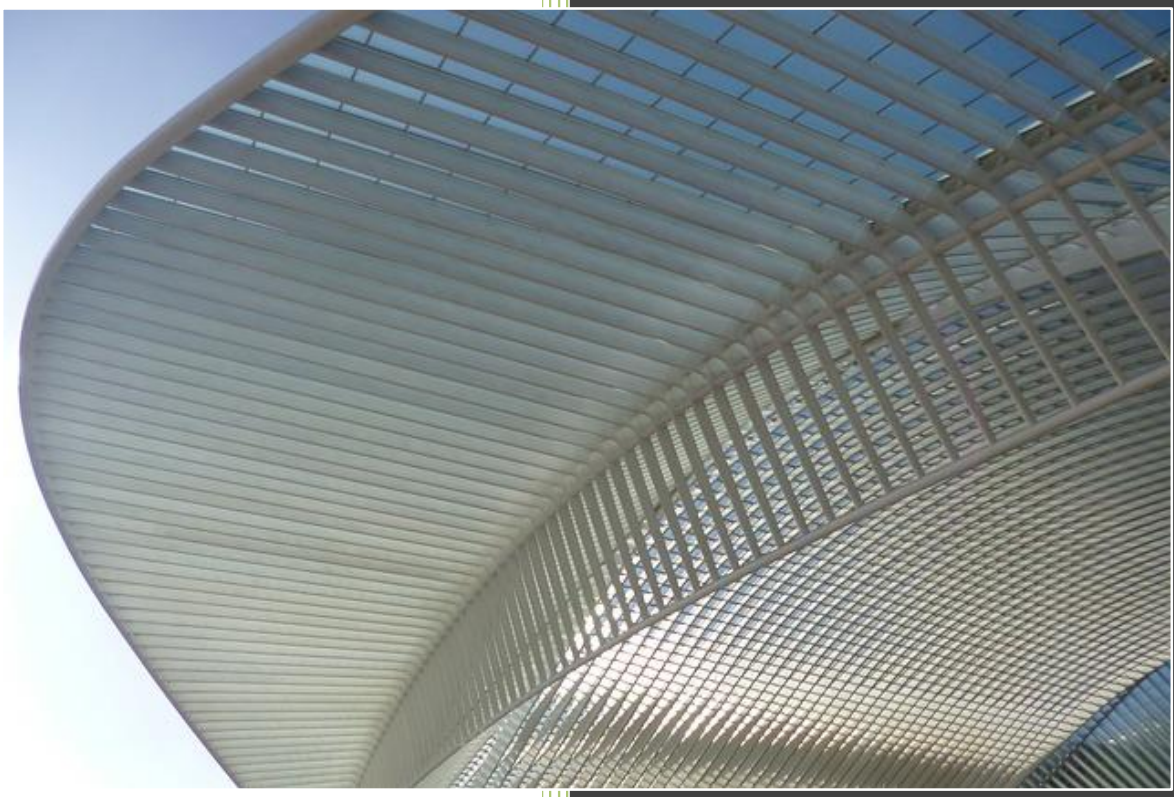
THE STUDY OF COMPETENCES IN THE CONSTRUCTION AND ARCHITECTURAL SECTORS

Report on the conducted research



Report prepared upon the commission of the Municipality of Kraków (UMK) by the Centre for the Evaluation and Analysis of Public Policies and the Interdisciplinary Centre for Organizational Research and Development
Jagiellonian University

SUMMARY

The report presents the results of research carried out within the framework of the project "The Study of Competences of the Kraków Scientific Centre" in the construction and architectural sector. Both interrelated sectors are vital for the city's development and implementation of its strategy, and additionally, in the case of the construction sector, we are dealing with a large impact on the local and regional labour market. For the purposes of this study, we adopted a limited definition of the sectors, focusing on companies involved in **architectural and construction design, construction and urban planning** in the case of the architectural sector, and companies involved in **the implementation of construction projects related to the construction of residential and non-residential buildings, construction of roads and motorways, railways and underground railways, as well as bridges and tunnels.**

As part of the conducted work, based on the analysis of job advertisements and in-depth interviews with opinion leaders and representatives of companies, we have analysed several dozens of competences expected of graduates of Kraków universities, which have different importance for the development of the sectors. The competences have been divided into four areas: **specialist knowledge and skills** (34 competences in construction, 31 competences in architecture), **business knowledge and skills** (17 competences in each sector), **soft skills** (16 competences in each sector) and **language skills and other requirements** (11 competence in each sector). In the next step, we conducted quantitative research of the demand for competences (together with a reanalysis of the data from last year, we included the results from 21 construction companies, employing a total of over 3,100 employees, and 27 companies from the architectural sector, employing a total of over 500 employees), which were then compared in the study with the supply of competences (16 fields of study, 20 specializations – which, in 2015, will be completed by a total of approx. 2,500 students).

With regard to the demand analysis, the report provides information on key competences currently sought by employers – in the construction sector, these include**: honesty, knowledge of building materials, operating office applications, initiative and entrepreneurship, organization and supervision of work**; whereas in the architectural sector, the most important competences recognized by companies include, among others: **honesty, oral communication, design of residential and non-residential buildings, knowledge of CAD / CAM / CAE design programs.** In the next five years, in addition to the aforementioned competences, which will remain important, the following will also gain significance: **knowledge of the principles of work safety, collaboration, construction of buildings and installations and cost estimation** (construction sector) and **knowledge of energy-saving technologies, knowledge of 3D design programs, modelling information on buildings and structures (BIM) and English** (architectural sector).

Among the most important competences, the most difficult to find in the labour market in the construction sector are those associated with **investment management, initiative/entrepreneurship, innovation/creativity, concern for quality/conscientiousness and knowledge of project documentation**, and in the architectural sector: **organization of work, focus on goals, knowledge of energy-saving technologies, project documentation and contextual design.**

In both analysed sectors, entrepreneurs are quite optimistic about the future and predict an increase in employment growth. The report also includes information on the positions to which Kraków employers from the analysed sectors most often recruit candidates.

The supply analysis provides information about fields of study, which, according to employers, satisfy the needs of both the construction and architectural sector, and an evaluation of obtained learning outcomes important from the point of view of employers (definitions of competences have been "translated" into general learning outcomes). Among the competences important to the employers, the most commonly obtained, according to universities, are: **operation of office applications, work safety, knowledge of CAD / CAM / CAE design programs, cooperation, quality assessment, general technical and engineering knowledge, new trends and technical drawing.**

The analysed sectors are strongly related, both with regard to the demand and supply of competences. A good example illustrating this relationship is the skills related to the design of industry installations. Architectural companies that look for specialists in this field on the labour market employ, in different forms, graduates of construction faculties. At the same time, they do not expect that architectural studies will provide the training of such competences. A similar situation applies to architects and designers employed in construction companies**. However, it is important that graduates of different fields of study have core competences enabling effective cooperation and the practical use of specialist knowledge from "cross-sectorial" areas.**

Cooperation between universities and business representatives is not systemic, but it is becoming more and more intense. Perhaps, as in the case of sectors analysed in the previous years, such a form of cooperation is a desirable solution. Therefore, representatives of the two sectors, both on the business side, as well as the universities, should have more opportunities to establish less formal contacts. **An important postulate is also the idea to intensify cooperation between UMK - business and UMK - universities.**

In both analysed sectors, we do not have to face the problem of a quantitative deficiency of human resources. What is particularly difficult for companies **is the quality of competences of some of the graduates.** This is also confirmed by representatives of universities, who indicate the risks associated with lower motivation and commitment of the students.

At the end, the report presents the conclusions resulting from the analysis, along with suggestions of activities aimed at the development of universities and companies operating in the sector.

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INTRODUCTION

For the third time, thanks to the project "The Study of Competences of the Kraków Scientific Centre", we are pleased to present you with the results of the study on the relationship between demand and supply of competences in sectors that occupy a key place in the strategic map of the development of the city of Kraków. In previous editions, the work concentrated on the following sectors: outsourcing (BPO and ITO), life science, energy, creative, and passive and energy-efficient construction. In 2014, research was carried out in the following sectors:

1. **Construction, taking into account construction companies and architectural and design offices,**
2. IT, taking into account companies operating in the area of information and communication technology.

A unique solution on a national scale was the expansion of research in the construction sector to include the analysis of positions that require education at the level of **technical and vocational schools.** This area of research was supported, both as to the funding and content, by the **Provincial Labour Office in Kraków**.

The innovative project "The study of competences", realized thanks to the commitment of the Municipality of Kraków and the Provincial Labour Office in Kraków, has far exceeded the regional borders with its range of impact. The results of the last two years of work and approach to the analysis of supply and demand of competences have already gained recognition on a national scale. As Jarosław Górniak observes[1] in the introduction to the report on the research Study of Human Capital, which described the Kraków research, the approach used herein "provides [...] the key to the "black box" called "specific sector-oriented professional competences", the lid of which, in the case of the Study of Human Capital, can be only slightly opened". Naturally, as with all analytical work, the applied methodological approach is associated with a variety of constraints that must be taken into account when using the results in practice.

As in the previous year, the reports devoted to each of the sectors present the demand of Kraków companies for specific competences and the supply of competences on the part of Kraków universities. There have been no changes in the objectives set before the research team that focused on questions about the expectations of employers from graduates of Kraków universities (as well as vocational and technical schools) and the level of teaching of competences sought by employers in the process of formal education.

In terms of the applied methodology, compared to the study conducted in 2013, there were no major changes. All the modifications were aimed at reducing the burden of time on the side of the respondents, while maintaining a high quality of data.

The conclusions presented in the reports have been formulated on the basis of questionnaires and several dozen interviews with sector experts, representatives of companies, universities and vocational and technical schools. The subject of research also included job advertisements and, to a lesser extent, the documents related to the curricula in selected fields of study of universities and secondary schools in the case of the construction sector.

[1] J. Górniak (2013). Competences of Poles and the needs of the Polish economy. A report summarizing the fourth edition of the BKL Study of 2013. Warsaw: PARP.

In 2014, the project commissioned by the Municipality of Kraków was realized in cooperation with the Centre for the Evaluation and Analysis of Public Policies at the Jagiellonian University and the Interdisciplinary Centre for Organizational Research and Development at the Institute of Psychology at the Jagiellonian University. Complementary work on the study in the construction sector, at the level of technical and vocational education, was financed by the Provincial Labour Office in Kraków. The two complementary projects would not have been possible if not for the kindness and professional assistance of representatives of the UMK, WUP, business, representatives of Kraków universities, Kraków vocational and technical schools and business environment institutions. While taking, as the research team, full responsibility for any possible imperfections and shortcomings of the report, we would like to express our gratitude to the ASPIRE Association (re. the study in the IT sector), the Association of Polish Architects (re. the study in the architectural sector) and the Galician Chamber of Construction (re. the study in the construction sector) – without their support and professionalism, our research would not be possible.

We extend our particular thanks to, in alphabetical order:

- Sector experts and those who enabled us to understand the essence of the functioning of all the analysed sectors in a broader context and who made numerous comments, often very critical, which improved the quality of the applied tools and definitions: Marian Bednarek (Zespół Szkół Budowlanych PDP Chemobudowa-Kraków), Adam Biernat (Provincial Labour Office in Kraków), David Carton (ITEKNA), Paul Chen (K'Sup), Łukasz Ciesielski (Making Waves), Jacek Ewy (Ingarden&Ewy), Marek Filipczyk (Practical Training Centre), Matthias Funke (IBM Lab), Marek Gajowniczek (Ericpol), Przemysław Gawor (SARP), Andrew Hallam (ASPIRE), Katarzyna Hodor (Faculty of Architecture, PK), Piotr Hrabia (Galician Chamber of Construction), Zbigniew Jabłoński (Municipal Engineering Works), Artur Jasiński (Faculty of Architecture and Fine Arts, KA), Stanisław Kaczmarczyk (Małopolska Regional Chamber of Civil Engineers), Kazimierz Koterba (Development Office of Kraków), Paweł Kubik (Projektsystem), Rafał Kulczycki (Municipality of Kraków), Maria Leńczuk (Provincial Labour Office in Kraków), Bohdan Lisowski (SARP), Richard Lucas (OpenCoffee etc.), Elżbieta Madej (Hive53), Eoin McCoy (GE Healthcare), Andrzej Mielczarek (Zespół Szkół Budowlanych Nr 1), Andrzej R. Pach (Department of Computer Science, Electronics and Telecommunication, AGH), Michał Pazdanowski (Faculty of Civil Engineering, PK), Wojciech Przybylski (Kraków Technology Park), Stanisław Rybicki (Wydział Inżynierii Środowiska, PK), Małgorzata Ulmaniec (Department of Environmental Engineering, PK), Andrzej Witkowski (Galician Chamber of Construction, Paal Metal), Aleksander Wojnarowicz (Innovation Nest), Katarzyna Wysocka (Municipality of Kraków), Tadeusz Zając (Galician Chamber of Construction, KrakChem).

- Representatives of construction and architectural companies[2]: AEDES*, AGA-Bauservice*, AMT-Projekt*, Archisystem*, Archi-Vision Biuro Doradczo – Projektowe, Artur Jasiński Biuro Architektoniczne, BAUTAM - Dawid Tamas*, Biuro Projektów Biprostal, Biuro Rozwoju

[2] The list of companies comprises only those entities that have agreed to include their names in the report. Both in the case of companies and universities, the list includes institutions that have completed the research questionnaire, in part or in whole, or participated in in-depth interviews. * represents companies and universities whose opinions and/or responses from 2013 have been partly reanalysed and used in developing this year's report.

Kraków, Budimex*, DLJM System*, DOM-BUD M. Szaflarski, Eko Elprom*, Ekoarchitekci.pl*, Fewaterm, Frapol*, FPHU Drewdom Mętel, Grupa CMP, Iliard Architecture & Project Management, IMB ASYMETRIA, Ingarden&Ewy, KKM Kozień Architekci, KrakChem, MC2 Paweł Masełko*, Miejskie Przedsiębiorstwo Robót Inżynieryjnych, Mota-Engil Central Europe, NC Architekci, Niras Polska, Ove Arup & Partners, PORR Polska, PROBADEX-KRAKÓW, PRUSDIS S. PRUS*, P.U. M - Projekt Kazimierz Mączka, Wizja, ZAPART-PROJEKT.

- Representatives of universities associated with the construction and architectural sector: AGH University of Science and Technology (Faculty of Geology, Geophysics and Environmental Protection*, Faculty of Mining Surveying and Environmental Engineering* Faculty of Mechanical Engineering and Robotics, Faculty of Mining and Geoengineering), Cracow Academy (Faculty of Architecture and Fine Arts), Cracow University of Technology (Faculty of Architecture, Faculty of Civil Engineering, Faculty of Environmental Engineering).

As in previous years, we have attempted to write particular reports in a way that, on the one hand, would enable their use by employers, universities, public authorities, students and graduates, and on the other hand, would provide a bridge between these groups and serve as a medium of communication. We believe that the presented results of research will remain a permanent element in the discussion on the relationship between the labour market and the education sector in Poland.

RESEARCH TEAM

Leading experts:

Jarosław Górniak – dr hab., professor, dean of the Faculty of Philosophy of the Jagiellonian University, director of the Centre for Evaluation and Analysis of Public Policies, director of the Department of the Sociology of Economy, Education and Social Research Methods at the Institute of Sociology of the Jagiellonian University. A sociologist and an economist, an expert in social research methods and data analysis, evaluation methodology and analysis of public policies, as well as the sociology of economy and organisations. Scientific patron of the systemic research project "Study of Human Capital", and previously – director of numerous research projects and author of studies on the labour market and public policies. A member of the Consulting Council at the Presidium of the City of Kraków.

Małgorzata Kossowska – dr hab., professor, deputy dean for educational issues at the Faculty of Philosophy of the Jagiellonian University, director of the Social Psychology Unit, President of the Polish Society of Social Psychology in the years 2008-2011 and 2011-2013, President of the Management of the Interdisciplinary Centre for Organizational Research and Development at the Institute of Psychology of the Jagiellonian University (ICBRO). She conducts research related to such issues as: individual differences, political approaches and beliefs, conditions for political beliefs, cognitive rigidity. Holder of numerous prestigious awards and distinctions. Author of numerous books and articles.

Team members:

Piotr Prokopowicz – Doctor of humanities, graduate of sociology and psychology at the Jagiellonian University. Senior lecturer at the Institute of Sociology of the Jagiellonian University, researcher at the Centre for the Evaluation and Analysis of Public Policies at the Jagiellonian University. Co-worker and lecturer at Cologne Business School and Jagiellonian University, Visiting Fellow at Saint Mary's University in Halifax. Specialist in organisation research and data analysis. When working as a consultant for Great Place to Work Institute Europe in Copenhagen, he took part in preparing the list of 100 best employers in Europe and South America. Author and editor of many studies, books and articles about sociology and psychology of management.

Grzegorz Żmuda – Doctor of social studies, psychologist and sociologist, Managing Director of ICBRO, member of the team monitoring the implementation of the development strategy of the Jagiellonian University. He specializes in the psychology of management and organisation, in particular in psychological organisational diagnostics, participatory management and psychology of personnel. He is also working on creating innovative tools for organisational

development. He is working on his PhD thesis concerning the preferences of management styles among young entrepreneurs. He is the author of numerous publications and presentations about organisational psychology.

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Przemysław Majkut – sociologist, psychologist, PhD student at the Institute of Sociology at the Jagiellonian University, where he takes part in the "Educational Measurement" programme. Employee of the Department of Research and Analysis of the Regional Examination Board in Kraków and the Institute for Educational Research, where he is a member of the Educational Value Added office. Analyst at the Centre for the Evaluation and Analysis of Public Policies at the Jagiellonian University. Specialist in educational research and social research methodology. His main areas of academic interest include social inequalities and their impact on the functioning of the education system and the determinants of learning outcomes. He is a trainer specializing in the field of evaluation of the learning process and the use of data analysis to improve the quality of schools.

Karolina Dukała – psychologist, PhD student in the Department of General Psychology at the Institute of Psychology at the Jagiellonian University. She specializes in the psychology of interrogations and lies. A certified coach of the group training method, she provides training mainly in the field of personal development and the use of soft skills in business, with particular emphasis on negotiation. As the President of the Association of Doctoral Students of the Jagiellonian University, she is engaged in the popularization of science and the creation of a platform of cooperation between business representatives and academics of the Jagiellonian University.

Maciej Taraday – psychologist, PhD student in the Department of Experimental Psychology at the Jagiellonian University. Participant of the doctoral programme project in the field of educational measurement. Academic interests: the relationship between working memory and intelligence, cognitive control, research methodology and statistics. Winner of many awards and

scholarships. He specializes in statistical analysis using the software environment of R, SPSS, STATISTICA and AMOS.

Marianna Król – psychologist, PhD student at the Social Psychology Unit of the Institute of Psychology at the Jagiellonian University. As a coach and a trainer, she specializes in development programmes for companies and organisations, which include trainings in the soft skills necessary for effective functioning in a complex business environment and individual coaching sessions focused on increasing efficiency and motivation among employees.

BASIC ASSUMPTIONS OF THE STUDY[3]

With regard to the basic assumptions and used methodology, as compared to the studies from 2013, there were no major changes in the presented research. One of the main objectives of the report is to present the opinion of sector experts, representatives of companies and universities on the competences of graduates of Kraków schools without the use of excessive simplification and evaluation. Although this was a significant challenge, we have made every effort to show the flow of intellectual capital from the universities to business, mutual expectations and the adopted perspectives in an objective manner.

As in the previous years, the Study of Competences derives from the analysis of the needs of Kraków companies. In this regard, we tried to maintain the previously adopted standard of not making assumptions in terms of the necessity of adjusting the educational offer to the current shape of the labour market. In our opinion, the needs of the employers should be one of the main factors taken into account in the construction of the curriculum, but certainly not the only one. Similarly, the assumption that cooperation problems arise only from a lack of willingness on the part of employers and their possibility to use the potential of universities is, in our opinion, difficult to defend. This year's survey has once again shown that the development of intellectual capital is based on a complex system, and the only way to carry out a positive change is to establish close cooperation between business, education and public authorities. We hope that the results of the conducted research and the conclusions drawn from them will become one of the elements of such cooperation and will serve the development and implementation of system solutions.

As last year, the term "competence" is understood as "a set of behaviours belonging to a common category, enabling the effective implementation of organizational goals and tasks on a specific workstation, determined by a variety of psychological factors".

In this sense, competences are sets of behaviours associated with the characteristics expected for a particular position. For simplicity, this year we decided to combine the categories of specialized knowledge and skills. The following list includes the categories of factors identified in the demand analysis:

- Knowledge – information acquired during the learning process (e.g. knowledge of the heat flow in buildings, knowledge of sector law)
- Skills – actions learned in a particular area (e.g. operation of MS Office, communication)
- Abilities – inborn predispositions in a particular area (e.g. analytical skills)
- Others – properties that cannot be attributed to the aforementioned categories (e.g. mobility, honesty, etc.)

