dependences between the assessment of theoretical preparation of the graduates and the industry

	1	2	3	4
Value	0.056332	0.018693	0.009749	0.000723
Percentage	65.89%	21.86%	11.4%	0.85%

The first two components that will be used to create the perceptual map describe 87.8% of the total inertia of the data set.

The characteristics of the grades given to practical skills of the graduates, obtained as a result of the calculations, is presented in Table 17.

Table 17. Characteristics of the provided answers

	E1	E2	E3	E4	E5
Mass	0.163077	0.255385	0.378462	0.153846	0.049231
ChiDist	0.355746	0.303688	0.140674	0.226935	0.725215
Inertia	0.020638	0.023553	0.007489	0.007923	0.025892

The obtained results indicate that the E5 grade differs from the typical answers to the greatest extent. This value also has the greatest share in the diversity of the data set. On the other hand, the characteristics of the industries are presented in Table 18.

Table 18. Characteristics of the industries

	HlHT	ICTT	MtCI	MAFP	RsCI	SGPI	TFCI
Mass	0.109231	0.141538	0.155385	0.152308	0.187692	0.123077	0.130769
ChiDist	0.374546	0.205908	0.384381	0.444083	0.147162	0.194237	0.137407
Inertia	0.015323	0.006001	0.022958	0.030037	0.004065	0.004643	0.002469

Special attention should be paid to MAFP, MtCI and HlHT industries, the representatives of which assessed the practical skills of the graduates in a manner differing from the typical one.

The perceptual map created on the basis of the conducted calculations is shown in Figure 7.
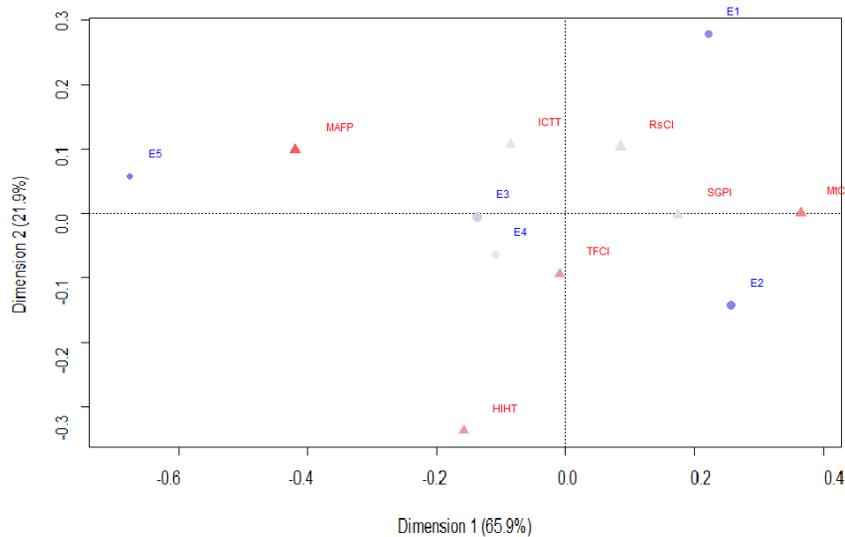

Figure 7. Perceptual map showing dependences between the assessment of practical skills of the graduates and the industry represented by the respondent