In a further part of the report, the word "competences" will collectively determine the behavioural manifestations of expectations expressed in the above categories, which is consistent both with the Polish tradition of research and the generally accepted international convention.

[3]Developed on the basis of the Study of competences of 2012 and 2013. Readers interested in more detailed assumptions may refer to last year's publication. The research methodology and the tools used have been described in more detail in Appendix 2.

Competences, which are one of the fundamental concepts in business institutions, have their university counterpart - learning outcomes. As Kraśniewski observes[4], the essence of learning outcomes "boils down to the assumption of (...) what the learner should know, understand and be able to do at the end of a certain period (process) of education." In Poland, learning outcomes are usually divided into three categories: **knowledge, skills and social competences**, though these are not always separable categories. As part of our work, we made a simplified translation of the expected competences into learning outcomes. As in previous studies, we decided to apply a fairly general catalogue of outcomes that could be easily detailed and adapted to the specific characteristics of particular fields of study.

BASIC INFORMATION ON THE ANALYSED SECTORS[5]

DEFINITIONS OF SECTORS

The construction sector is one of the most complex sectors and combines many different types of businesses. For this reason, it is important to accurately define the scope of what is meant by this term in the report. In our study, the companies operating in the construction sector include enterprises involved in the implementation of construction projects related to the construction of buildings and works associated with the construction of residential and non-residential buildings, construction of roads and motorways, railways and underground railways, bridges and tunnels[6]. This definition is quite broad; it covers virtually every company dealing in construction, including companies engaged in finishing works, although it does not exhaust the entire spectrum of entities which identify with the construction sector. The sector itself can be divided into several segments of construction, e.g. housing, offices, roads, bridges or tunnels. This raises some problems, as each of these segments may have slightly different characteristics, needs and expectations. Keeping in mind these specifics, the report tries to focus on those issues related to competences that are common to all companies operating in the broadly understood construction sector.

The architectural sector includes companies dealing in architectural and construction design, construction design and urban planning[7]. In the case of both analysed sectors, we do not focus on entities that specialize in the area of passive and energy efficient construction – this issue was discussed in a separate report in 2013[8].

[4] See also: A. Kraśniewski (2011). How to prepare training programmes in accordance with the requirements of the National Qualifications Framework for Higher Education. Warsaw: MNiSW; E. Chmielecka (2010). Curriculum autonomy of the university. Qualifications framework for higher education. Warsaw: MNiSW; Regulation of the Minister of Science and Higher Education dated 02.11.2011 on the National Qualifications Framework for Higher Education

[5] This chapter is based on desk research analysis of documents and industry publications, as well as information obtained from the interviews with experts, representatives of companies and universities.

[6] PKD: 41.10.Z - Execution of construction projects related to the construction of buildings; 41.20.Z - Construction works related to the construction of residential and non-residential buildings; 42.11.Z - Works related to the construction of roads and highways; 42.12.Z - Works related to the construction of railways and underground railways; 42.13.Z - Construction of bridges and tunnels.

[7] PDK: 71.11.Z - Architectural activities

[8] See www.Kraków.pl/zalacznik/71489

THE SPECIFIC NATURE OF THE SECTORS IN KRAKÓW

The situation of construction companies in Kraków is largely linked to the overall condition of the construction sector in Poland, and in this context, it cannot be said that construction companies in Kraków are very different from other companies of this type operating in other regions of Poland. The construction sector is largely dependent on investments, which in recent years have been associated mainly with the spending of EU funds. For this reason, the downturn which has affected the entire sector since 2012 also affected companies in Kraków[9]. However, there are certain features which, in the opinion of experts, are specific to the construction sector in Kraków.

Kraków construction companies are seen as modern, making full use of innovative technologies and applying creative solutions. In some segments of the sector, they may be regarded as leaders on a national scale (or having the potential to become leaders). A good example is the passive energy construction sector (energy-efficient). This was indicated in the report "The Technology Perspective of Kraków-Małopolska 2020"[10], prepared under the direction of the Kraków Technology Park, as one of the 10 technologies of the future, in which Małopolska can become a leader. Another such area is materials engineering, whose products have direct application in the construction sector. The strong position of Kraków companies in the field of modern construction technologies should be directly associated with the potential of Kraków as an academic centre. Technical universities (AGH University of Science and Technology or Cracow University of Technology) and research institutes located in the city carry out research in the field of innovative technological solutions, which are often directly applied in construction. The role of the above universities in the training of personnel should not be underestimated. The interviews conducted frequently pointed out that Kraków has a significant position with regard to the availability of highly skilled engineers, prepared for the creative use of modern technology. In addition, a specific feature of Kraków construction companies is extensive experience and competence in the field of construction works on complex conservation repairs and renovations of monuments. This is a result of a large number of historical buildings in Kraków, which over the past 25 years underwent overall renovation, often associated with difficult construction projects.

In terms of construction projects carried out in Kraków, we can speak of certain trends that affect the nature of the construction sector and to some extent influence the direction of its development. For example, the reuse of industrial buildings is worth mentioning. These projects include both commercial construction (e.g. the adaptation of the post-industrial area of the Solvay plant) and residential and office construction (e.g. the adaptation of the brewery on ul. Lubicz). Investments of this type often require the development of special building solutions, related to the provision of conservator protection to the adapted buildings or their immediate surroundings. Another clearly visible trend is the development of commercial construction associated, among other things, with the continuous development of the BPO/ITO sectors (business process outsourcing and information technology)[11] in Kraków.

[9] See: "Polskie spółki budowlane - kluczowi gracze, perspektywy rozwoju" – report prepared by the consulting company Deloitte in 2013

[10] Bendyk, E., Kisieliński, S. (ed.) (2010). "Perspektywa technologiczna Kraków – Małopolska 2020. Wyzwania rozwojowe"

[11] See: Study of Competences in BPO and ITO in Kraków, http://Kraków.pl/biznes/17621,artykul,bilans_kompetencji.html

It should be noted that the specific nature of the construction sector in a given area is largely determined by investments. In this respect, Kraków is a city where the number of construction projects in recent years is still very high, both in terms of those executed on behalf of public entities and those implemented by private funds. The financial support from the European Union, which greatly accelerated public investment, especially in the field of roads and public buildings, is absolutely crucial. Examples of the largest investments of this type are: Kraków Arena, Małopolska Garden of Art, Kraków Opera, Cricoteca, Museum of the Home Army, the Injury Centre of Emergency Medicine and Disasters at the University Hospital and the Integrated Specialist Centre for Emergency Medicine at John Paul II Hospital. In the area of transport infrastructure, the following investments should be noted: new tram routes (Płaszów, Ruczaj), the modernization of existing routes and the construction of new road networks (e.g. the reconstruction of Rondo Ofiar Katynia and the repair of ul. Mogilska). The importance of housing construction is also worth emphasizing. According to data presented by the Central Statistical Office (GUS)[12], in the years 2000 - 2011, only Kraków and Warsaw reported an increase in the number of inhabitants. This demographic process largely affects the development of housing in Kraków. In addition, GUS forecasts show a steady increase in the number of inhabitants up to 2020, which is a positive sign for the development of the construction sector in the housing construction sector in the near future.

As for the architectural sector, it has very special characteristics in relation to other sectors of the economy. First of all, it plays a special role in creating the space in which people live. This effect is particularly evident in large cities, which in recent years were subject to rapid transformations and change. Today, there is more and more spatial and functional chaos dominating the urban space, which results in a weak planning system and excessive liberalism in the area of management[13]. Reversing these trends is extremely important for the quality of life, which largely depends on spatial order. Well-planned architectural and urban solutions significantly improve the quality of life, and their deficiencies can significantly hamper the daily functioning of residents. The second notable feature of the sector is the strong link with the construction sector. This means, above all, a high dependence on investments from both public and private funds.

Architectural companies operating in Kraków are in many respects similar to other companies operating in other Polish cities. These are usually design offices, employing at most several people. Among the factors that determine the specific nature of the architectural sector of Kraków, the most important seem to be: the existence of faculties educating architects in the city, a large area of the city covered by conservator protection and the nature of the investments made in Kraków, both from public and private funds.

In terms of the number of trained architects and urban planners, Kraków is one of the leaders in Poland. The city has two faculties of architecture educating people who may find employment in the sector[14]. A relatively large number of graduates in the labour market means that not all of

[12] See: Population forecast for the years 2008-2035, http://stat.gov.pl/obszary-tematyczne/ludnosc/prognoza-ludnosci/prognoza-ludnosci-na-lata-2008-2035-opracowana-2007-r-,1,1.html

[13]See: report "Poles living space"", http://www.sarp.org.pl/pliki/1908_53fdc64bb3140-pzp_spistresci_1.pdf

[14] For comparison, in 2014, there were 27 such departments in Poland, of which 9 were public and 18 private.

them will find employment in their profession, but their availability makes it relatively easy to find employees with the necessary qualifications. The style in which Kraków architects are taught is also worth noting. In the interviews, experts evaluated it as more artistic than the styles preferred in other faculties of architecture in Poland. At the same time, Kraków architectural companies are seen as rather hermetic, promoting people from the local (in terms of the completed school) environment, and not favourable to open recruitment.

Due to the nature of the city, Kraków architecture companies have extensive experience and expertise in complex adaptations of buildings and urban spaces covered by conservator protection. This experience has proven to be very useful, especially in the context of trends associated with the intensification of development in cities and the reuse of industrial buildings (often historic). This usually means developing specific solutions related to conservator protection of the adapted buildings or space in which they are located (e.g. the previously mentioned buildings of the brewery on ul. Lubicz or the adaptation of post-industrial areas of the Solvay plants).

The functioning of architectural companies largely depends on the demand for construction projects. Their character in a given area affects the development of the sector and its characteristics. In this respect, Kraków is a city where, in the past few years, we can observe an increase in the number of construction projects, which translates into a large number of architectural projects. In the interviews, the Kraków architectural market was defined as fairly large and very absorbent. There is a difference between projects implemented with public and private funds. Public investments (usually supported by European funds) allow for more daring designs. It should be emphasized that when selecting a project for implementation, the impact of the investment on the area in which it is located (also perceived in social terms) is of great importance. This applies particularly to public utilities, which have already been mentioned earlier. On the other hand, investments from private funds are often focused on profit. Bold architectural and urban projects cost more, so are rarely implemented in residential or commercial-office construction. The focus is on the functionality of the estate, which is perceived rather narrowly. This often means forgetting about the aesthetics of the building; sometimes this damages the quality of life in a given place. It happens that estates are built in a chaotic manner; they lack socially important places, such as playgrounds, nurseries, schools. It should be noted that this trend also exists in other cities in Poland. Importantly, experts point to a growing awareness of investors and potential customers in this area and the gradual improvement of the situation.

Architecture and urban design play a special role in the management of urban space. To a large extent, they are responsible for the usability and aesthetics of the city. This is particularly important in Kraków, which is seen as a city of great tourist interest and which has the opinion of a comfortable place to live. The functionality of architectural and urban planning also has a direct impact on the situation in other sectors, such as outsourcing, affecting the ability to attract employees with exceptional skills to relocate and live in Kraków. The appearance and functionality of the city is therefore of vital importance.

COOPERATION BETWEEN BUSINESS AND SCIENCE

Both in terms of the construction sector, as well as architecture, Kraków should be considered one of the strongest academic centres in Poland. Technical universities and research institutes located in the city provide construction companies with easier access to modern technology and skilled employees who are able to use them. However, to fully exploit this potential, companies and universities should strengthen their cooperation. It is widely accepted that the key to the development of innovation in the sector is the rapid transfer of knowledge and skills from the world of science to the widely understood world of business. For this reason, cooperation between universities and enterprises has been the goal of many studies that aim to identify potential barriers to this process and ways to overcome them.

The report on the study "The role of diploma theses in the economic development of the Małopolska Province", prepared in 2010 [15], provides an insight into the nature of this cooperation. The results presented in the report indicate the predominance of informal contacts, both in terms of initiating cooperation, as well as maintaining the relationship. Most frequently, cooperation with universities was declared in the units of the AGH University of Science and Technology and the Cracow University of Technology – more than 80% of the cases. These results confirm the positive trends in the field of cooperation between universities and the construction sector, which occurred during the interviews conducted as part of the Study of Competences. The scope of cooperation is worth further analysis. The analysis of survey results indicates the dominance of cooperation in the case of short-term research projects, expert opinions and studies on solutions to specific problems, as well as internships for students and researchers. Shared commitment of universities and companies in long-term research projects, planned as a form of development of the company's potential, was much rarer.

In the construction sector, the main problems with cooperation between universities and companies, indicated in the interviews carried out for the Study of Competences, are consistent with the results of 2010. For entrepreneurs, the most significant barrier to successful cooperation was excessive university bureaucracy and a lack of practical experience of part of the researchers related to the problems concerning construction work, which hampered the implementation of the proposed solutions. Both representatives of companies and universities stressed the financial barriers (research is often a large expense, which, according to companies, should bring profit in the foreseeable future), information barriers (lack of knowledge about the capabilities and readiness of cooperation in solving specific problems) and different kinds of legal issues, such as copyright issues and intellectual property.

Kraków is also one of the strongest academic centres in Poland in the field of architecture. Architecture can be studied at two universities, which gives design agencies easier access to skilled employees.

The conducted interviews suggest that, as in the construction sector, cooperation between universities and design offices is not structural or systemic. It is based on informal contacts or direct personal relationships. For university employees, cooperation means internships organized for students or considering the opinion of employers when planning the curriculum. On the other hand, representatives of enterprises indicate the need to support their activities by universities. Architecture is a specific industry, and frequently, the design of particular solutions

[15] See: "The role of diploma theses in the economic development of the Małopolska Province", http://www.malopolska.pl/Przedsiebiorca/iMalopolska/Strony/RaportyBadaniaAnalizy.aspx

requires knowledge of other disciplines (acoustics, geology, etc.). It happens that design offices, when working on specific projects, seek help in selected departments or fields of studies (e.g. geology). However, such activities are incidental and, to a large extent, based on personal contacts between the academic staff and representatives of companies. Another characteristic feature of the architecture sector is the fact that many university employees are also active in the business field. In this context, the transfer of knowledge is facilitated and occurs almost spontaneously.

In both analysed sectors, there is insufficient awareness, both among the representatives of science and business, of the possibility of organizing more systematic cooperation, also in research and development. Despite this, according to the opinion of representatives of the sectors, there are some positive trends in the cooperation between universities and business. University units specially designated for that purpose, such as technology transfer centres and innovation centres, play an increasingly important role in this respect. It should be noted, however, that university units may have a slightly different profile depending on the university. This is due to the specific nature of the scientific and research activities conducted by universities, as well as their cooperation with companies. For example, the results of research of Kraków universities from 2010 indicate the focus of the technology transfer centre at AGH on the support of the patenting process, whereas a similar unit at the Cracow University of Technology is aimed primarily at cooperation with business.

A significant role in promoting cooperation between companies and universities is played by the Marshal's Office of the Małopolska Province. This commitment is supported by EU funds, which are successfully used in projects related to this issue. Examples of such projects are: "SPIN – Model of the transfer of innovation in Małopolska"[16], "The regional innovation system of the Małopolska Province. Pilot project"[17] or the project "SMART_KOM. Kraków in the network of smart cities"[18]. Projects of this type have many advantages, but undoubtedly the most important of them is to understand the barriers to collaboration between science and business and preparing and promoting solutions to overcome them. A good example of building the capacity to cooperate in the construction sector is the activity of the Małopolska Centre for Energy-Efficient Construction[19], functioning at the Cracow University of Technology, which has a rich research and development, consulting and promotional offer concerning innovative technologies in the field of passive construction.

DEVELOPMENT PERSPECTIVES OF THE SECTORS IN KRAKÓW

Prospects for the development of both analysed sectors are tightly linked and undoubtedly driven by investments. Both sectors are very important from the point of view of the development of the city. Representatives of construction and design companies are the contractors, in the physical sense, of the city's development strategy, which has been redefined in a key document entitled "The study of spatial development conditions and directions of the

[16] http://www.spin.malopolska.pl/o-spin.html
[17] Publications presenting reports developed under this project are available on http://www.malopolska.pl/Przedsiebiorca/iMalopolska/Strony/RaportyBadaniaAnalizy.aspx
[18] See: http://www.sse.Kraków.pl/pl/smart-kom.html
[19] This unit is one of the partners of the project "SPIN - Model of the transfer of innovation in Małopolska"

city of Kraków"[20]. They also take part in the spontaneous development of the city, controlled by local needs, business decisions, etc., which are elements of housing and commercial construction. The importance of the construction sector in the context of the functioning of the labour market should also be noted. Construction companies have great potential in the creation, but also the loss, of jobs. For this reason, the condition of the sector is an important element allowing for the proper functioning of the socio-economic development of the city.

Kraków is a perspective city for both sectors, which is associated with a number of important factors. On the one hand, the demand for construction and architectural services is created by the Municipality as an investor. There are many expectations associated with the development strategy of the city of Kraków[21] and a new study of the conditions [22], which involves significant municipal investments that have a direct impact on the growth in demand in the construction market. Long-term strategic plans for the development of the city, such as "Kraków-Nowa Huta of the Future", "Vistula River Park", "Płaszów-Rybitwy" or "Balice", provide for a comprehensive revitalization and management of large areas, which will certainly require the implementation of significant architectural and construction projects. Moreover, the "SmartCity" concept plays an important role in the development strategy of the city of Kraków. The essence of this concept includes issues associated with the use of modern information and communication technologies in the management of the city, a focus on sustainable development with respect for the environment and quality of life[23]. For this reason, the demand for the use of modern construction technology in urban investments is likely to increase. Another factor is related to the continuous modernization and development of the road network and public transport in Kraków. EU funds will continue to play an important role. In the years 2015-2020, Małopolska will have approx. 2.9 billion EUR. The money will be used, among other things, for a comprehensive programme of urban renewal, improving public transport, mainly in the field of rail transport (e.g. the start-up of Rapid Agglomeration Rail in Kraków) and building a network of Park & Ride parking lots on the outskirts of cities[24]. The funds will also be spent on social issues related to the arrangement of urban space to engage people to be more active. The planned investments from public funds are, therefore, a very good prognosis for the development of the widely understood construction sector. Public investment in the city will also be supported by private funds. Another good forecast of the development of the construction and architecture sector is the constantly growing importance of Kraków as a city that is the seat of BPO/ITO companies. The development of companies in this sector generates demand for office space, which is also a stimulus for the development of the entire sector. Housing construction should also develop in the near future in Kraków. The aforementioned GUS forecast concerning the number of residents in the city of Kraków up to 2030 indicates a steady increase in population by 2022. Population growth is one of the most important impulses for the construction of new housing developments.

Undoubtedly, one of the most important factors in the development of the construction sector in Kraków is universities, which affect the development of companies, either directly (cooperation in research and development projects) or indirectly (access to highly qualified staff). It seems

[20] See: "Studium uwarunkowań i kierunków zagospodarowania przestrzennego miasta Krakowa", https://www.bip.Kraków.pl/?id=48

[21]Documents related to the strategy of the city of Kraków can be found on the following website: https://www.bip.Kraków.pl/?dok_id=56832

[22] See: "Studium uwarunkowań…" op cit.

[23]The vision of Kraków as a "Smart city" was the topic of the project "SMART_KOM. Kraków in the network of smart cities", see: http://www.sse.Kraków.pl/pl/smart-kom.html

[24] See: "Budowlani. Biuletyn małopolskiej okręgowej izby inżynierów budownictwa", no. 2/2014

that with time, this factor will become more and more important. This is proven by an increasing number of initiatives undertaken jointly by universities and construction companies[25].

In the context of the construction sector, an important factor is the availability of skilled workers for jobs that do not require higher education. For this reason, vocational and technical education at secondary level is very important. Experts and representatives of companies indicated in their interviews that despite the problems and challenges, Kraków has a fairly wide educational offer of professions related to the construction sector. In recent years, vocational and technical schools providing education in this area have been funded, and their cooperation with the city is quite good. This does not mean, however, that objectively the situation is satisfactory. One of the most important problems of vocational and technical schools is the negative stereotype of this kind of education among young people graduating from junior high schools. Vocational schools and, to a much lesser extent, technical schools are considered to be second choice schools. It should be noted that this trend is being limited, but according to the directors of vocational schools who participated in the interviews, a more intensive information policy in this regard is necessary. Another problem is that graduates of such schools quickly go abroad, which means that the market suffers a shortage of skilled construction workers.

The development of both analysed sectors faces a number of barriers. On the one hand, this results from the fact that a significant part of the city (especially the centre) is under conservator protection. This causes tension between investors and the services responsible for the protection of monuments. This issue is directly related to the zoning plans in Kraków. According to data available on the website of the Municipality of Kraków, as of 10 September 2014, the applicable plans covered 49.5% of Kraków[26]. The lack of existing plans extends the formalities necessary to begin construction and discourages investors. Moreover, it also causes problems with precise determination of the nature of the investment. Such a situation may lead to disputes between the local community and the investor and the city and the investor. Examples of such conflicts that have a negative effect on the city's atmosphere and image include issues related to the former Cracovia hotel, the areas around Zakrzówka or the NOT office building (popularly known as the "Skeleton"). Most professionals agree that Kraków is a specific city with respect to its legal barriers. In this context, they mentioned the special supervision over monuments and the spa in Swoszowice. However, it should be noted that although the vast majority of administrative and legal barriers arise from the existing legislation, the city itself can try to streamline this process, e.g. in terms of greater assistance in preparing the necessary applications and continuous development of employees of municipal offices, who are responsible for organizing and supervising construction projects in the city. A more systematic collaboration between the Municipality and representatives of companies was also suggested. Currently, according to sector representatives, it is difficult to maintain the relationships, and there is a need for more meetings, workshops and conferences.

In conclusion, the prospects for the development of the construction and architectural sector in Kraków should be considered as very promising. Such an assessment is also the result of the overall situation of the sector in Poland[27]. Positive processes in the whole country, such as good

[25] The aforementioned project "SPIN - Model of the transfer of innovation in Małopolska" may serve as an example.
[26] See: https://www.bip.Kraków.pl/?dok_id=1361&lid=310147181&vReg=2
[27] See: "Polskie spółki budowlane - kluczowi gracze, perspektywy rozwoju" – report prepared by the consulting company Deloitte in 2013

economic growth forecasts or the planned support of broadly understood construction projects from EU funds for the budgetary period 2015-2020, will also be reflected in the condition of the analysed sectors in Kraków. In addition, the development of the sector should also be affected by the processes taking place on a local and regional level. Increasing cooperation between business and science, the potential of the labour market with respect to high-skilled workers, as well as the growing demand for offices and apartments, should also be noted.

PESTER AND SWOT ANALYSIS

Pester, i.e. analysis of the external environment (Environment: Political-Legal, Economic, Socio-cultural, Technological, Environmental, Regulatory)

a) Political and legal environment:

The development of the construction and architectural sector is heavily dependent on public investments, which are strongly conditioned by legal rigidities associated with the public procurement law. The current practice of selecting offers with the lowest price can be a threat – the final cost of construction depends on the price of raw materials, which may be subject to periodic fluctuations, and the preparation of the project is usually very time consuming. This practice, in extreme cases, may lead to bankruptcy, which was quite common in the construction sector in 2012. The decisions of the National Chamber of Appeal in considering appeals against the investors themselves had a significant impact on the application of the price criterion in the process of selecting the contractor. Major changes in this area may occur as a result of the amendment of the Act on Public Procurement[28], which, among other things, points to the contractor as the entity that is required to prove that its offer does not contain an abnormally low price and limits the use of price as the sole criterion for evaluation of tenders. Another opportunity for the development of the sector is the liberalization of economic law limiting the number of procedures required to start the investment, which can significantly shorten the time of execution.

b) Economic environment

The existing economic growth forecasts for Poland have resulted in very positive expectations of the development of the construction and architectural sector throughout the country, and therefore also in Kraków. Other key factors affecting the positive assessment of the economic environment of the sector include the need for modernization of urban space, road, rail and energy infrastructure and co-financing of investments from EU funds.

c) Socio-cultural environment

Constantly evolving environmental attitudes may affect the technologies used in construction. Passive construction and the development of public transport, including infrastructure, are particularly worth mentioning. In addition, the development of the sector in the field of housing can be positively affected by the strong tendency existing in Polish society to own property. On the other hand, we observe a growing tendency of individual protest groups which affect the

[28] The Act of 29 August 2014 amending the Act - Public Procurement Law (Journal of Laws, item 1232)

shape of urban space. This often results in extending the deadline of the investment and, frequently, has a negative effect on the final shape of the investment.

d) Technological environment

Currently, we can observe a development of modern technologies used in the construction sector, which also affects architectural projects. Research and development facilities in this area existing in Kraków, as well as the availability of qualified staff, provides a very good prognosis with regard to the use of these technologies by companies operating in the local construction market. The cooperation between universities and enterprises in the field of research and development of the sector is currently insufficient.

e) Natural environment

The natural environment in Kraków and Małopolska does not constitute a particularly large challenge for construction companies. There are of course difficulties in the implementation of specific investments; however, this is not a phenomenon unique to Małopolska. On the other hand, more and more frequently occurring violent weather conditions increase the demand for construction work that will be able to protect the inhabitants against their effects. This leads to an increased demand for construction services.

f) Regulatory environment

Legal changes in obtaining approvals for construction and the importance of criteria other than the lowest price in public tenders would undoubtedly have a positive influence on the development of the sector – the coming months will show whether the new legislation in this area will prove to be effective[29]. So far, representatives of the sector treated these issues as barriers to development. The expected completion of the process of adopting zoning plans will help to increase the attractiveness of Kraków for investors and contractors.

SWOT analysis, i.e. summary of the strengths and weaknesses of the sector and the opportunities and threats that arise from the environment of the sector.

Strengths of the construction and architectural sectors in the region:

- The existence of technical universities
- The existence of architecture faculties
- Qualified staff
- Access to modern technology and the continued development of research in this area
- A large market, a lot of investments, including in the field of public buildings

Weaknesses of the construction and architectural sectors in the region:

- Weak position of vocational education
- A relatively low level of technology transfer between science and business

Opportunities of the construction and architectural sectors in the region:

[29] The Act of 29 August 2014 … op cit.

- Large capital investment in transport infrastructure, urban revitalization with the use of EU funds in the period 2015-2020
- Increase in the number of inhabitants and the dynamic development of Kraków as a business service centre, which increases the demand for housing and commercial construction
- A new study of conditions and directions of spatial development of the City of Kraków
- Changes in the law on public procurement

Threats to the construction and architectural sectors in the region:

- Competition from companies from other regions of Poland and abroad
- Competition with other regions regarding personnel and capital
- Fluctuations in the market of raw materials prices, which may lead to a decline in the profitability of construction projects – particularly related to public investment

DEMAND ANALYSIS: THE DEMAND OF SECTORS FOR COMPETENCES

The description of the results related to the demand of sectors for competences begins with the presentation of the list of positions most frequently recruited for by companies of the analysed sectors. Similarly to the observations made in the previous year, it is important to pay attention to the different recruitment strategies of companies. On the market, there are both companies that employ graduates directly for independent positions, as well as those for which this situation is unrealistic, and that recruit only for assistant positions, which can be promoted after 2-3 years, after acquitting sufficient experience.

Positions for graduates most often mentioned by companies from the construction sector
Construction engineer
Construction manager
Architect
Constructor, design engineer
Foreman
Works coordinator
Assistant construction manager, assistant project manager
Assistant building constructions designer, assistant plumbing installations designer, assistant sanitary installations designer
Estimator
Refrigeration and air conditioning specialist, electrical installations specialist, building automation specialist, logistics specialist
Fitter
Coordinator of foreign contracts
Trainee engineer
Engineer
Administration

Table 1. List of positions to which graduates in the construction sector are recruited.

Positions for graduates most often mentioned by companies from the architectural sector
Assistant designer
Designer
Assistant architect, assistant architect-urbanist
Architect
Draftsman
Constructor, design engineer
Installation specialist
CAD drawings specialist, visualisation specialist
Estimator
Administrative assistant

Table 2. List of positions to which graduates in the architectural sector are recruited.

Plans for the employment of graduates in the year 2015 and 2020 are quite optimistic. In both sectors, companies predict an increase in the employment of graduates. Comparing the number of planned recruitments to the current state of employment, it seems that there will be more jobs for graduates. The situation in the architectural sector is more dynamic, which is understandable considering the total volume of employment, although quantitatively more jobs will be available in the construction sector. In addition, according to the interviews, employment

in the architectural sector will be rather short-term, associated with the implementation of specific work projects. The dynamics of the employment of graduates in both sectors is as follows:

Employment of graduates in 2015	Employment of graduates in 2020
3.2%*	**4.3%***
Growth in employment of graduates	

Table 3. The dynamics of employment of graduates in the construction sector.
* Graduates who will be employed in 2015 and 2020 as a percentage of current total employment status (taking into account all legal forms)

Employment of graduates in 2015	Employment of graduates in 2020
17.1%*	**26.1%***
Growth in employment of graduates	

Table 4. The dynamics of employment of graduates in the architectural sector.
* Graduates who will be employed in 2015 and 2020 as a percentage of current total employment status (taking into account all legal forms)

In the case of the construction sector, the usual form of employment among the companies participating in the survey is contracts of employment (84% compared to 16% of civil law contracts). This trend is not so clear in the case of the architectural sector, where approx. 54% of employees have a contract of employment (Fig. 1).

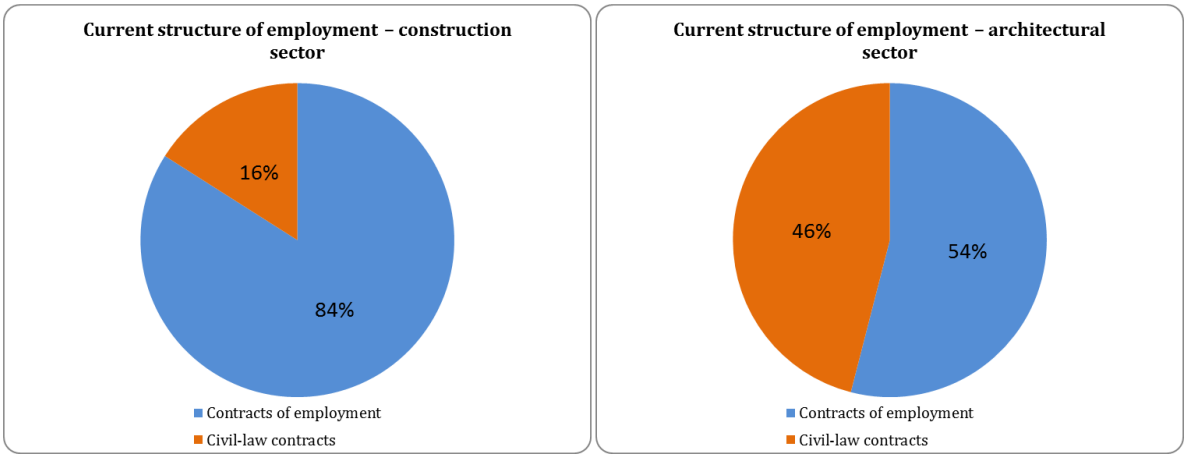

Fig. 1. The structure of employment in the construction and architectural sector with regard to the type of contract.

COMPETENCES OF TODAY AND TOMORROW

As mentioned in the introduction, the analysed competences have been identified on the basis of interviews with opinion leaders, companies and the analysis of job advertisements. To make them clearer, they were divided into 4 groups: specialized knowledge and skills (professional),

business knowledge and skills, soft skills, foreign languages and other requirements. **The list of competences, although extensive, does not have to be exhaustive** – there are probably a lot of companies on the market that need other, often very specific and unique skills. Therefore, competences related to passive construction and energy saving, which were developed in a separate report in 2013, were not analysed in detail in the current year.

As part of our preparatory work, we tried to bring the sought for competences to a similar level of generality. However, it was not always possible, or even desirable; therefore, **individual competences will vary in details,** which to a certain extent reflects the specific nature of the sector.

Companies participating in the study answered questions relating to, among other things, the importance of the competences now and in the future. Due to the segmented nature of the sectors, there are significant differences in the importance of individual competences depending on the profile of activity and specialization of the entity. **Therefore, we have taken the perspective of the entire sector, with the reference point being the job market for graduates as a whole.** This should be taken into account when interpreting the results. For example, the importance of road works was assessed relatively low – which does not mean that there are no companies on the market for which this competence is of vital importance – however, from the point of view of the overall number of graduates employed in the future, its weight is relatively smaller. The study showed that both analysed sectors are strongly related, also when it comes to the supply and demand for competences. **As a consequence, architectural companies look for people for positions traditionally associated with the construction sector (e.g. specialist in the field of various types of installation), whereas construction companies employ architects and designers.** This was reflected in the catalogue of specialized competences for both sectors, **which does not mean that, for example, a person employed in the position of designer must and shall have all the competences listed in the catalogue** – from a practical point of view, this is simply impossible. In this particular case, it means that the designer or architect should have sufficient knowledge and skills related to installation that will enable him to cooperate effectively with people who will deal with them in more detail. This also affects the desired learning outcomes in professional fields of study, which will be further discusses in the part of the report concerning the analysis of the supply of competences.

It should be noted that, as in previous reports, the **presented data describes the opinions of people who are responsible for personnel policy or management in companies operating in the sector, and hence they are not prescriptive.** In other words, we present the beliefs of the management of the companies, refraining from the evaluation of whether these beliefs are true or not and whether the strategy based on them is good.

The tables below show a set of 20 core competences (requirements) in the years 2015 and 2020 for both analysed sectors.

With regard to the construction sector today, the most important competences from the point of view of the labour market include: **honesty, knowledge of building materials, operation of office applications, initiative and entrepreneurship and the ability to organize and**

supervise construction works[30]. The results do not indicate a significant shift in the future. Five core competences in the future are: **the organization and supervision of works, operation of CAD / CAM / CAE design programs, work safety and knowledge of building materials**. Among the competences that appear on the " future" list, there are: **focus on development, analytical skills, cost estimation and mobility** (see Table 5)**.**

The construction sector: 20 core competences (requirements) today	Important in 2015	The construction sector: 20 core competences (requirements) of tomorrow	Important in 2020
Honesty	4.92	Organization and supervision of works	5.00
Knowledge of building materials	4.83	Operation of CAD / CAM / CAE design programs	4.80
Operation of MS Office, OpenOffice or Google Docs	4.79	Work safety	4.78
Initiative/entrepreneurship	4.71	Initiative/entrepreneurship	4.77
Organization and supervision of works	4.70	Knowledge of building materials	4.76
Work safety	4.67	Honesty	4.75
Commitment	4.67	Cooperation	4.75
Availability	4.64	Availability	4.73
Construction of buildings and installations	4.61	Operation of MS Office, OpenOffice or Google Docs	4.71
Operation of CAD / CAM / CAE design programs	4.60	Construction of buildings and installations	4.71
Innovation/creativity	4.60	Innovation/creativity	4.64
Learning	4.58	Commitment	4.64
Coping with stress	4.58	Concern about quality/conscientiousness	4.62
Organizing one's own work	4.57	Focus on development	4.62
Cooperation	4.57	Analytical skills	4.62
Adaptation	4.55	Adaptation	4.60
Quality assessment	4.50	Cost estimation	4.60
Investment management	4.50	Project documentation	4.59
Concern about quality/conscientiousness	4.50	Mobility	4.58
Project documentation	4.44	Learning	4.55

Table 5. Competences today (recognized as important in 2015) and competences of tomorrow (recognized as important in 2020). Orange indicates competences that in 5 years will lose their place among the top 20. Green shows competences that in 5 years will join the list of the top 20.

In the case of the architectural sector (see Table 6), the most important competences today are: **honesty, oral communication, concern for quality/conscientiousness, design of residential and non-residential buildings and operation of CAD / CAM / CAE design programs.** The most important competences of the future are: **concern about quality/conscientiousness, operation of CAD / CAM / CAE design programs, honesty,**

[30] Precise definitions of these and other competences have been included in the dictionary of competences in Annex 1.

English and learning. The list of future competences includes only 3 new skills: **technical English, modelling information about buildings and structures (BIM) and coping with stress.** Surprisingly, **general knowledge of architecture** has disappeared from the list of 20 most important competences, but it seems that this is the result of the design of the tool (the competence itself, though it is not in the top 20, is still rated as very important).

The architectural sector: 20 core competences (requirements) today	Important in 2015	The architectural sector: 20 core competences (requirements) of tomorrow	Important in 2020
Honesty	4.92	Concern about quality/conscientiousness	5.00
Oral communication	4.86	Operation of CAD / CAM / CAE design programs	4.92
Concern about quality/conscientiousness	4.78	Honesty	4.91
Designing residential and non-residential buildings	4.77	English	4.83
Operation of CAD / CAM / CAE design programs	4.71	Learning	4.80
Operation of MS Office, OpenOffice or Google Docs	4.69	Analytical skills	4.78
Project documentation	4.67	Knowledge of energy efficient technologies	4.74
Focus on goals	4.67	Operation of MS Office, OpenOffice or Google Docs	4.67
Learning	4.60	Technical English	4.67
Organizing one's own work	4.58	Organizing one's own work	4.64
Analytical skills	4.56	Designing residential and non-residential buildings	4.62
Contextual design	4.53	Project documentation	4.60
Architecture	4.50	Operation of 3D design programs	4.58
Knowledge of energy efficient technologies	4.50	Cooperation	4.55
Commitment	4.50	Focus on goals	4.44
Operation of 3D design programs	4.37	Commitment	4.44
Cooperation	4.36	Modelling information on buildings and structures (BIM)	4.43
Knowledge of building materials	4.35	Contextual design	4.40
Urban design and landscape architecture	4.31	Coping with stress	4.40
English	4.31	Oral communication	4.38

Table 6. Competences today (recognized as important in 2015) and competences of tomorrow (recognized as important in 2020). Orange indicates the competences that in 5 years will lose their place among the top 20. Green shows the competences that in 5 years will join the top 20.

COMPETENCE GROUPS

The following graphs present the importance of competences in each group (specialist knowledge and skills, business knowledge and skills, soft skills, languages and other requirements), comparing the present situation with the 5-year perspective.

In the construction sector, in the case of specialized knowledge and skills (Fig. 2), the importance of individual competences in the coming years, according to employers, will be

relatively stable. The increased importance of knowledge in areas such as **organization and supervision of works, knowledge of energy-saving technologies, equipment selection, design of railways and rail and modelling information on buildings and structures (BIM)** is worth noting.

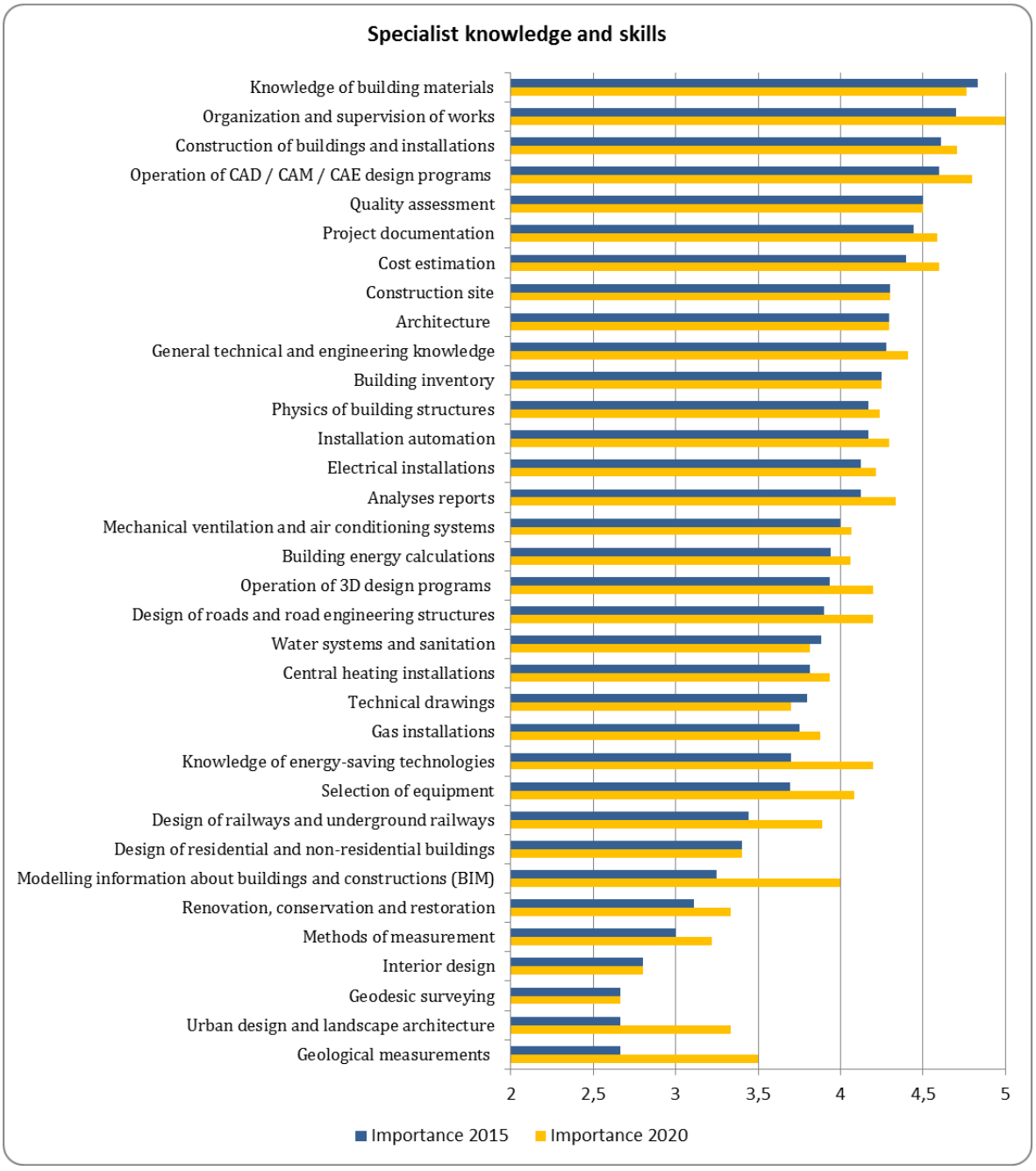

Figure 2. The construction sector. Predicted importance of competences in the area of "Specialized knowledge and skills" in the eyes of employers in the years 2015 and 2020.