In order to conduct an analysis of dependences between the assessments of practical skills and the industries in a manner which takes into account the value of all designated principal components, we conducted a taxonomic analysis. Also in this case, we used the Euclidean metric and the Ward's method. The dendrogram created as a result of the analysis is presented in Figure 8.
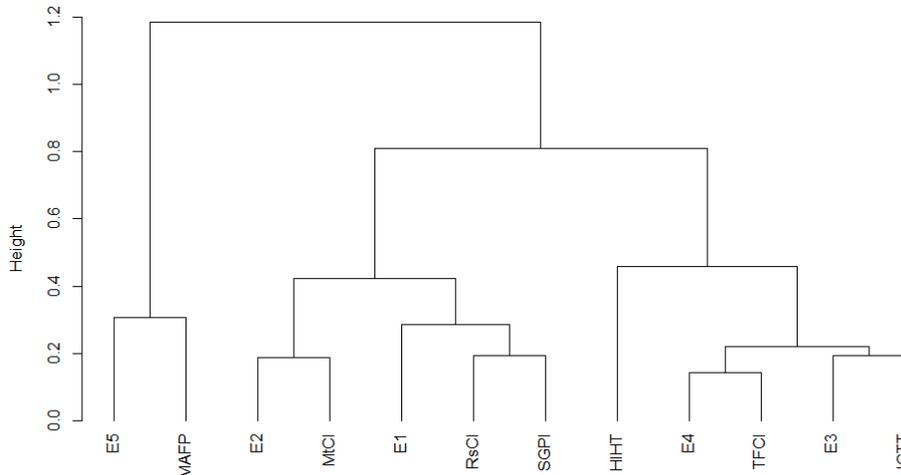

Figure 8. Dendrogram showing the relations between the assessment of practical skills and the industry represented by the respondents

Analysis of the dendrogram allows for formulating the following conclusions:

- assessments of the practical skills of the graduates made by representatives of RsCI and SGPI industries are close to the E1 grade,
- respondents representing the MtCI industry give practical skills of the graduates the E2 grade,
- representatives of the MAFP industry gave the E5 grade to the graduates' skills,
- grades of the representatives of other industries are close to the E3 and E4 grades.

5. Conclusions

The research results indicate the existence of a clear competence gap in the field of intelligent technologies. This gap concerns both knowledge and practical skills of graduates of vocational schools.

5.1. Assessment of the theoretical preparation of graduates of vocational schools

In order to assess the competence gap in the field of knowledge, we compared numeric equivalents of grades concerning the level of knowledge of the graduates of vocational schools and assessments of the significance of knowledge of the expected employment candidates. The ratio value amounted to -1.3077.

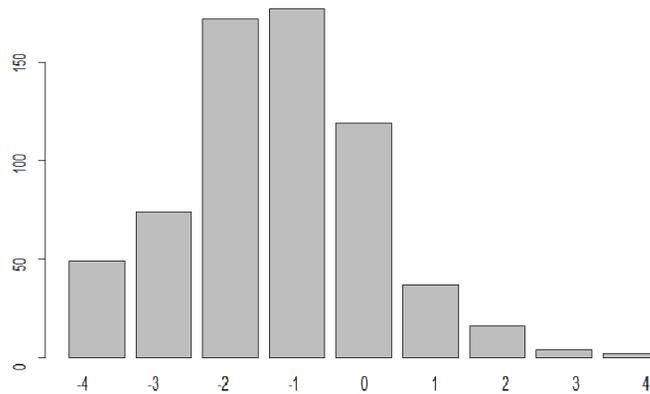The distribution of differences between the assessment of knowledge possessed and expected is presented in Figure 9.

Figure 9. The distribution of differences between knowledge possessed by the graduates and expected by the employers

Analysis of designated differences across industries shows that the representatives of each industry indicated the existence of the competence gap. Its size was assessed in the manner presented in Table 19.

Table 19. Size of the competence gap in the field of knowledge across industries

Industry	Difference
Health and Health-promoting Tourism	-0.9295775
ICT Technologies	-1.3260870
Metal and Casting Industry	-1.6435644
Modern Agriculture and Food Processing	-1.0808081
Resource-efficient Construction Industry	-1.2213115
Sustainable Growth of the Power Industry	-1.6500000
Trade Fair and Congress Industry	-1.2705882

Analysis of the obtained results allows for concluding that the competence gap in the field of knowledge is particularly visible in such industries as Sustainable Growth of the Power Industry, as well as Metal and Casting Industry.