In the architectural sector, in the same category (Fig. 3), there are also no revolutionary changes. In the five-year perspective, there is an increase in the importance of such competences as: **knowledge of energy-saving technologies, modelling of information on buildings and structures (BIM), operation of CAD / CAM / CAE design programs, energy calculations of buildings or the design of roads and road engineering structures**.

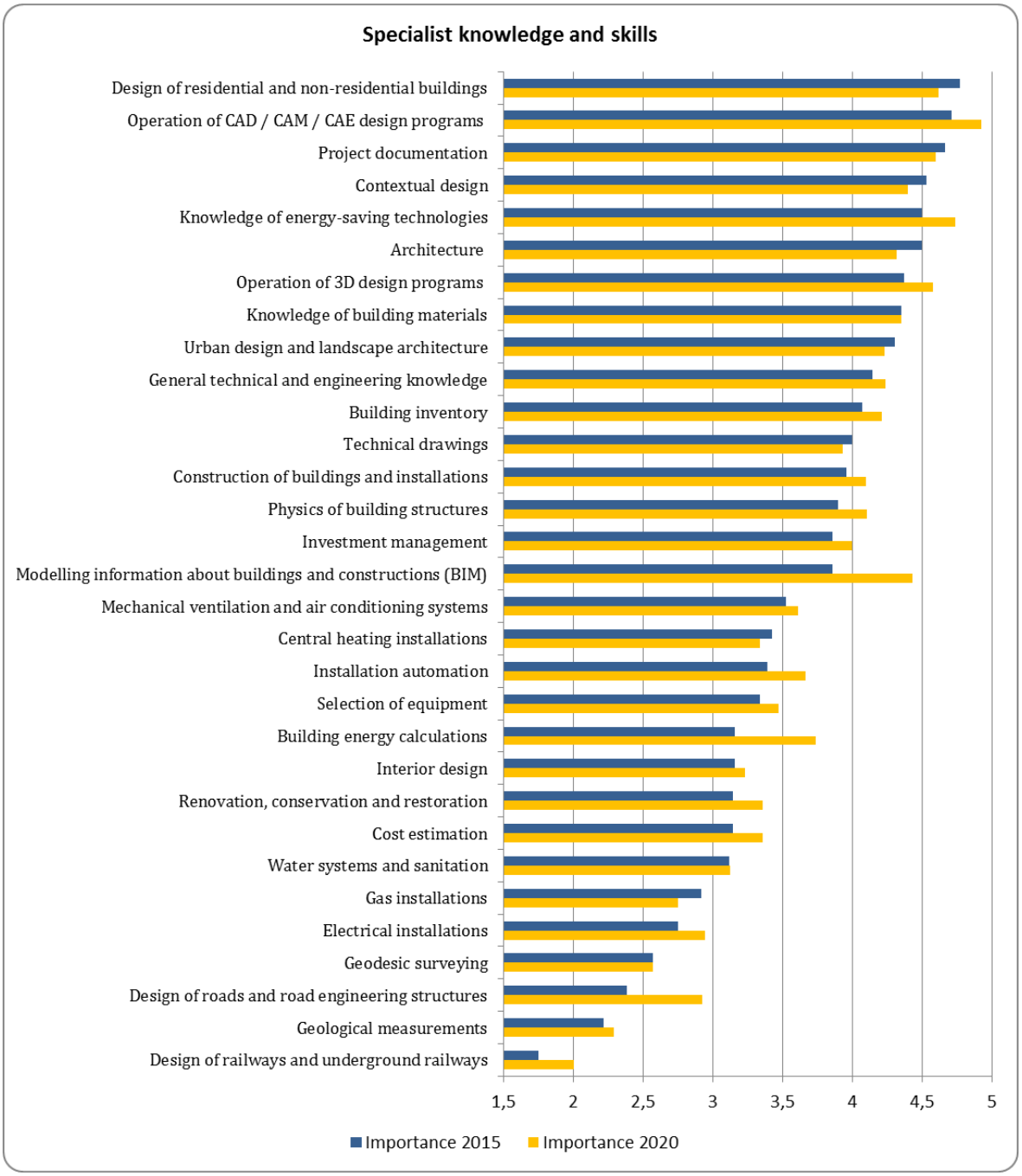

Figure 3. The architectural sector. Predicted importance of competences in the area of "Specialized knowledge and skills" in the eyes of employers in the years 2015 and 2020.

In terms of business knowledge and skills in the construction sector (Fig. 4), the following skills were considered the most important and will remain so in subsequent years: **work safety, investment management and economics**. A relatively large increase of importance is expected for **knowledge of new trends, business etiquette and project and team management**.

In the architectural sector (Fig. 5), in the 5-year perspective, the most important competences in this group will include: **the ability to present and defend projects, new trends, work safety and business etiquette**.

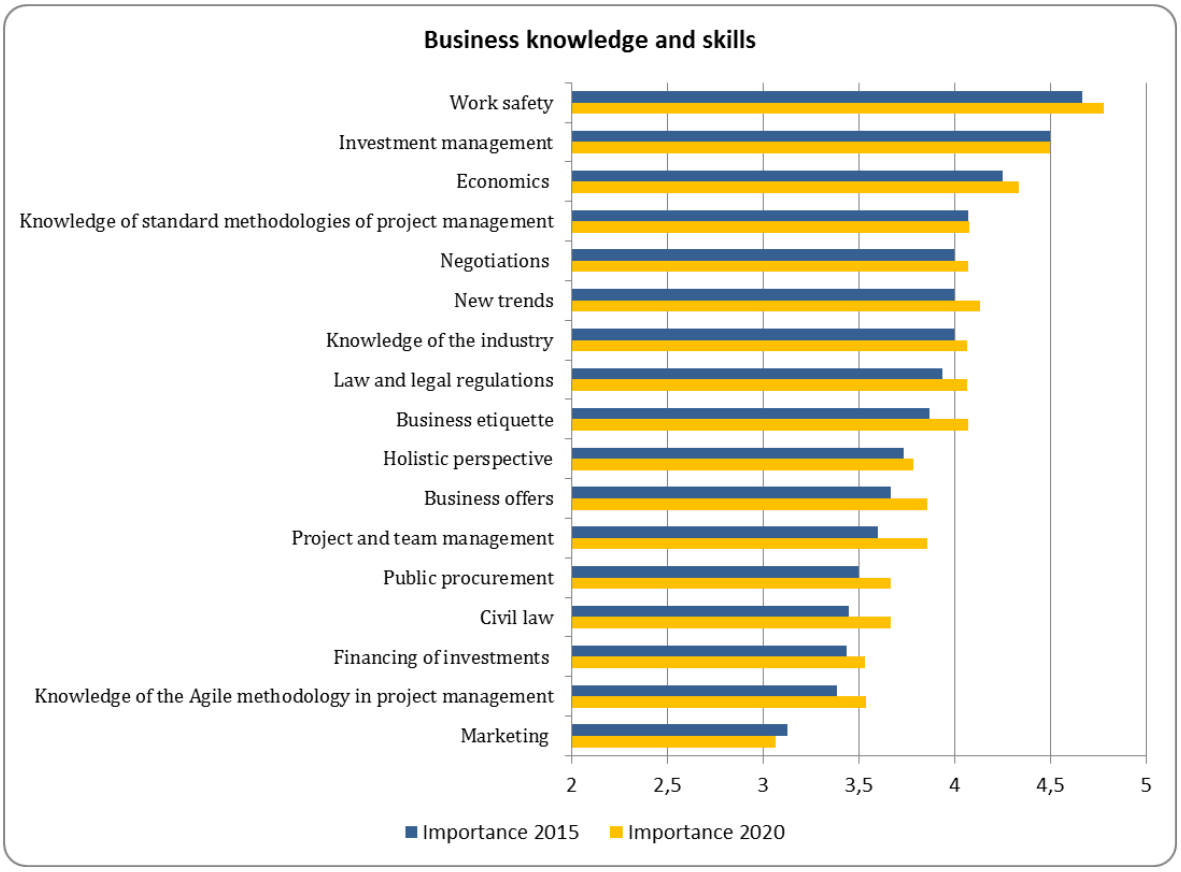

Figure 4. The construction sector. Predicted importance of competences in the area of "Business knowledge and skills" in the eyes of employers in the years 2015 and 2020.

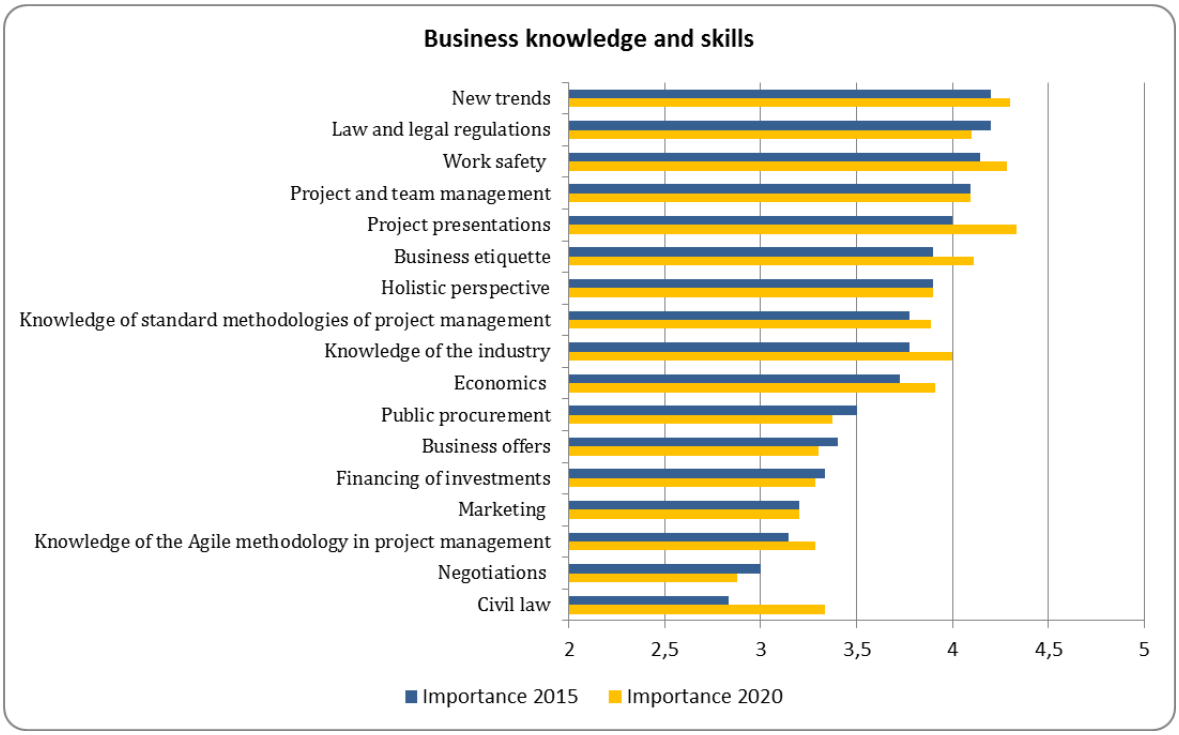

Figure 5. The architectural sector. Predicted importance of competences in the area of "Business knowledge and skills" in the eyes of employers in the years 2015 and 2020.

In the category of soft skills in the construction sector (Fig. 6), there will be some changes. The most important competence remains **initiative/entrepreneurship**, but the following competences will gain significance: **the ability to cooperate, concern for quality/conscientiousness and analytical skills.**

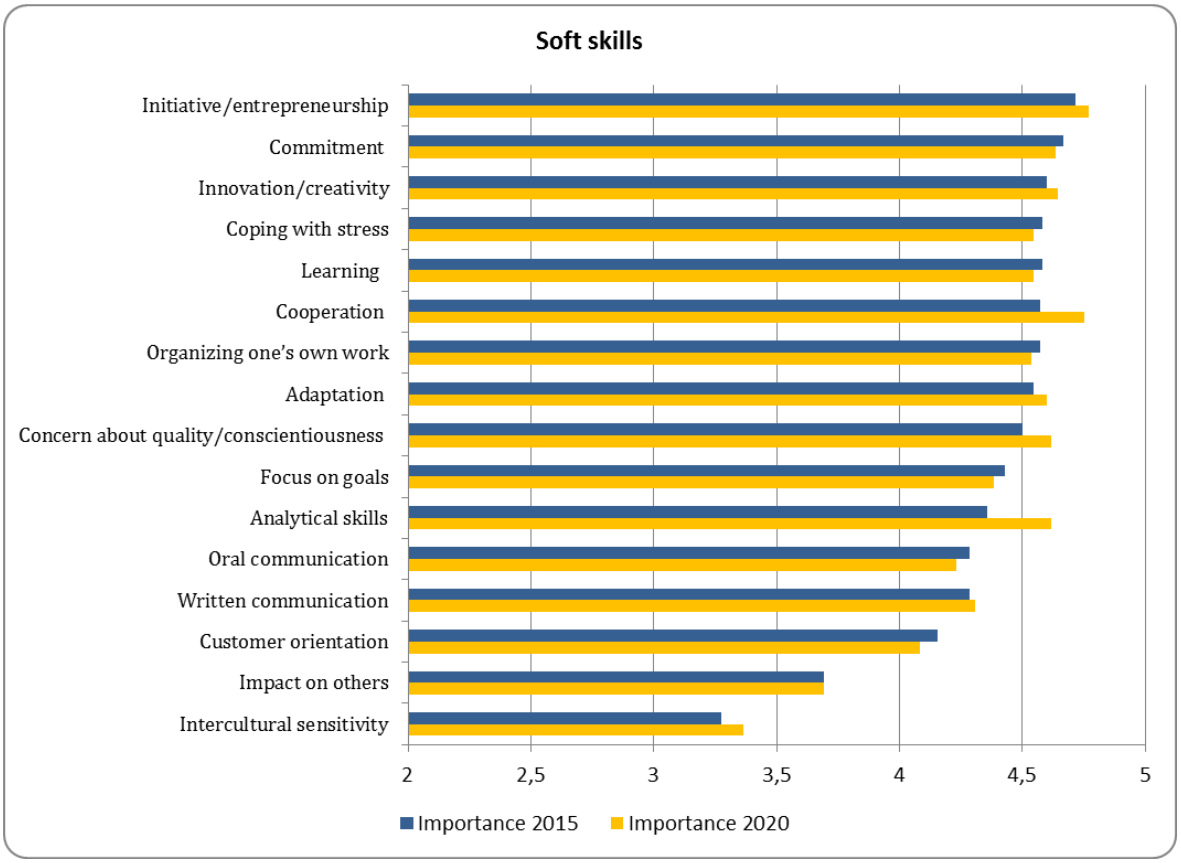

Figure 6. The construction sector. Predicted importance of competences in the area of "Soft skills" in the eyes of employers in the years 2015 and 2020.

In the same area in the architectural sector (Fig. 7), there are some major changes. The importance of **oral communication and focus on goals** (although this may be the result of a reference to the scale) drops, and the importance of **conscientiousness, learning, analytical skills and cooperation** grows.

In both analysed sectors, the competence in this area evaluated as the least important is **cross-cultural sensitivity**.

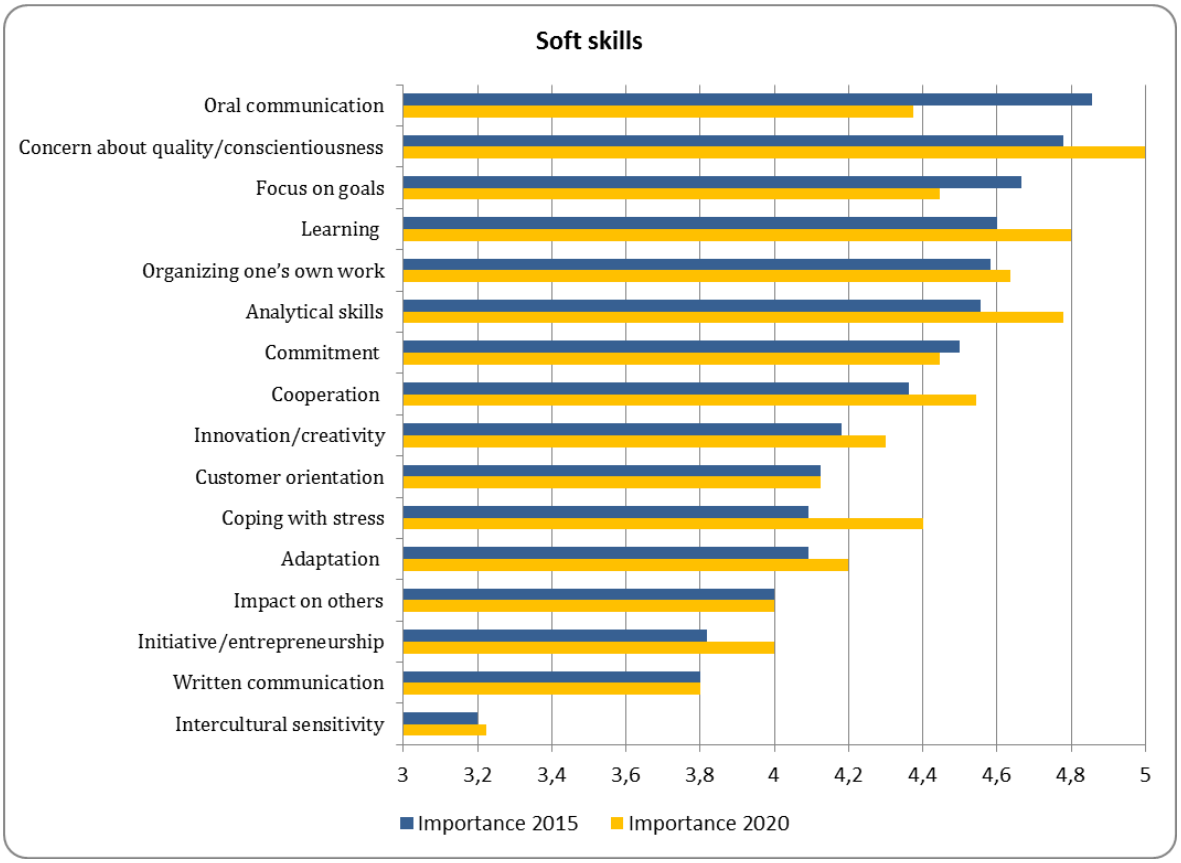

Figure 7. The architectural sector. Predicted importance of competences in the area of "Soft skills" in the eyes of employers in the years 2015 and 2020.

The last analysed category is foreign languages and other requirements/expectations. In the construction sector (Fig. 8), the most important competences remain: **honesty, operation of office applications, availability and focus on development. Mobility** will also gain in significance. When it comes to language skills, English and German are equally important, and the use of technical foreign language is less important. Spontaneously surveyed companies also mentioned French and Russian as important languages.

In the case of architecture (Fig. 9), the most important competence is also **honesty**, followed by **operation of office applications, as well as English and technical English**. In the five-year perspective, language skills will clearly gain importance (**English, German, Technical English and Technical German**).

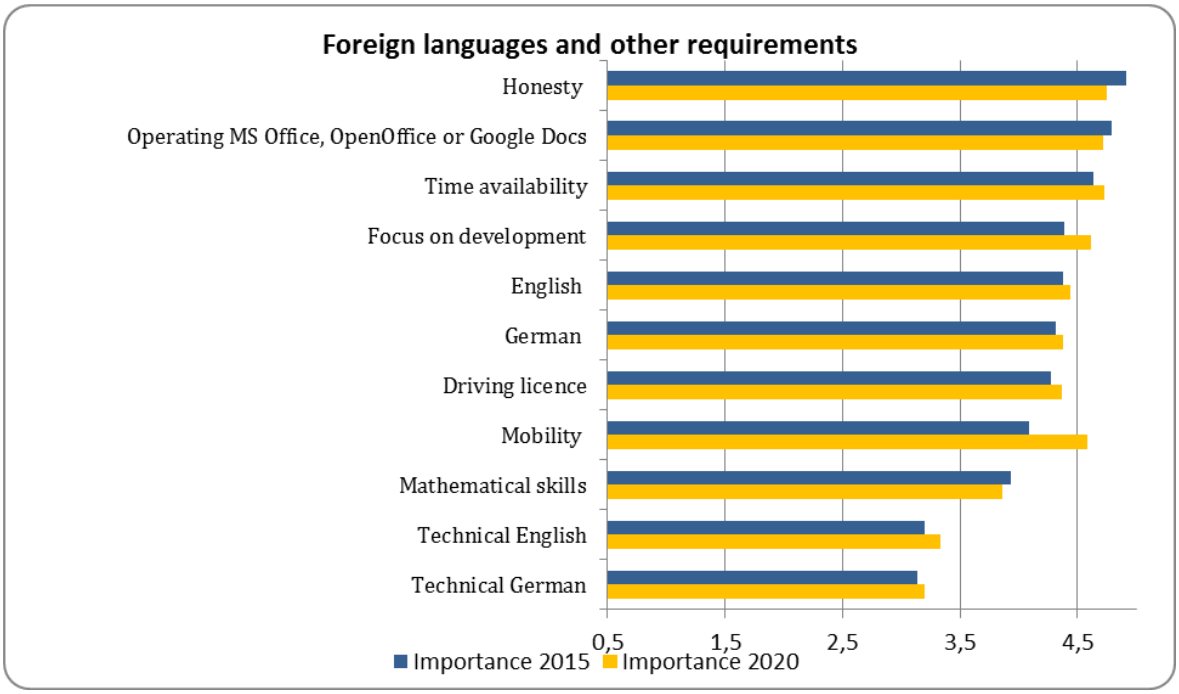

Figure 8. The construction sector. Predicted importance of competences in the area of "Languages and other requirements" in the eyes of employers in the years 2015 and 2020.

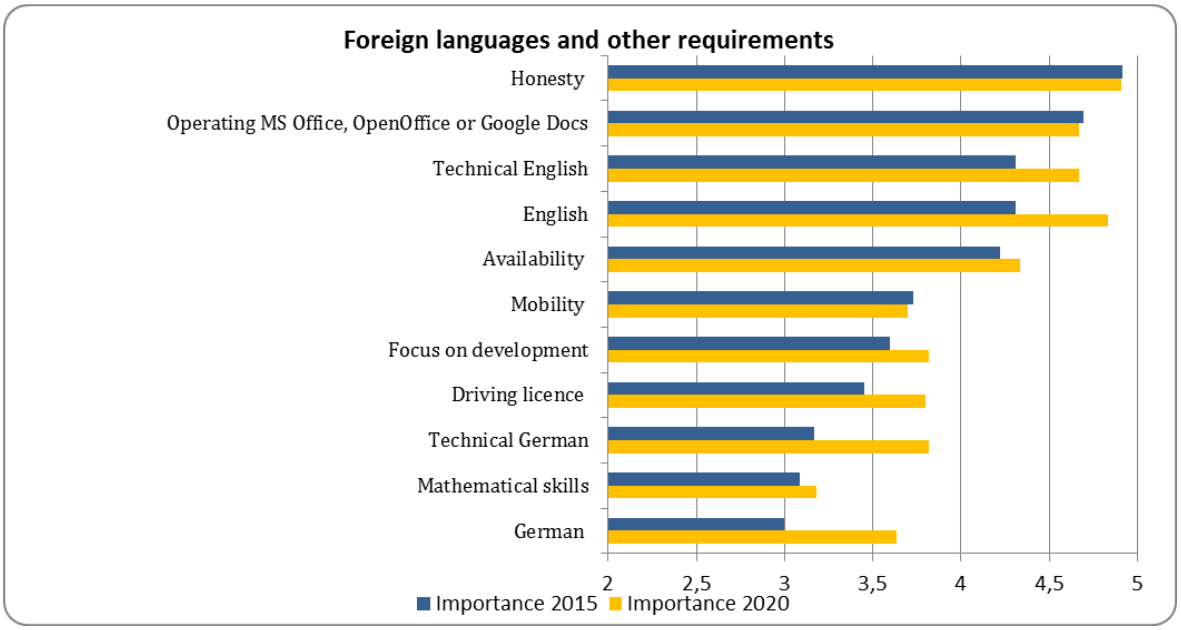

Figure 9. The architectural sector. Predicted importance of competences in the area of "Languages and other requirements" in the eyes of employers in the years 2015 and 2020.

We also asked employers to provide competences that are crucial in the context of professional promotion. They are listed in the table below.

List of competences/requirements that are essential in the context of promotion

Construction sector	Architectural sector
Focus on development	Diligence
Ability to work/cooperate in a group	Honesty
Loyalty	Engagement
Honesty	Learning, focus on development
Commitment	Operation of specialist programs
Availability	Independence
Mobility	Reliability
Knowledge of English	Creativity
Focus on goals	Loyalty
Diligence	English
Initiative	Conceptual design
Expertise	Technical design
Adaptability	Building permits
Independence	Work organization
Organization of working time, time management	Ability to make decisions
Specialist skills	Personal culture
Openness	Availability
Contact with customers, building relationships	Communication
Ambition	Punctuality
Group management	Initiative
Knowledge of specialist programs	Customer orientation
Responsibility	Team work
	Innovation
	Resourcefulness
	Practical knowledge
	Expertise
	Responsibility
	Flexibility

Table 7. List of key competences for graduates to obtain promotion

Most of the competences identified by employers in both sectors of relevance for promotion are related to soft skills and a certain attitude. This is important information, indicating the role of these particular characteristics for the career development of graduates.

KEY COMPETENCES FOR THE SECTOR

One of the most important indicators of the perception of the education market from the point of view of employers is the comparison of the importance of specific competences with the difficulty in obtaining them. As shown by the data presented in Table 8 and Table 9, the twenty most important competences include those which are readily available on the labour market (green), as well as those which are difficult to obtain (red). Following this line of thought, key competences – from the point of view of supply and demand – include competences that industry representatives consider important yet are difficult to obtain, as they are particularly scarce. Thus, in the case of the construction sector, it can be said that in comparison with other analysed sectors, the situation is fairly optimistic. Key, though difficult to obtain, competences include: **investment management, initiative/entrepreneurship** and **innovation/creativity**. There is a more difficult situation in the architectural sector, where it is generally more difficult to acquire relevant competences in the labour market. The competences most difficult to obtain are: **organizing one's own work, focus on goals, knowledge of energy-saving technologies**

and the ability to develop project documentation. The result is more surprising, as according to the conducted interviews, there is no shortage of university graduates on the labour market. It seems, therefore, that these results are affected by, on the one hand, increased standards of performance and, on the other hand, the fight that is taking place within the sector for the most valuable graduates (not only with local or national competitors).

20 core competences (requirements) today	Importance	Difficulty in obtaining
Honesty	4.92	2.82
Knowledge of building materials	4.83	3.13
Operation of MS Office, OpenOffice or Google Docs	4.79	1.92
Initiative/entrepreneurship	4.71	3.69
Organization and supervision of work	4.70	3.30
Work safety	4.67	2.89
Commitment	4.67	3.00
Availability	4.64	3.09
Construction of buildings and installations	4.61	3.19
Operation of CAD / CAM / CAE design programs	4.60	3.10
Innovation/creativity	4.60	3.58
Learning	4.58	2.70
Coping with stress	4.58	3.27
Organizing one's own work	4.57	3.15
Cooperation	4.57	3.33
Adaptability	4.55	3.20
Quality assessment	4.50	3.22
Investment management	4.50	3.75
Concern for quality/conscientiousness	4.50	3.38
Project documentation	4.44	3.37

Table 8. Construction sector. Twenty core competences and the difficulty in obtaining them. Green shows competences readily available in the labour market, red shows the ones that are the most difficult to obtain.

20 core competences (requirements) today	Importance	Difficulty in obtaining
Honesty	4.92	3.50
Oral communication	4.86	3.75
Concern for quality/conscientiousness	4.78	3.89
Design of residential and non-residential buildings	4.77	3.92
Operation of CAD / CAM / CAE design programs	4.71	2.83
Operation of MS Office, OpenOffice or Google Docs	4.69	2.91
Project documentation	4.67	4.05
Focus on goals	4.67	4.22
Learning	4.60	3.40
Organizing one's own work	4.58	4.40
Analytical skills	4.56	3.89
Contextual design	4.53	3.93
Architecture	4.50	3.56

Knowledge of energy-saving technologies	4.50	4.17
Commitment	4.50	3.89
Operation of 3D design programs	4.37	3.23
Cooperation	4.36	3.81
Knowledge of building materials	4.35	3.79
Urban design and landscape architecture	4.31	3.31
English	4.31	3.17

Table 9. Architectural sector. Twenty core competences and the difficulty in obtaining them. Green shows competences readily available in the labour market, red show the ones that are the most difficult to obtain.

Below we present graphs reflecting the importance of and the difficulty in obtaining individual competences in the four aforementioned groups (specialist knowledge and skills, business knowledge and skills, soft skills, languages and other requirements).

In the case of the construction sector, in the area of specialist knowledge and skills, there is quite a significant variation in terms of the difficulty in obtaining competences in the labour market (Fig. 10). Among the most important competences, the following are relatively easy to obtain**: knowledge of building materials, ability to organize and supervise work, knowledge of building and installation construction and operation of CAD / CAM / CAE design programs.** It is more difficult, but still easier than in other analysed sectors, to obtain competences related to: **automatic installation, electrical installation, knowledge of energy-saving technologies, renovation, conservation and restoration of buildings and modelling information on buildings and structures (BIM).**

In the case of the architectural sector, the situation is slightly different (Fig. 11). The following competences are relatively easy to obtain: **operation of CAD / CAM / CAE design programs, architecture, operation of 3D design programs, interior design** and **building inventory**. It is more difficult to obtain competences in the field of: **design of residential and non-residential buildings, project documentation, contextual design** or **knowledge of energy-saving technologies.**

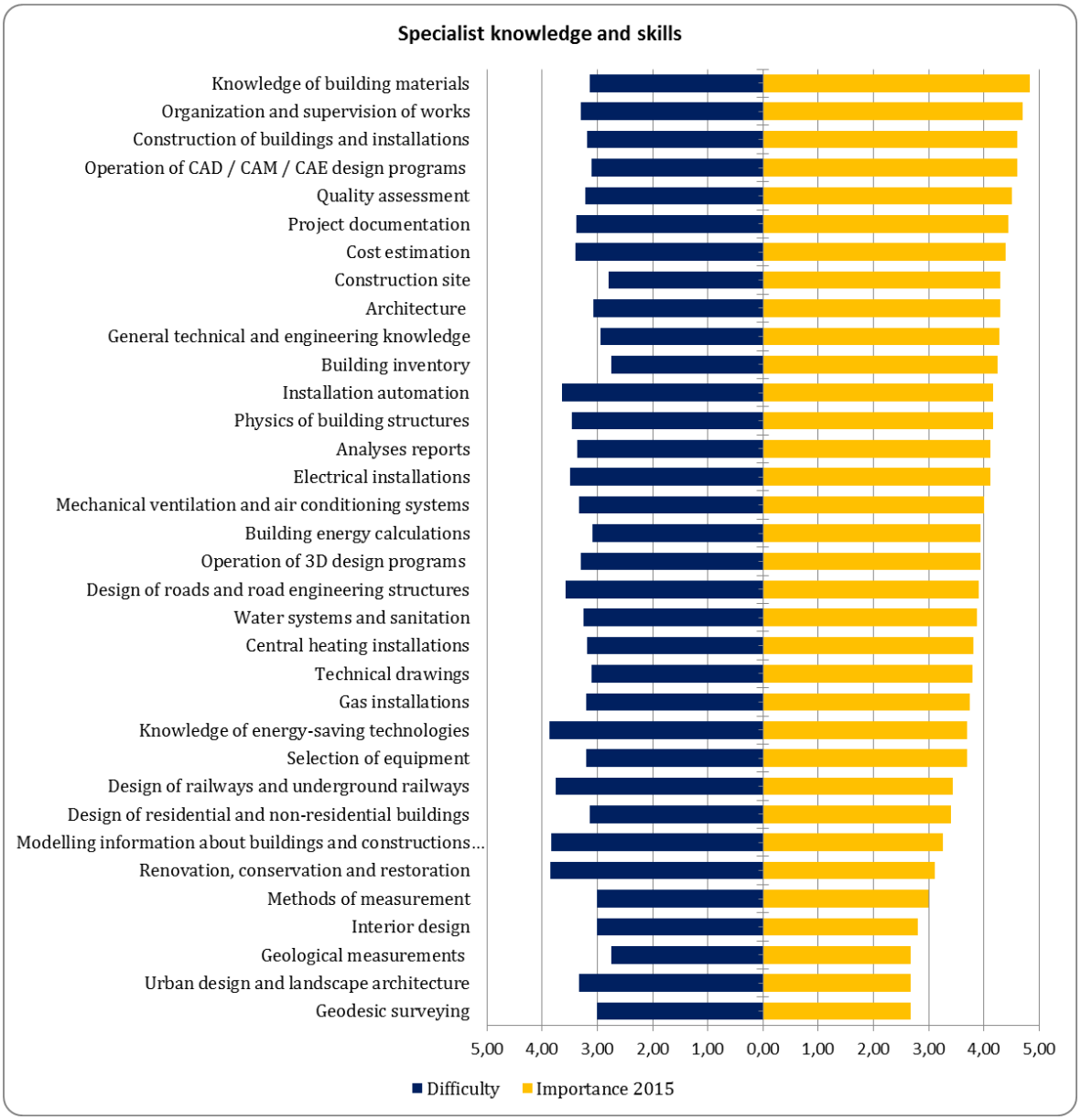

Figure 10. The construction sector. The importance of and the difficulty in obtaining competences in the area of "Specialized knowledge and skills" in the eyes of employers.

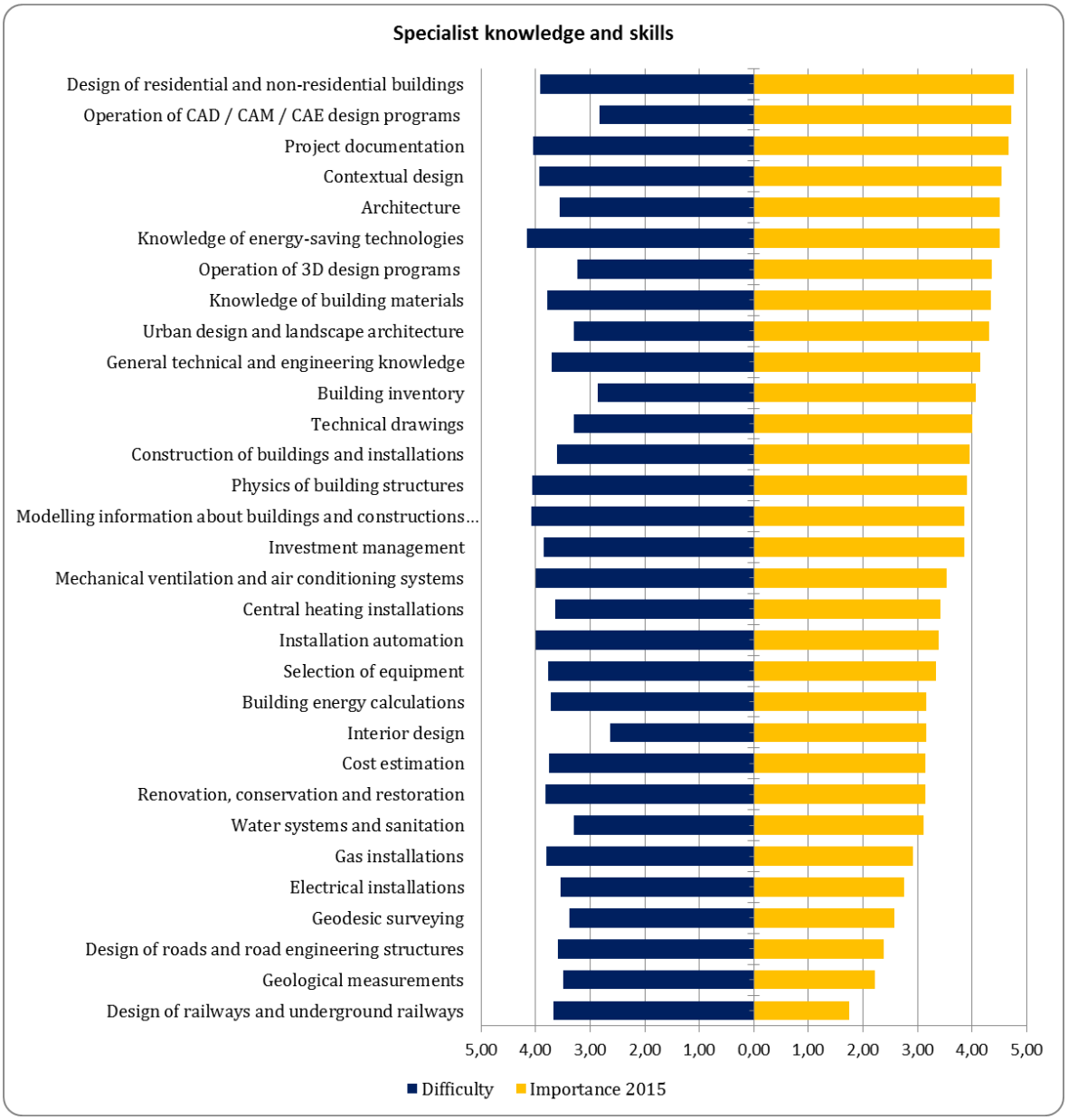

Figure 11. The architectural sector. The importance of and the difficulty in obtaining competences in the area of "Specialized knowledge and skills" in the eyes of employers.

In the construction sector, in the area of business knowledge and skills (Fig. 12), it is worth noting that the most valuable competence related to **work safety** is also one of the more easily accessible in this group**. General knowledge of the industry** and **the ability to prepare business proposals** is also relatively easily to obtain. Competences that are difficult to obtain and very important from the point of view of employers include: **investment management, economics** and **knowledge of standard project management methodologies**.

In the architectural sector (Fig. 13), competences that are relatively easily available include: **knowledge of new trends, work safety** and **project presentation**. The most difficult to obtain are competences related to: **project and team management, knowledge of standard project management methodologies, economics, knowledge of industry law** and **legal regulations and civil law.**

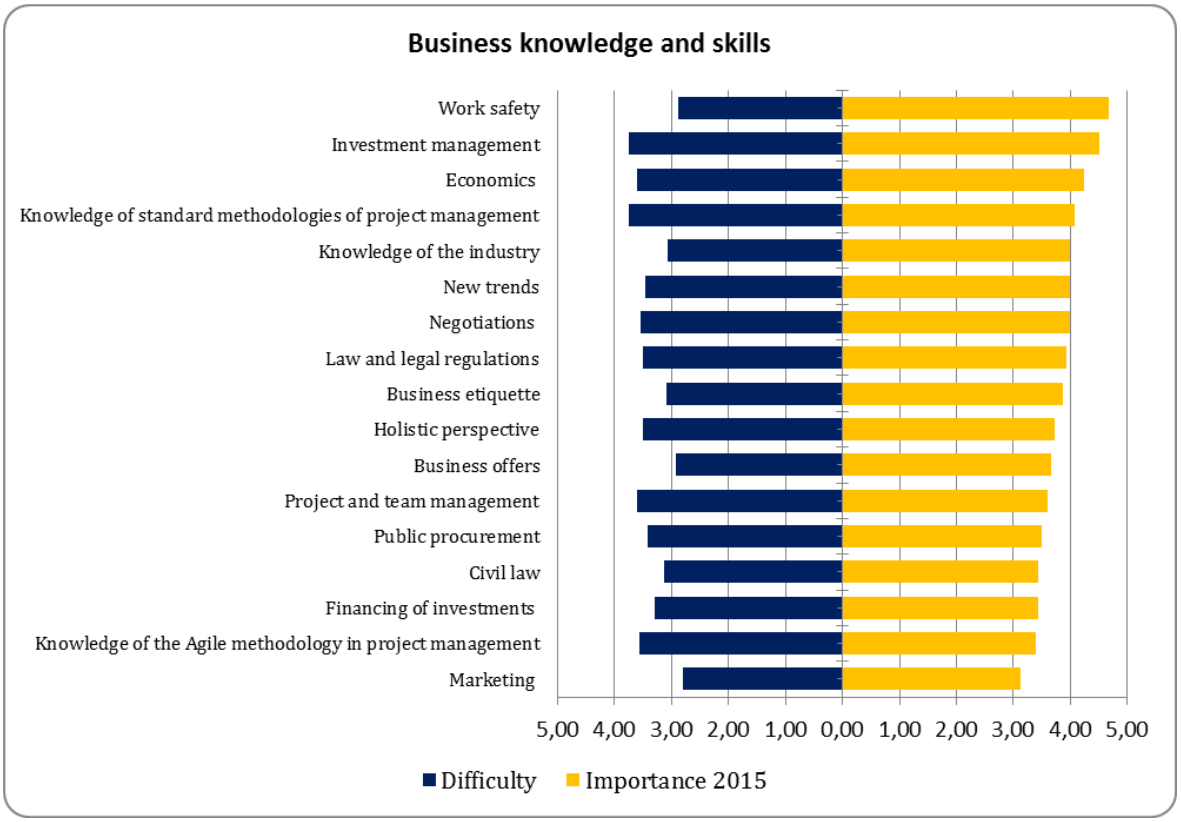

Figure 12. The construction sector. The importance of and the difficulty in obtaining competences in the area of "Business knowledge and skills" in the eyes of employers.