5.2. Assessment of the theoretical preparation of graduates of vocational schools

A parallel analysis was conducted in order to assess the competence gap in the field of practical skills. For this purpose, we compared assessments of the practical skills of the graduates with the assessments of the importance of this competence component. The average value of differences amounted to -1.8154. It indicates the existence of a clear competence gap in the field of practical skills. This gap is greater than in the case of theoretical knowledge. The distribution of differences is presented in Figure 10.
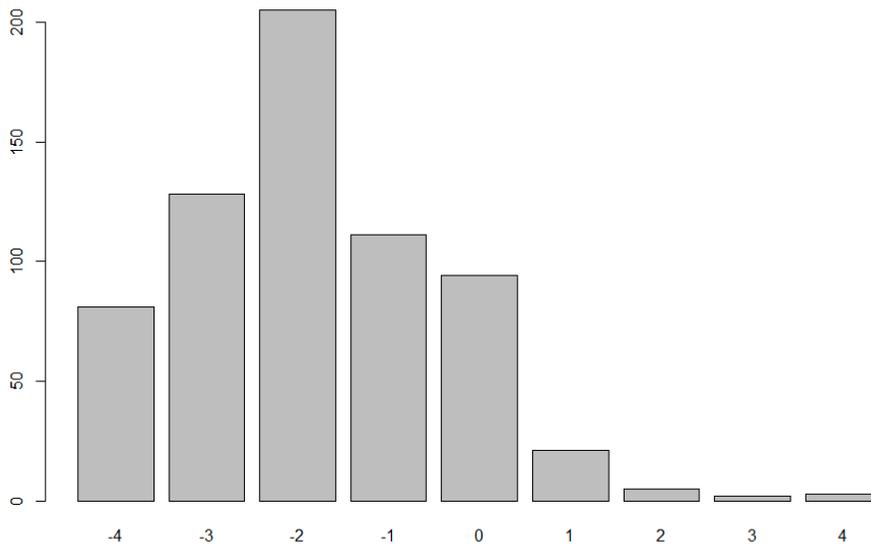
Figure 10. The distribution of differences between practical skills possessed by the graduates and expected by the employers.

Assessment of the competence gap regarding practical skills across industries is presented in Table 20.

Table 20. Size of the competence gap in the field of practical skills across industries

Industry	Difference
Health and Health-promoting Tourism	-1.605634
ICT Technologies	-1.782609
Metal and Casting Industry	-2.168317
Modern Agriculture and Food Processing	-1.515152
Resource-efficient Construction Industry	-1.770492
Sustainable Growth of the Power Industry	-2.050000
Trade Fair and Congress Industry	-1.800000

Particularly high value of the ratio is observed in the Metal and Casting Industry and in the Sustainable Growth of the Power Industry, namely the very industries, where the competence gap regarding knowledge appeared. However, the problem of the competence gap in the field of skills is greater than in the field of knowledge.

5.3. Assessment of the professional education methods

Comparison of the conducted assessments of theoretical knowledge and practical skills shows that, in general, employers give better grades to theoretical knowledge of the graduates than to their practical skills (when treating the values indicated by the respondents as numerical, the average in the difference between grades given to knowledge and skills amounted to 0.398 in favor of knowledge). The distribution of the diversity of assessments is presented in Figure 11.

Higher grades were given to knowledge than to practical skills by respondents representing each industry, but the difference in the assessment slightly differed in particular groups (Table 21).
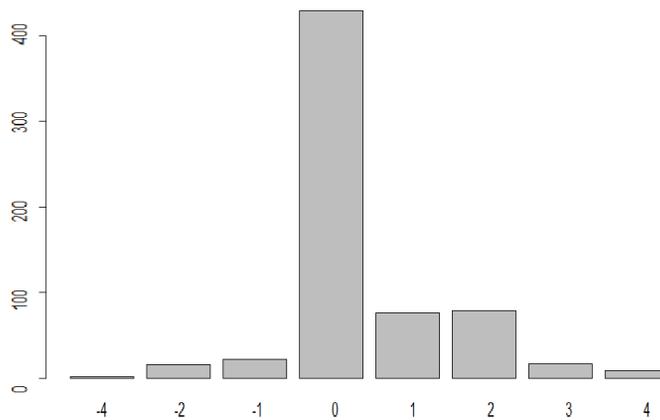
Figure 11. The distribution of differences in the assessment of the importance of knowledge and practical skills of graduates of vocational schools