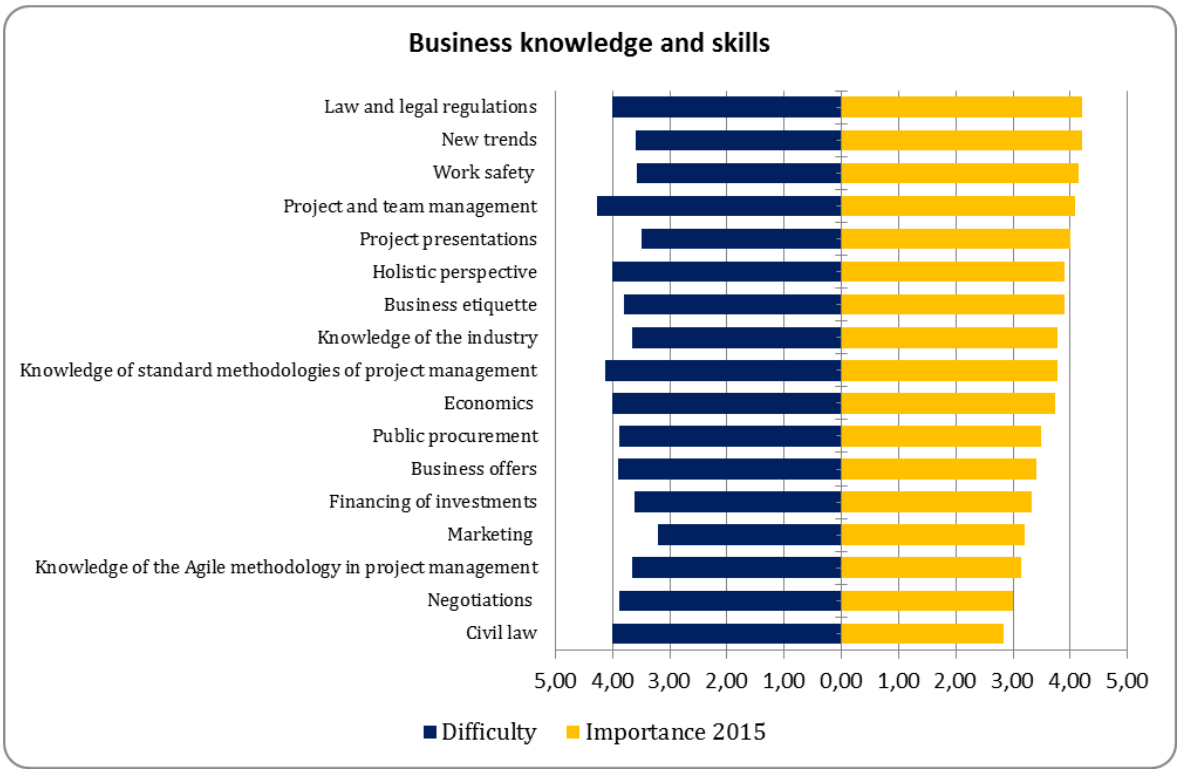

Figure 13. The architectural sector. The importance of and the difficulty in obtaining competences in the area of "Business knowledge and skills" in the eyes of employers.

In the area of soft skills, there are some differences between the construction and architectural sector (see Fig. 14 and 15). While in both cases, these competences are highly evaluated as to

their importance, when it comes to the difficulty in obtaining them, the situation in the construction sector is slightly more optimistic than in the case of architecture. Construction companies have difficulties in obtaining employees with high **initiative/entrepreneurship** and **creativity/innovation**. Whereas architectural companies complain about the shortcomings of graduates in terms of **initiative/entrepreneurship, organization of one's own work** and **focus on goals**. It seems that these results are directly related to the specific nature of work in each of the analysed sectors.

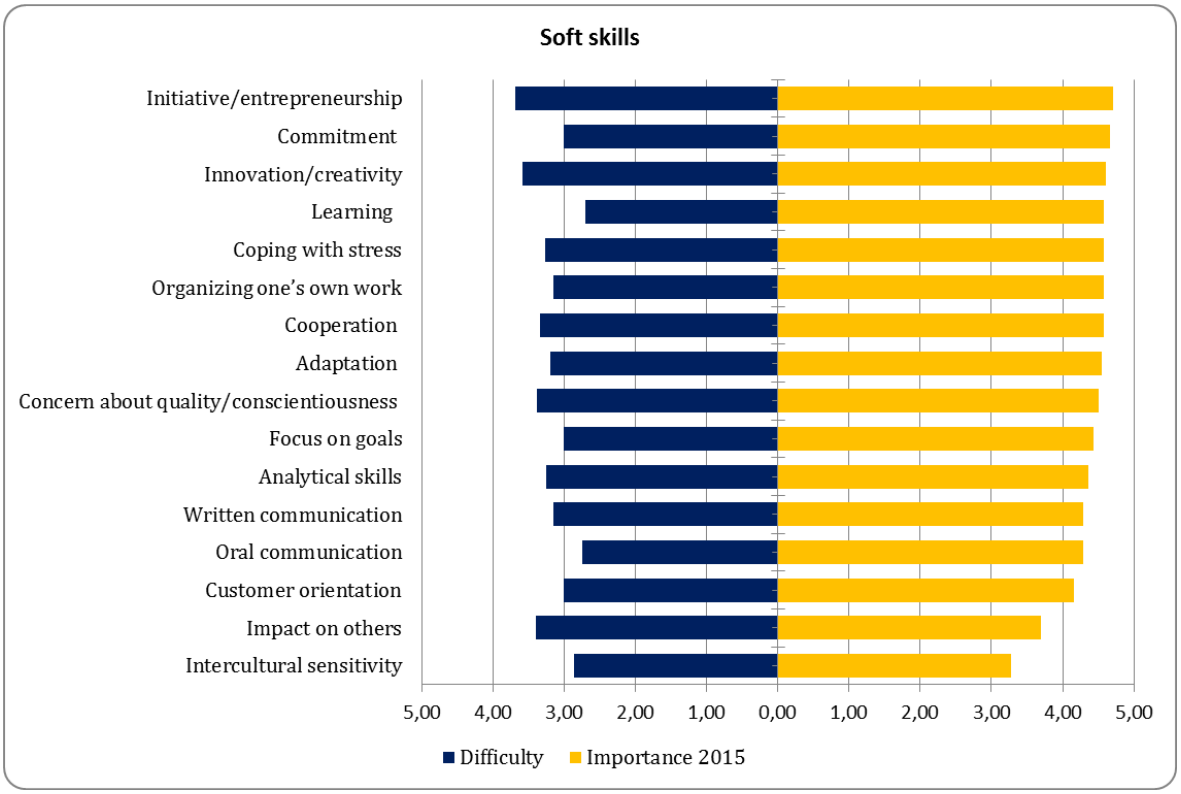

Figure 14. The construction sector. The importance of and the difficulty in obtaining competences in the area of "Soft skills" in the eyes of employers.

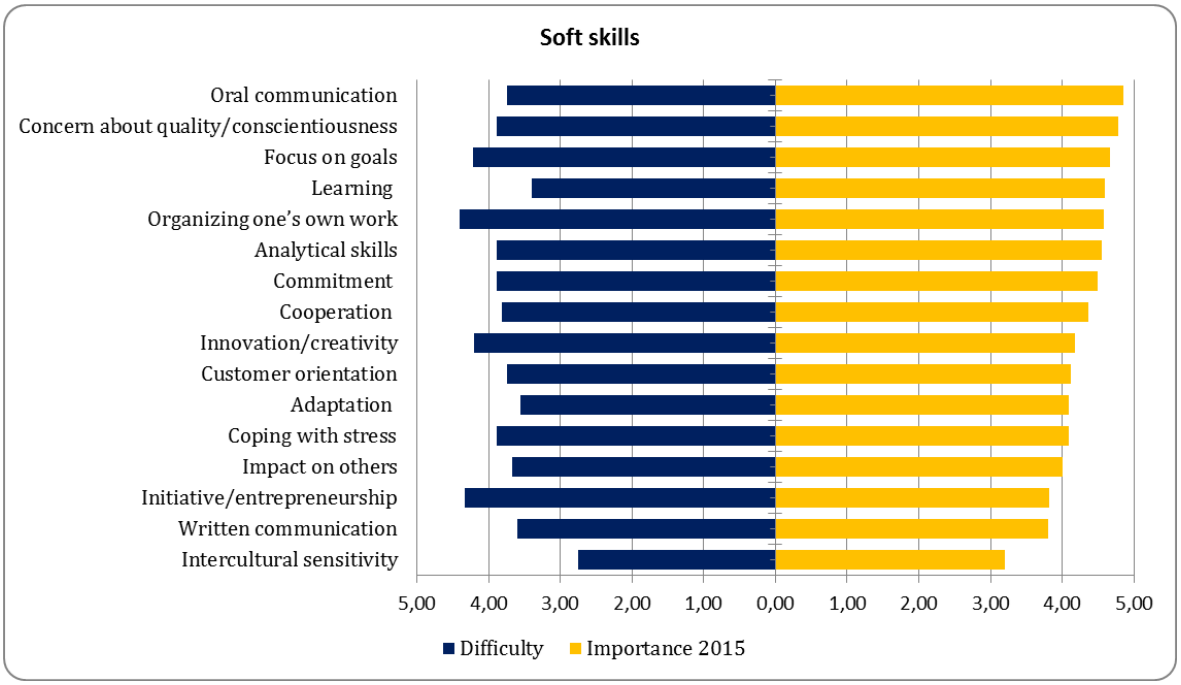

Figure 15. The architectural sector. The importance of and the difficulty in obtaining competences in the area of "Soft skills" in the eyes of employers.

As regards other requirements, **honesty** is the core competency in both sectors, as in the vast majority of sectors that have already been analysed (see Fig. 16 and 17). In construction, its availability is assessed by employers as quite high, whereas in the case of architecture, it is one of the most difficult to obtain. This situation may be related to the fact that honesty is often assessed in the context of loyalty to the employer, which is much easier to obtain in the case of a contract of employment.

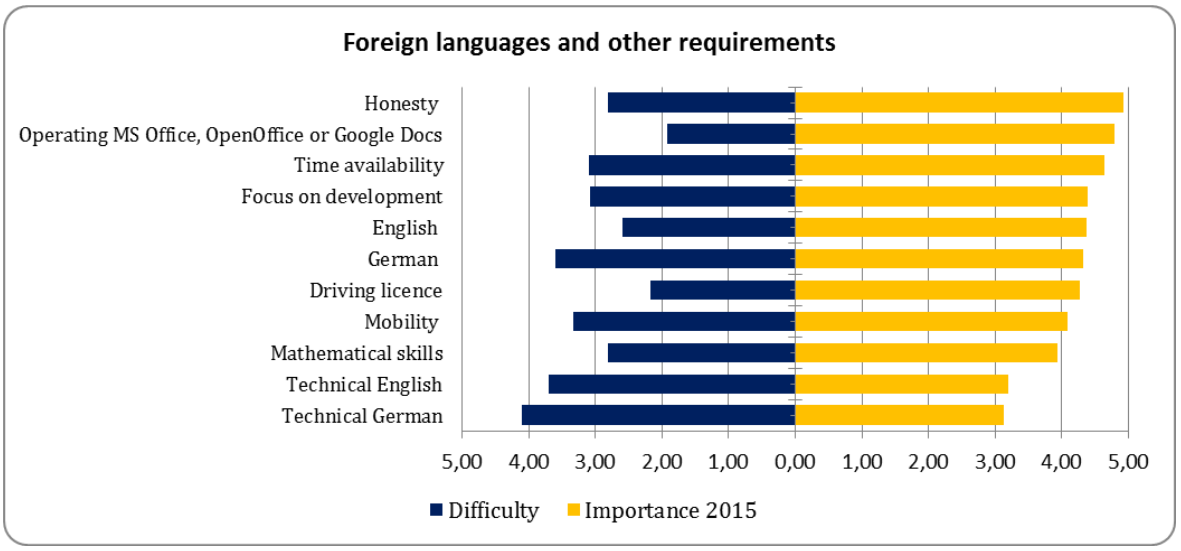

Figure 16. The construction sector. The importance of and the difficulty in obtaining competences in the area of "Foreign languages and other requirements" in the eyes of employers.

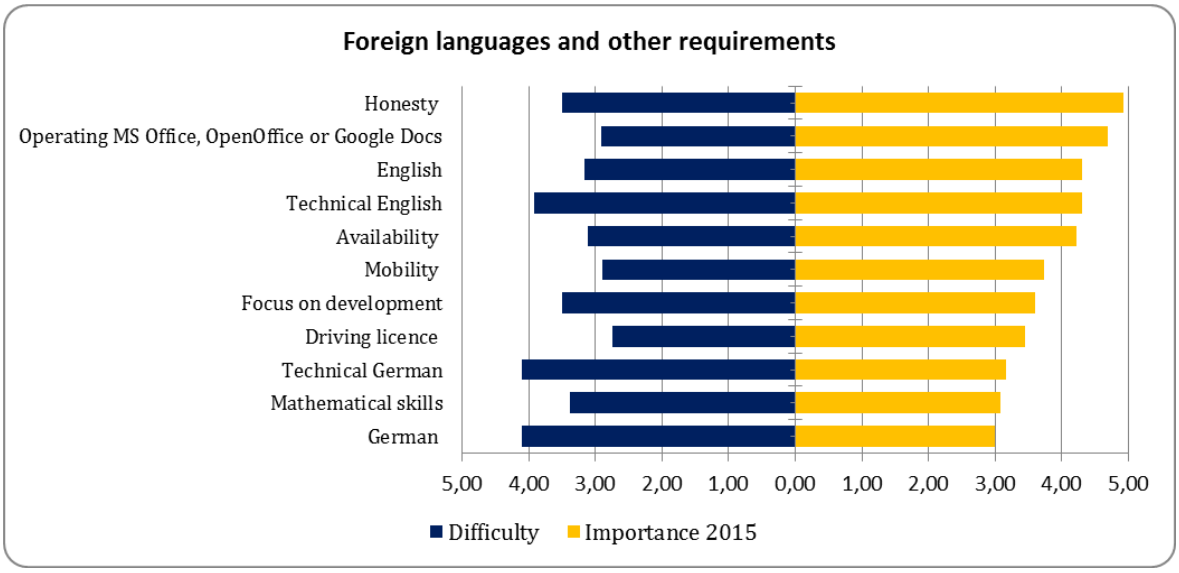

Figure 18. The architectural sector. The importance of and the difficulty in obtaining competences in the area of "Foreign languages and other requirements" in the eyes of employers.

The surveyed companies reported some additional competences and requirements with regard to graduates. Some of them coincided with the competences included in the original lists, but sometimes they are defined slightly differently, and for this reason, it is worth paying attention to them. In the case of the construction sector, some of the additional competences refer to the sector of passive and energy-efficient construction, which was discussed in a separate report in 2013 and has not been analysed in detail this year.

Additional competences/requirements identified by employers in the construction sector	**Additional competences/requirements identified by employers in the architectural sector**
French	Russian
Chinese	General knowledge
Spanish	Reliability, accuracy
Technical and social security	Conceptual thinking
Availability	Hand drawing
Design	Knowledge of 3D Studio Max
Design of wooden buildings	Knowledge of CAD
Knowledge of natural materials	Artistic skills
Frame buildings	General personal culture
Wooden building materials	Town planning
	Spatial planning
	Making mock-ups
	Graphics, computer graphics
	Manual skills

Table 10. List of additional competences important in the analysed sectors.

SUPPLY ANALYSIS: LEARNING OUTCOMES IMPORTANT FOR THE SECTORS

The analysis of learning outcomes achieved in the fields related to the analysed sectors is rather complicated. By definition, learning outcomes relate to the "average student", which, in practice, means that graduates leaving university include both those who are better and worse prepared than the average score suggests. In the case of the construction and architectural sectors, despite their specific nature, a large part of the competences coincide. The same applies to the fields of study, from which the staff is recruited. This results from the fact that **architectural companies also employ graduates of construction, and construction companies recruit architects and designers.** However, the interpretation of the results requires some caution. For example, **the fact that architectural companies value skills related to the design of industry installations does not mean that they expect these skills to be taught at the faculty of architecture**. However, for the development of the sector, it is necessary that qualified graduates of faculties directly related to construction, etc. were present on the labour market. Therefore, it was decided that the analysis of the supply of competences will be conducted jointly for both analysed sectors, similarly as it was in the case of passive and energy-efficient construction. This solution is also supported by the relatively low return of questionnaires from universities – combining them in the analysis provides more stable results.

At a general level, the responses of companies and universities concerning the quality of education seem to be consistent. Representatives of both communities seem to appreciate the positive changes in the educational programmes, while highlighting the negative phenomena associated with the approach of the students to the learning process. Excessive generalization would be harmful to this environment, but the opinions of representatives of companies and universities emphasize the smaller involvement and motivation of a large group of students and graduates, which also affects the results achieved in terms of learning outcomes. This does not mean, however, that the number of well-prepared graduates has decreased. The aforementioned observations only indicate the fact that a growing number of graduates do not fully exploit the opportunities that are offered to them by both companies and universities.

According to representatives of universities, the following years will see a decline in the number of graduates (approx. 16% on average) – reductions will include mostly part-time studies (approx. 20%).

The following table lists the fields of study which have been identified by representatives of companies as most adjusted to their expectations. Interestingly, a high number of companies taking part in this year's research indicated fields of study at universities other than in Kraków (including Rzeszów University of Technology, Warsaw University of Technology, University of Technology in Gliwice and the Silesian University of Technology). Among Kraków universities, the following were most often mentioned: Cracow University of Technology, AGH University of Science and Technology, University of Agriculture and Kraków University.

Fields of study/specializations/profiles[31] most often mentioned by companies in the sector as adjusted to their expectations
Construction; Intelligent building objects; Technology and organization of construction; Engineering structures
Architecture: town planning; designing
Environmental engineering; Environment protection; Renewable Energy Engineering
Installations; Sanitary installations; Sanitary and heating installations; Refrigeration; Heating and air conditioning; Air Conditioning and Refrigeration; Heating
Civil engineering
Energy sector
Building automation; Automation/Electronics; Mechanical engineering; Electrotechnics
Geodesy
IT

Table 11. List of fields of study, specializations and study profiles indicated by employers as providing education adjusted to the needs of the sectors.

The acquisition of individual learning outcomes in each of the four competence groups will be presented in several diagrams below. These will not be average responses, as in the case of the demand for competences, but a percentage of the surveyed fields of study where the given learning outcome is achieved at least at an average level. This is related to the fact that, apart from certain post-graduate courses and a small number of specialized courses, the curriculum rarely includes most of the competences important for the sector. Learning outcomes within the fields of architecture and construction also have their own characteristics, which is better reflected in the presentation of percentage data. On the other hand, the curricula often include learning outcomes that are not particularly important for a given sector (hence, the unfair assessment frequently made by business representatives that graduates possess a lot of useless knowledge – this knowledge may be applied in other sectors). The use of an average or weighted average would artificially lower the results and fail to provide a complete picture of the supply of competences.

As part of the curriculum of the analysed fields of study, the learning outcomes most often achieved within the area of sector knowledge and specialized skills include: **general technical and engineering knowledge, quality assessment, technical drawing** and **the operation of CAD / CAM / CAE design programs.** More than half of the analysed competences are taught at least at an average level in a minimum of 50% of fields/specializations related the analysed sectors. The analysed fields of study least frequently teach **design of railways and underground railways, electrical installations, road design** and **road engineering structures and cost estimation** (Fig. 18).