Table 21. The difference in the assessment of the importance of knowledge and practical skills of graduates of vocational schools across the examined industries

Industry	Difference
Health and Health-promoting Tourism	0.5352113
ICT Technologies	0.3478261
Metal and Casting Industry	0.3465347
Modern Agriculture and Food Processing	0.3535354
Resource-efficient Construction Industry	0.4836066
Sustainable Growth of the Power Industry	0.3000000
Trade Fair and Congress Industry	0.4235294

It is also worth taking a look at how each grade (from E1 to E5) was ascribed to the assessment of knowledge and practical skills (Figure 12).
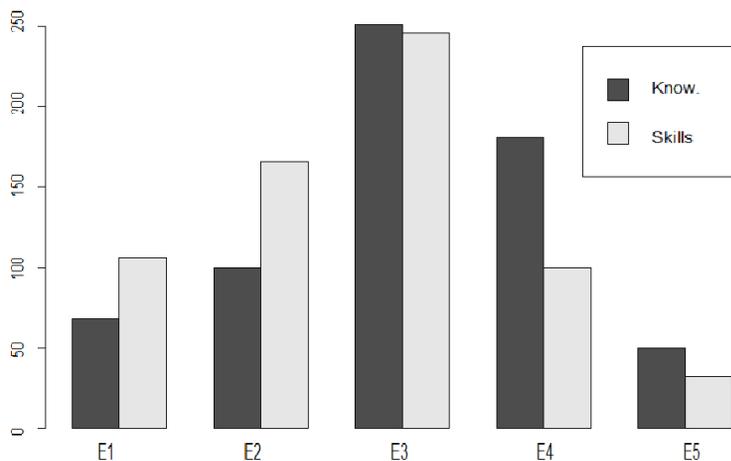

Figure 12. Comparison of the method of assessing knowledge and practical skills

The presented data indicate that more low grades (E1 and E2) were given to practical skills than to theoretical knowledge. On the other hand, in the case of high grades (E4 and E5), they were more often given when assessing theoretical knowledge than practical skills.

It is also worth analyzing differences in the way knowledge and skills were assessed in connection with industries. For this purpose, we compared dendrograms used in earlier stages of the research. The comparison of dendrograms is presented in Figure 13.
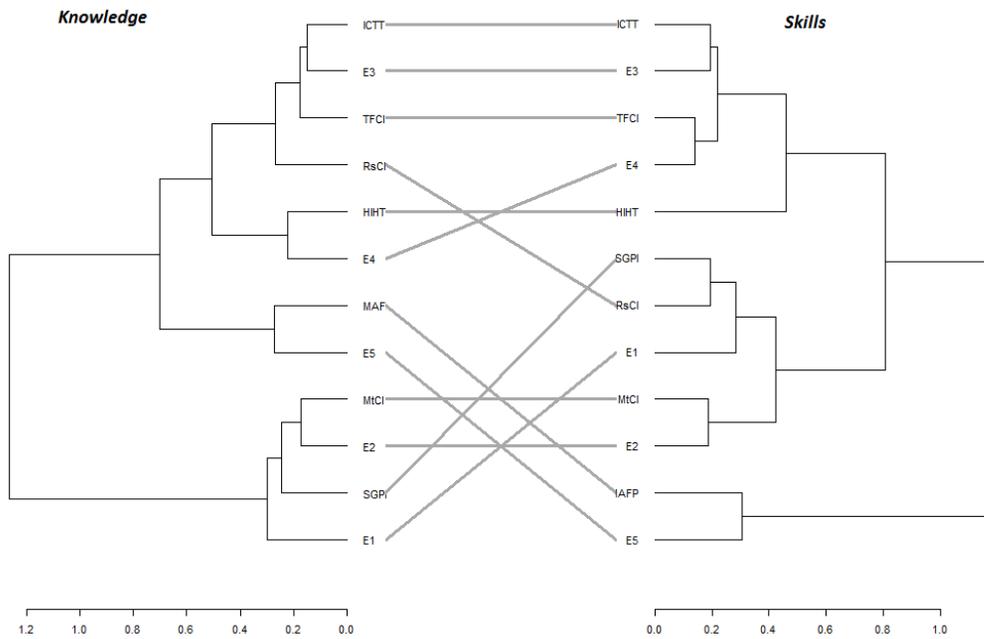