In terms of business knowledge and skills (Fig. 19), all, or almost all, curricula include issues related to **new trends, work safety, general knowledge of the sector** and **industry law and legal regulations**. At the other extreme, there are: the preparation of **business offers, knowledge of "agile" project management methodologies, civil law** and **negotiations**.

[31] The original names provided by entrepreneurs have been maintained; different categories are not always mutually exclusive. The results have been supplemented by desk research analysis.

According to the representatives of universities, other competences from the area of business knowledge and skills are taught at an average level in more than half of the fields of study.

In the area of soft skills (Fig. 20), all the competences are taught at more than half of the courses related to the sectors. All the fields of study, according to representatives of the universities, teach **group work,** less frequently **customer orientation** and **goal orientation**.

With regard to other requirements (Fig. 21) – all the analysed fields of study provide students with the **knowledge on operating office software**, and the vast majority teach the remaining competences: **honesty, focus on development** and **mathematical skills**. The fact that more and more universities declare the achievement of learning outcomes other than specialist knowledge and skills is quite an interesting trend, which has been observed from the beginning of the research on the study. We may safely assume that it is related to marketing and positioning, but we are also dealing with a real phenomenon. Three years ago, we often heard voices of outrage associated with the very fact of placing such questions in the survey on learning outcomes, whereas today they seem perfectly natural. The evaluation of obtaining this type of learning outcomes is not high (usually declared as an average level, and much less at a good or very good level).

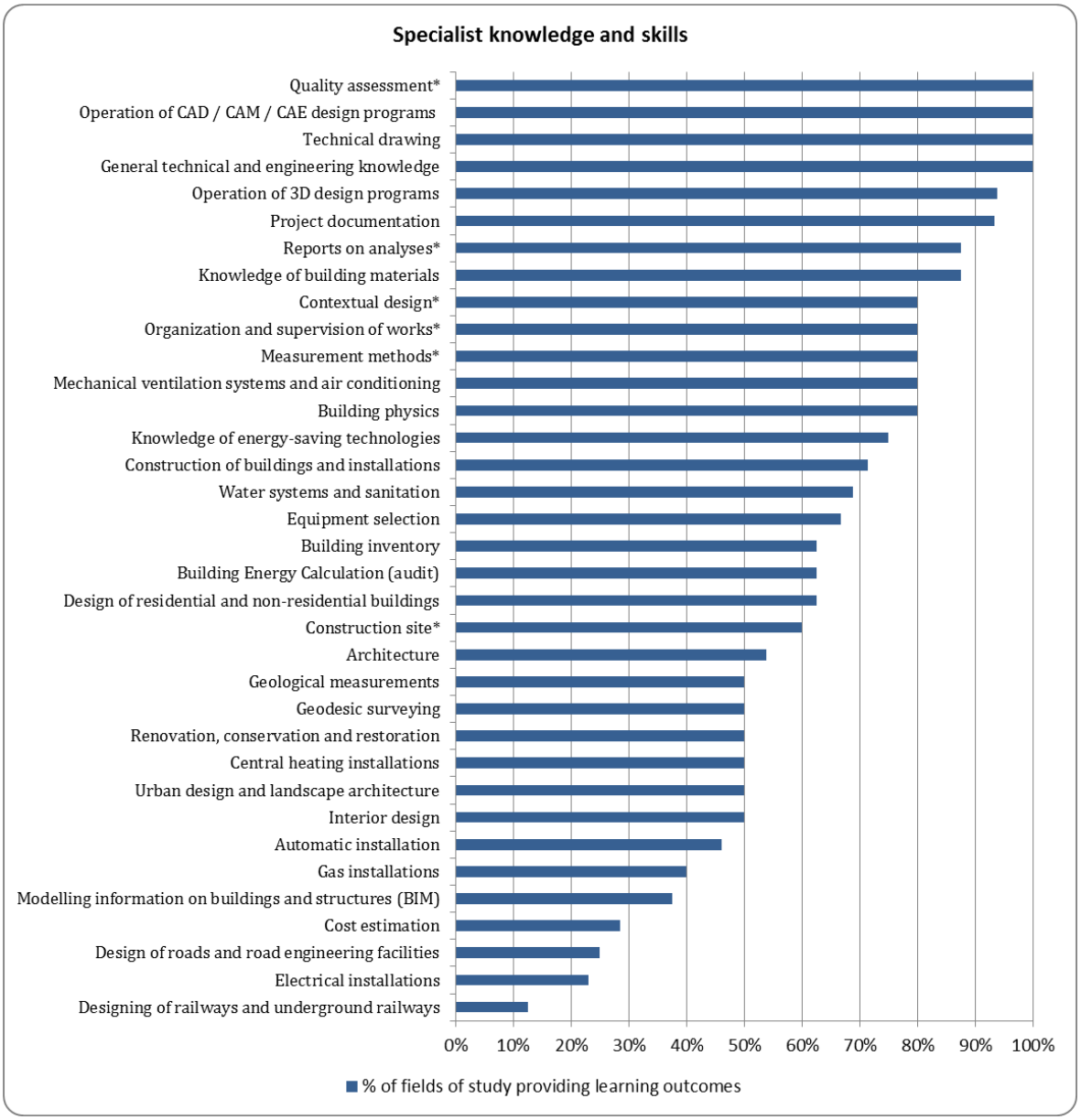

Figure 18. Percentage of fields of study and specializations which provide learning outcomes in the area of "Specialized knowledge and skills" at least at an average level (university perspective). * Indicates those learning outcomes which were evaluated exclusively by representatives of architecture or construction.

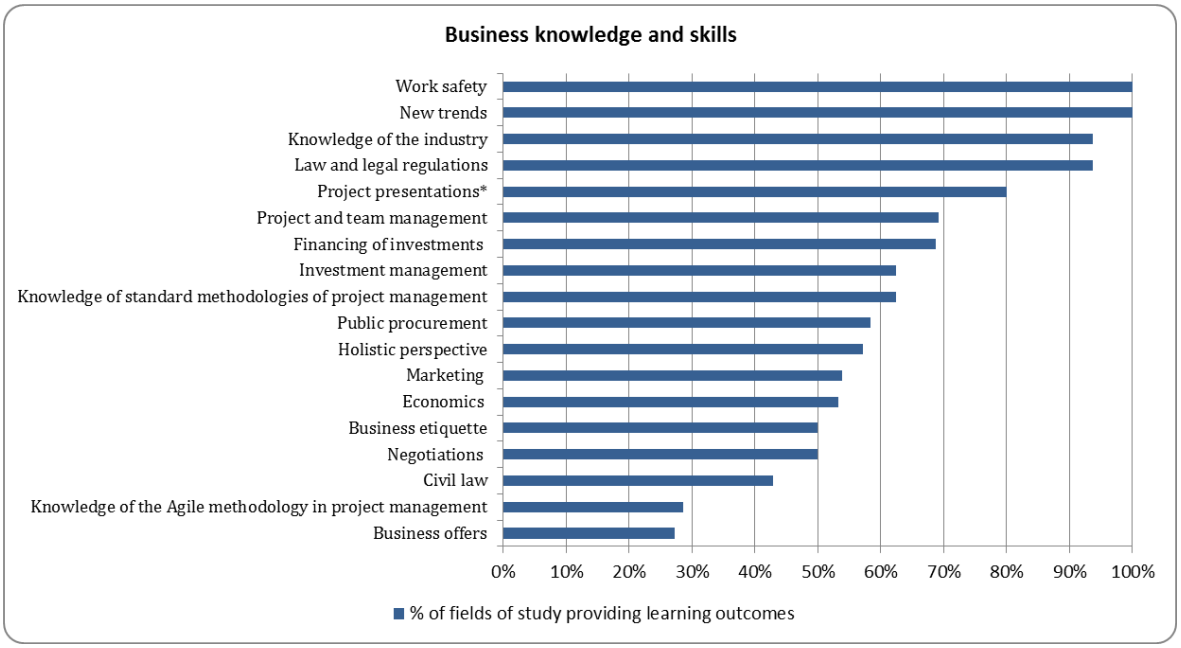

Figure 19. Percentage of fields of study and specializations which provide learning outcomes in the area of "Business knowledge and skills" at least at an average level (university perspective). * Indicates those learning outcomes which were evaluated exclusively by representatives of architecture or construction.

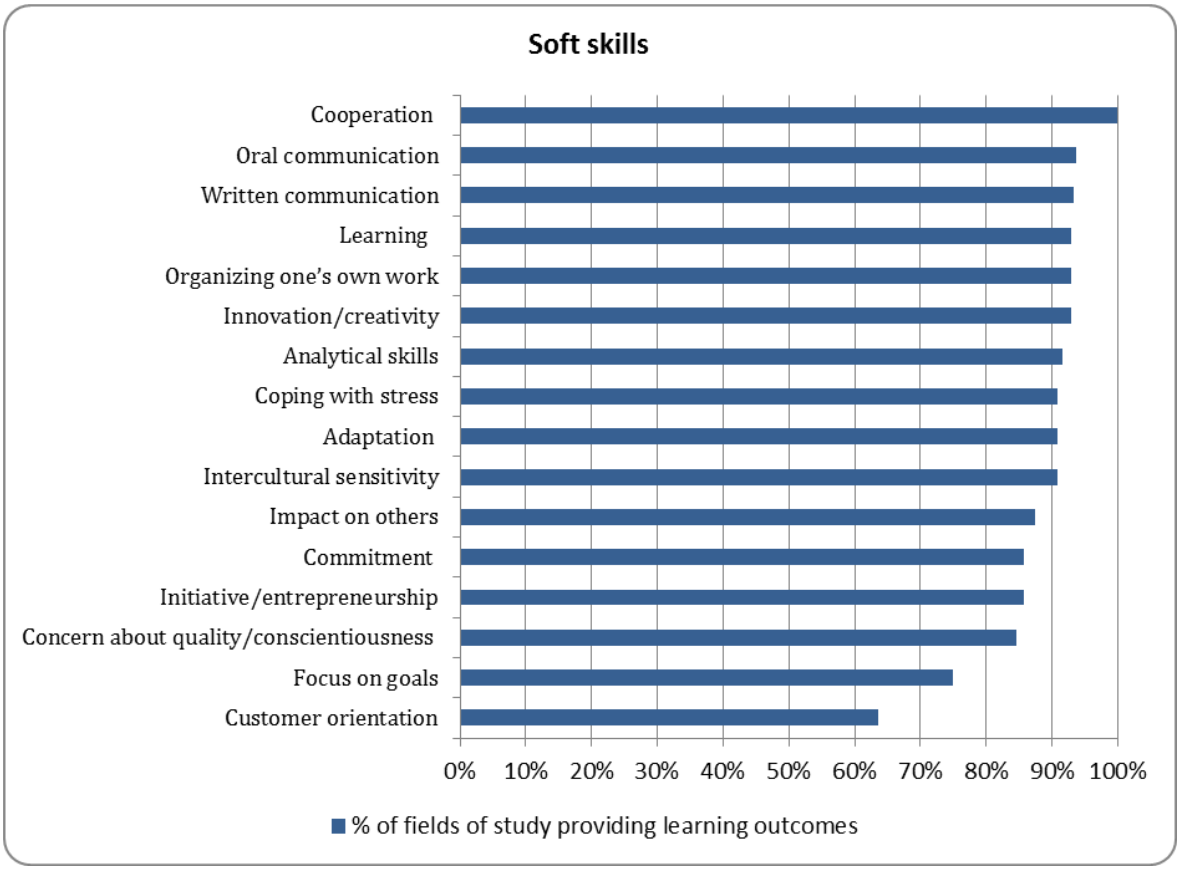

Figure 20. Percentage of fields of study and specializations which provide learning outcomes in the area of "Soft skills" at least at an average level (university perspective).

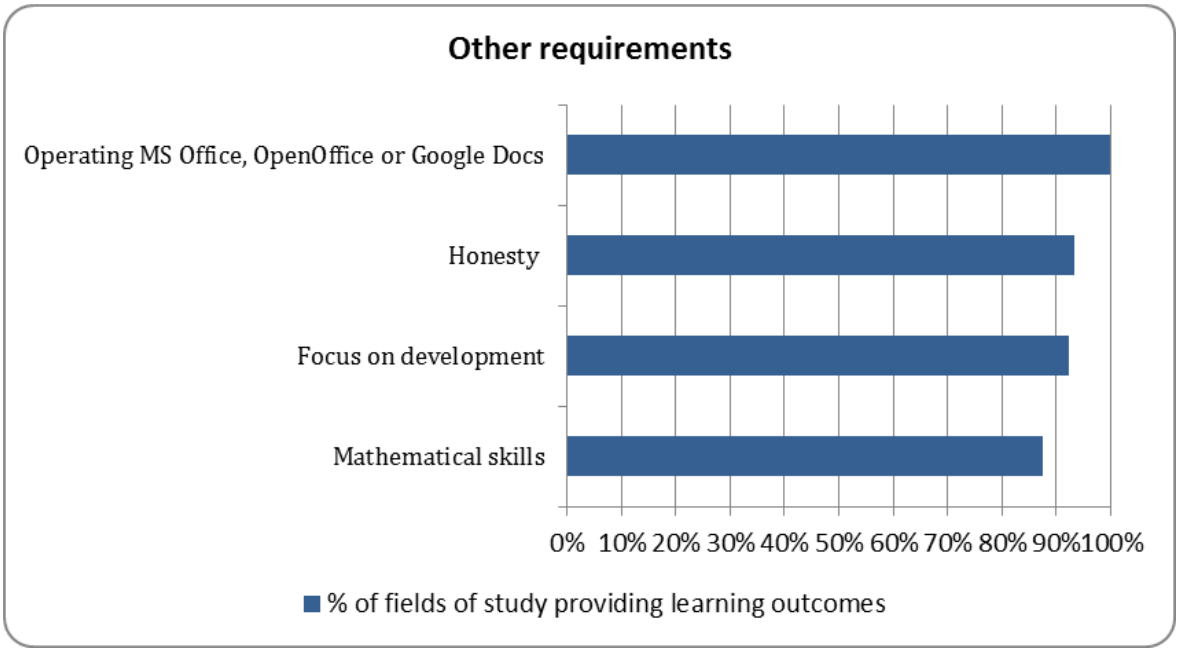

Figure 21. Percentage of fields of study and specializations which provide learning outcomes in the area of "Other requirements" at least at an average level (university perspective).

In summary, the analysis of the supply of competences shows that the fields of study and specializations involved in the study are able to achieve, at least at an average level, about half of the learning outcomes related to specialized knowledge and skills and most of the competences in the area of business knowledge and skills and soft skills. This situation is quite natural and should not be surprising, as individual companies often recruit graduates from different fields of study for diverse working positions. **Besides, it is impossible for one person to possess all the competences included in the sector list – especially if we take into account the specific nature of each of the analysed sectors**. Therefore, it should not be concluded that, for example, a graduate of architecture should possess all the mentioned competences, including those which are more important for the construction sector and vice versa. **It is important, however, that taking into account the investment process, graduates of different fields of study have core competences at least in the extent that allows for effective cooperation and practical use of expertise in different areas. Such synergy is necessary to meet the needs of customers and contribute to the development of the company**. This idea seems natural and is further confirmed by the Study of Competences comparing the expectations of companies with the learning outcomes. Taking into account the specific nature of the analysed fields of study and the fact that, to a large extent, they do not train graduates exclusively for the needs of the analysed sectors, we asked university representatives to identify additional learning outcomes that may be relevant to the employers. We present them in the table below.

Additional learning outcomes achieved in the fields related to the sector
Knowledge of the realities of the sector
Ability to interpret results and draw conclusions
Knowledge of the labour market
Ability to create multi-disciplinary teams
Fluent English in field literature
Building mechanics
Specialist knowledge of bar structures
Soil mechanics

Ability to use modern measuring equipment on-line

Table 12. List of additional learning outcomes

STUDY OF COMPETENCES: TRANSFER OF COMPETENCES FROM UNIVERISITES TO BUSINESS

Our demand analysis pointed to the key competences, from the point of view of the sector, trends concerning their importance in the future and the difficulties experienced by employers when recruiting graduates with specific knowledge and skills. The supply analysis, on the other hand, showed what kind of learning outcomes are achieved in the fields of study related to the sector and the complexity of training in this field. The following section presents a summary of these two perspectives, focusing on the comparison between the difficulty in obtaining the competences with the average level at which they are obtained at universities. Similarly to the study conducted in 2013, we would like to raise one important objection associated with the observed non-compliance of assessments related to the difficulty in obtaining competences and training provided at universities.

In the case of a perfect compliance of opinions of businesses and universities, we would deal with a situation in which competences which, according to employers, are difficult to obtain, are not taught, according to universities. In the case of the presented results, such compliance in the construction sector relates only to the training of specialized knowledge and skills (correlation r = -0.34[32]), and in the architectural sector, to business knowledge and skills (correlation r = -0.29). Other areas present a different relationship – virtually no connection between the declared difficulty/ease of acquiring competences with the obtained learning outcomes. We would like to stress that this does not mean that the "fault" lies exclusively on the part of universities, which inadequately assess their educational offer. Although to some extent, this may be one of the reasons for the differences in evaluations; other interpretations are equally plausible (they were described in last year's reports; a summary is presented below).

One of them is associated with the observed polarization of the development of HR processes in companies – problems with finding suitable candidates may therefore result from the use of inappropriate tools of recruitment and selection, remuneration policy or work introduction programmes (on boarding). The second reason may be the way in which learning outcomes are defined. They relate to the qualifications gained by the average student – this means that both better and worse graduates appear in the labour market. Another reason may be the fact that graduates of fields of study identified as adjusted to the profile of the sector are also employed in other sectors of the economy, in other cities and even outside the country. Although there is no official data on the size of this phenomenon, it is likely that engineers with better language skills more frequently find employment abroad as compared to those who did not decide to go. Furthermore, individual competences may also be understood differently by representatives of universities and business – what is satisfactory for the former may be below the acceptable minimum for the latter. Finally, not all the sought-after competences can or should be taught at universities. The presented results of the Study of Competences should therefore be treated as a

[32] The correlation (or Pearson's r) is a measure of the linear relationship of two variables, included in the range from -1 (perfect negative relationship – every increase in the first variable is accompanied by a proportional reduction in the size of the other variable), through 0 (total lack of relationship – every increase in the first variable is accompanied by a random change in the size of the other variable) to 1 (perfect positive relationship – every increase in the first variable is accompanied by a proportional increase in the size of the other variable).

tool that may be used by both universities and companies to establish effective co-operation and initiate discussion on the curriculum.

Figures 22 and 23 show the relationship between the difficulty in acquiring specific competences and the obtained learning outcomes in the area of twenty core competences in each of the sectors (if, among the 20 core competences, there were competences not analysed on the supply side – e.g. availability and mobility, they were replaced with the next most important competences from the list). The graph includes a range of presented values, which allows for a clear presentation of the division into the most difficult and relatively easier to acquire competences and the division of the outcomes obtained in a greater and lesser extent (otherwise, most of the competences should be considered as difficult to obtain and taught simultaneously).

The results in the construction sector show the convergence of company and university ratings in the area of such competences as **operating office software** (taught and readily available) and, among others, **investment management, innovation/creativity and initiative/enterprise** (less accessible and taught to a lesser extent). The largest differences relate to a number of key competences that are relatively difficult to obtain and, at the same time, are provided for by universities. This situation applies to, among other things, **project documentation, organization and supervision of work, knowledge of building materials or operation of CAD / CAM / CAE design programs.** It is worth noting that compared with other sectors, the difficulty in acquiring these competences in the labour market is not particularly high.

The situation is different in the architectural sector. Companies and universities present similar ratings concerning such competences as: **operation of CAD / CAM / CAE design programs, operation of 3D design programs and office software** (taught and relatively easy to obtain) and **focus on goals, design of residential and non-residential buildings** or **concern for quality/conscientiousness** (difficult to obtain and taught less frequently). The discrepancy relates to such competences as **architecture and urban design** (easy to obtain and not frequently taught; the result is probably the consequence of combining the fields of study originally classified as construction and architectural in the supply analysis) and, for example, **knowledge of building materials, project documentation and organizing one's own work** (taught and difficult to obtain).