Figure 13. The comparison of dendrograms showing the assessment of knowledge and practical skills of the graduates across industries

The largest change concerns the Resource-efficient Construction Industry, the representatives of which gave theoretical knowledge of graduates the E3 grade, while in the case of practical skills, this industry (along with the Sustainable Growth of the Power Industry) is in the group, to which the E1 grade was assigned.

However, the similarity of both dendrograms is generally relatively high, which is proven by the value of Pearson correlation coefficient between cophenetic correlation matrixes designated for each dendrogram,

the value of which amounted to 0.425.

The results presented in item 3 indicated the distribution of the importance - expected by the employers - of the knowledge component and the skills component in the education of vocational school graduates (employers assign greater meaning to practical skills than to theoretical knowledge of employment candidates). Assessment of the preparation of graduates shows that the relations between the listed competence components are opposite to the expected ones.

References:

Armstrong, M. (2011). *Zarządzanie zasobami ludzkimi*. Warsaw: Oficyna Wolters Kluwer Business.

Boyatzis, R. E. (2008). Competencies in the 21 st century. *Journal of Management Development, 27*(1), 5-12.

Filipowicz, G. (2004). *Zarządzanie kompetencjami zawodowymi*. Warsaw: PWE.

Gatnar, E., & Walesiak, M. (2011). *Analiza danych jakościowych i symbolicznych z wykorzystaniem programu R*, Warsaw: C. H. Beck Publishing House. Retrieved from: http://www.spinno.pl/en/the-smart-specializations

Inteligentne specjalizacje szansą na sukces gospodarczy regionu. Retrieved from http://www.2014-2020.rpo-swietokrzyskie.pl/pobierz-publikacje/item/301-inteligentne-specjalizacje-szansa-na-sukces-gospodarczy-regionu

Król, H., & Ludwiczyński, A. (2006). Zarządzanie zasobami ludzkimi. Tworzenie kapitału ludzkiego organizacji. Warsaw: PWN

Nowakowska, I., Głowacka, M. D., Rasińska, R., & Głowacka-Rębała, A. (2011). Zarządzanie jakością pracy członków organizacji. *Problemy Zarządzania, 9*(4), 217-225.

Oleksyn, T. (2006). *Zarządzanie kompetencjami. Teoria i praktyka*. Cracow: Oficyna Wydawnicza.

Pocztowski, A. (2007). *Zarządzanie zasobami ludzkimi*. Warsaw: PWE.

Rostkowski, T. (2014). Model kompetencyjny organizacji. In M. Juchnowicz (Ed.), *Zarządzanie kapitałem ludzkim. Procesy – narzędzia – aplikacje* (38-64). Warsaw: PWE.

Sławiński, S. (Ed.), Dębowski, H., Michałowicz, H., & Urbanik, J. (2011), *Słownik kluczowych pojęć związanych z krajowym systemem kwalifikacji*. Warsaw: IBE.

Thierry, D., Sauret, Ch., & Monod, N. (1994). *Zatrudnienie i kompetencje w przedsiębiorstwach w procesie zmian*. Warsaw: Poltext.

Uszczegółowienie inteligentnych specjalizacji województwa świętokrzyskiego. Załącznik 1 do Planu Wykonawczego do RIS3. Retrieved from: http://www.spinno.pl/logotyp-ssi/viewcategory/271-uszczegolowienie-inteligentnych-specjalizacji-wojewodztwa-swietokrzyskiego

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