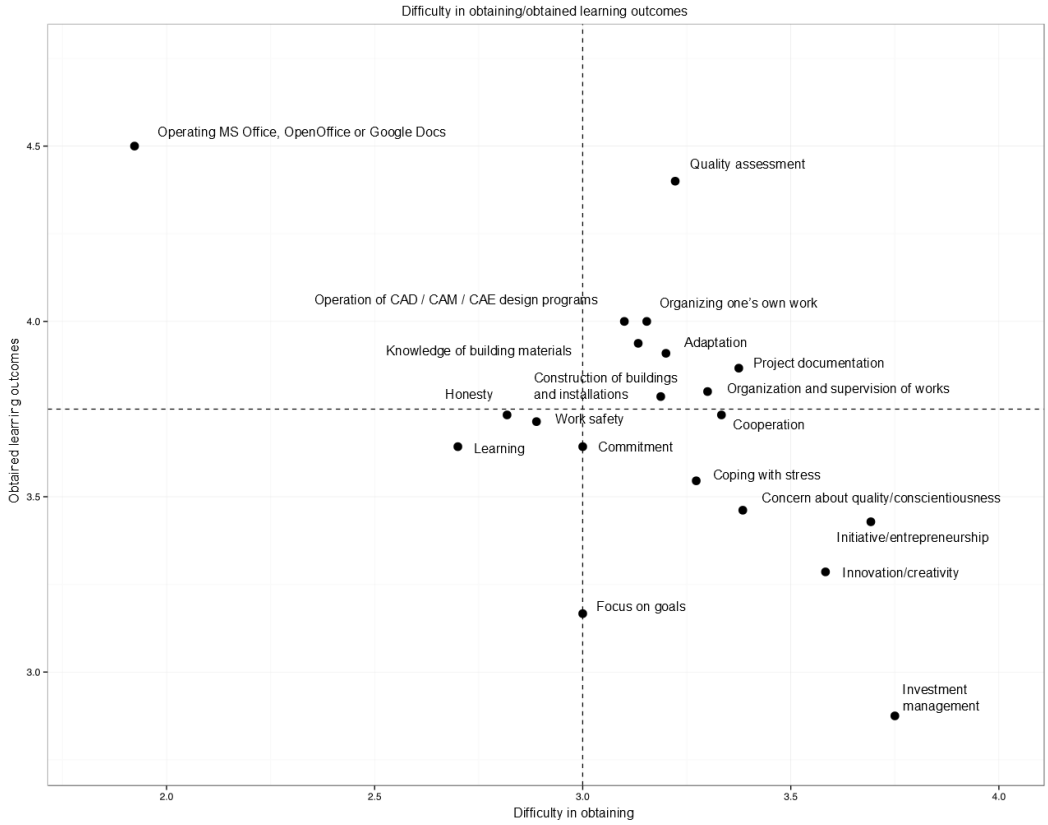

Figure 22. The construction sector. Matrix illustrating the relationship between the difficulty in acquiring specific competences (the employers' perspective) and the obtained learning outcomes (university perspective) for the 20 core competences. For better understanding of the graph, a trimmed scale has been used (from 2.0 to 4.0 for the difficulty and from 3.0 to 4.5 for the obtained outcomes).

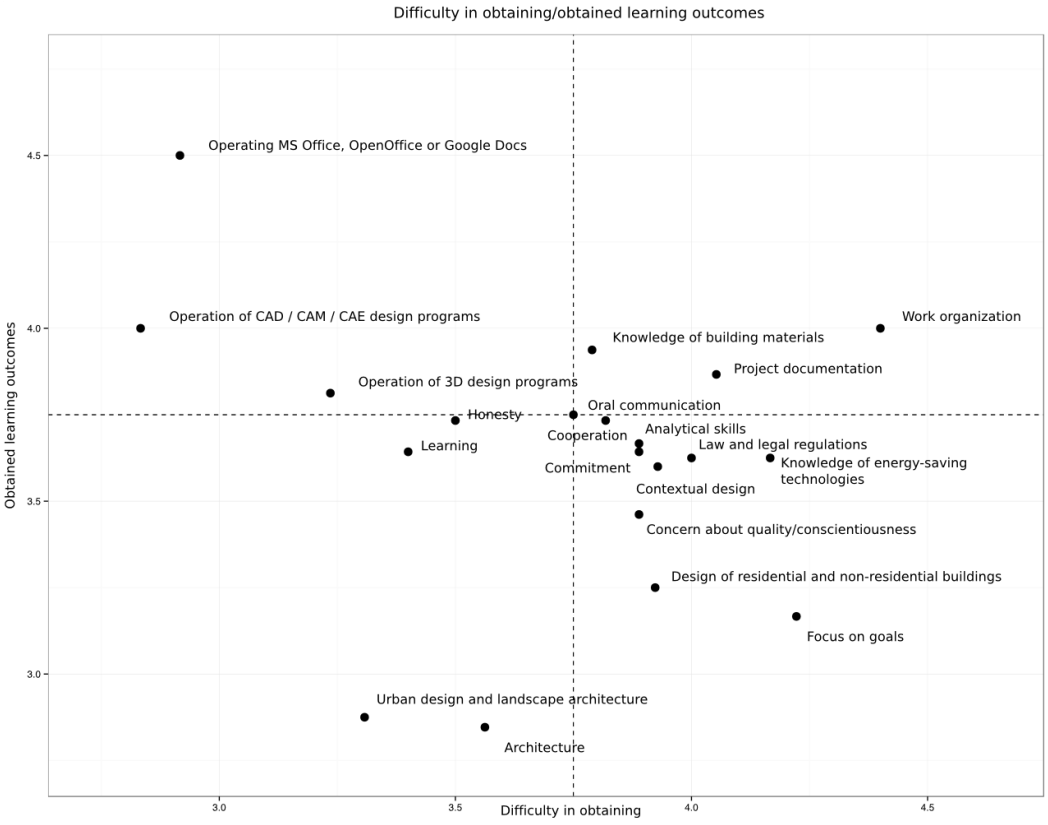

Figure 23. The architectural sector. Matrix illustrating the relationship between the difficulty in acquiring specific competences (the employers' point of view) and the obtained learning outcomes (university point of view) for the 20 core competences. For better understanding of the graph, a trimmed scale has been used (from 2.5 to 4.5).

In the construction sector, in the area of specialized knowledge and skills, there is a direct, although moderate, relationship between the assessment of the degree of implementation of learning outcomes at universities and the difficulty in obtaining them according to the employers – competences such as **renovation, conservation and restoration of buildings, modelling information about buildings and constructions (BIM)** or **automation installations** are difficult to obtain and are taught at a moderate level. The situation is different in terms of such competences as **knowledge of energy-saving technologies, project documentation** and **analysis reports**, which are quite difficult to obtain, but are taught at universities (see Fig. 24).

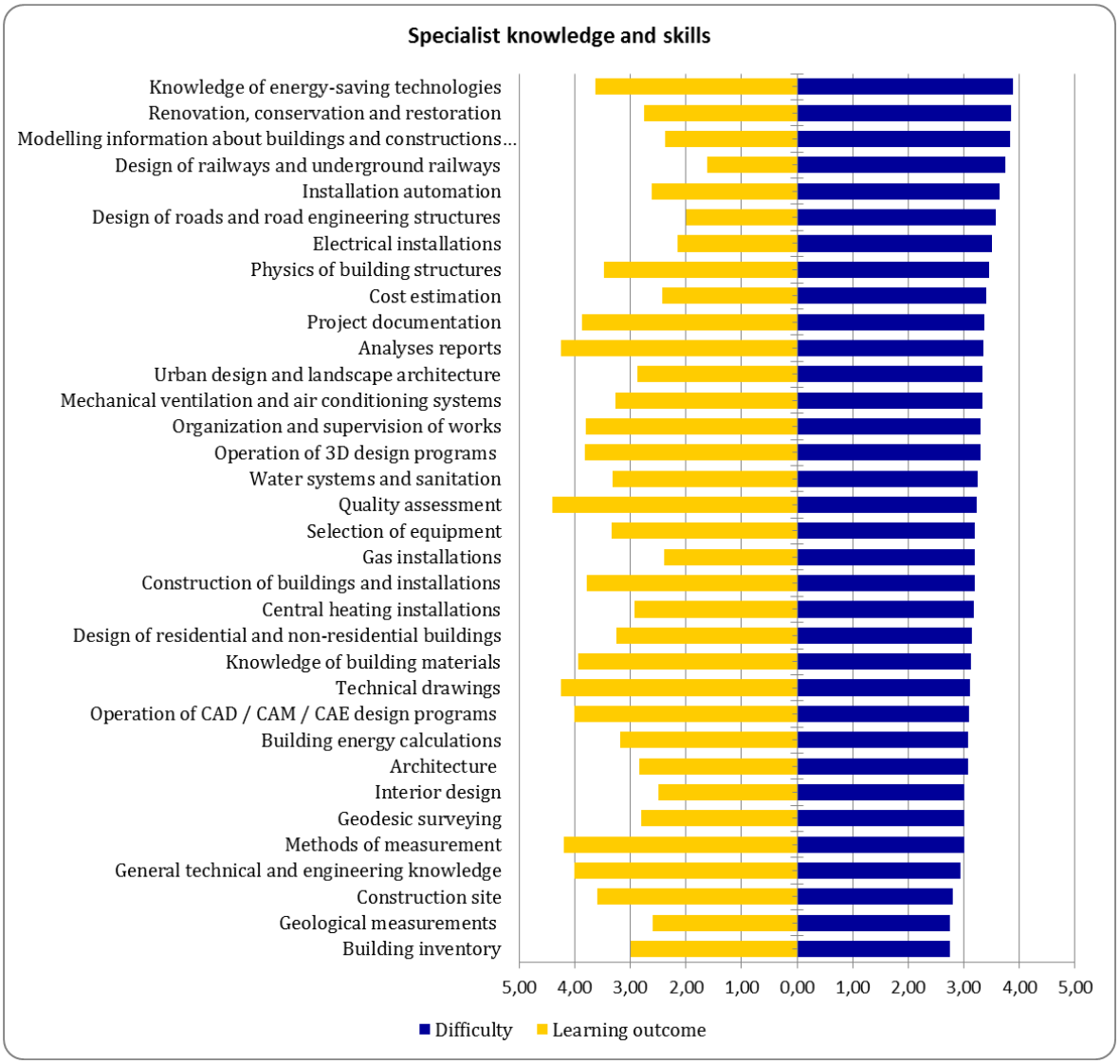

Figure 24. The construction sector. Matrix illustrating the relationship between the difficulty in acquiring competences (the employers' point of view) and the obtained learning outcomes (university point of view) in the area "Specialist knowledge and skills".

In the architectural sector, the competences that are difficult to acquire and are taught at a moderate level at universities include: **modelling information about buildings and structures (BIM), automatic installation, gas installation** or **design of railways and underground railways.** "Conflict" competences that are difficult to obtain, but are taught at universities include: **knowledge of energy-saving technologies, project documentation** and **knowledge of building materials** (see Fig. 25).

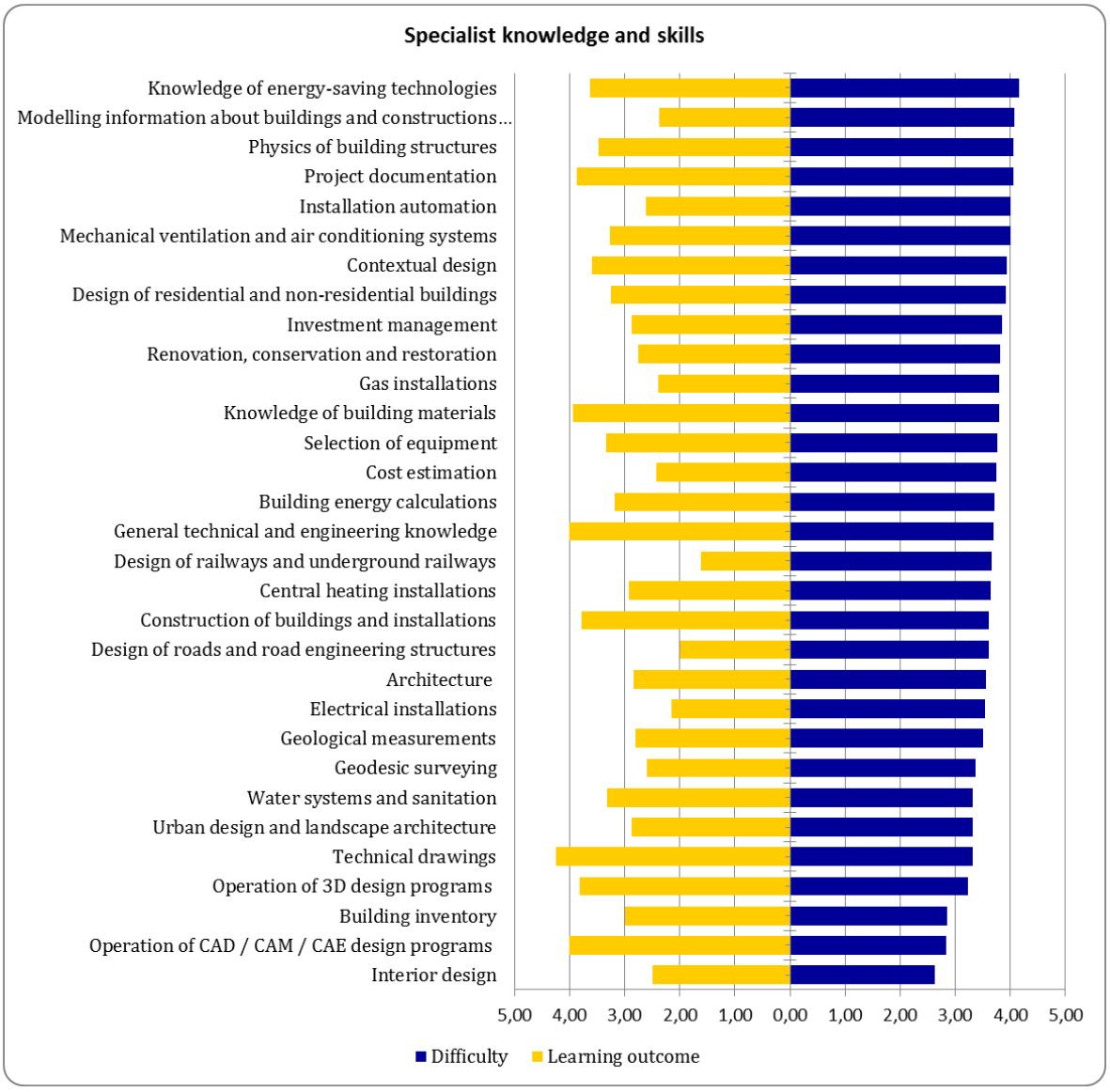

Figure 25. The architectural sector. Comparison of the difficulty in acquiring competences (the employers' point of view) and the obtained learning outcomes (university point of view) in the area "Specialist knowledge and skills".

In the case of business knowledge and skills, in the construction sector (Figs. 26 and 27), the competences that are difficult to obtain, according to business, and implemented from the point of view of universities include competences associated with **law and legal regulations** and **new**

trends, and in the architectural sector**: law and legal regulations, project presentations** and **knowledge of the sector.**

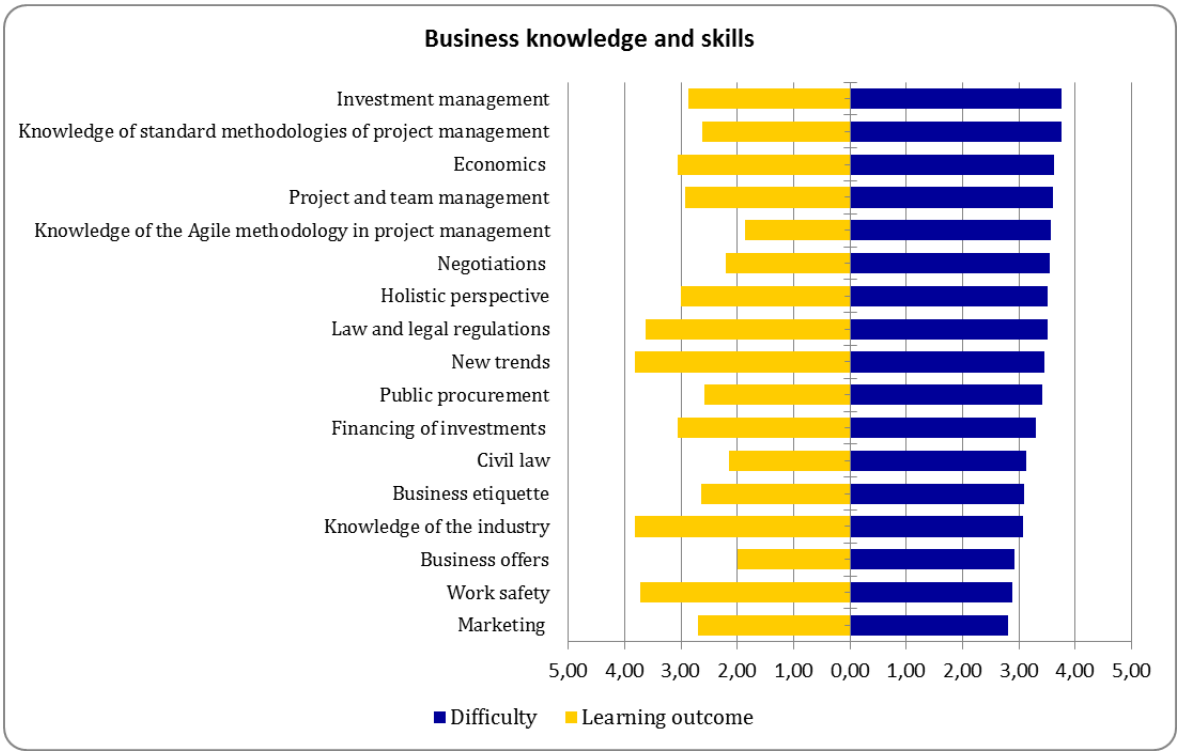

Figure 27. The construction sector. Comparison of the difficulty in acquiring competences (the employers' point of view) and the obtained learning outcomes (university point of view) in the area "Business knowledge and skills".

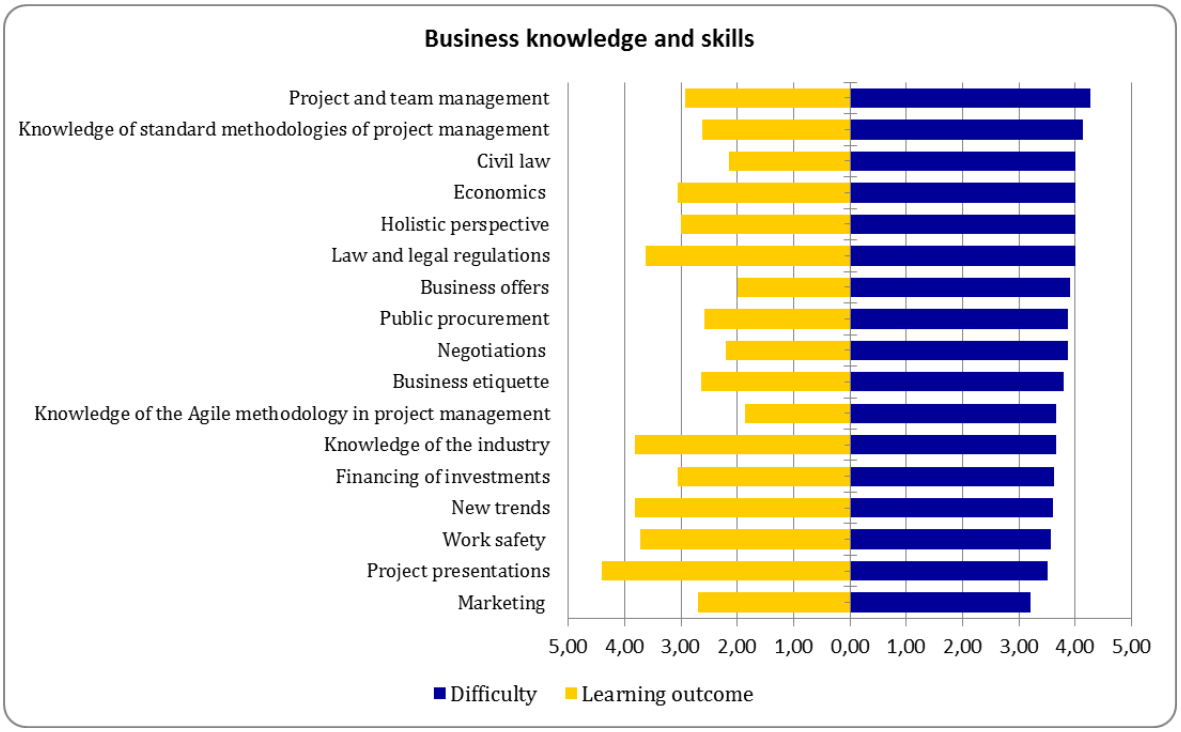

Figure 27. The architectural sector. Comparison of the difficulty in acquiring competences (the employers' point of view) and the obtained learning outcomes (university point of view) in the area "Business knowledge and skills".

In the area of soft skills (Fig. 28 and 29), the largest discrepancy in both sectors concerns the organization of one's own work.

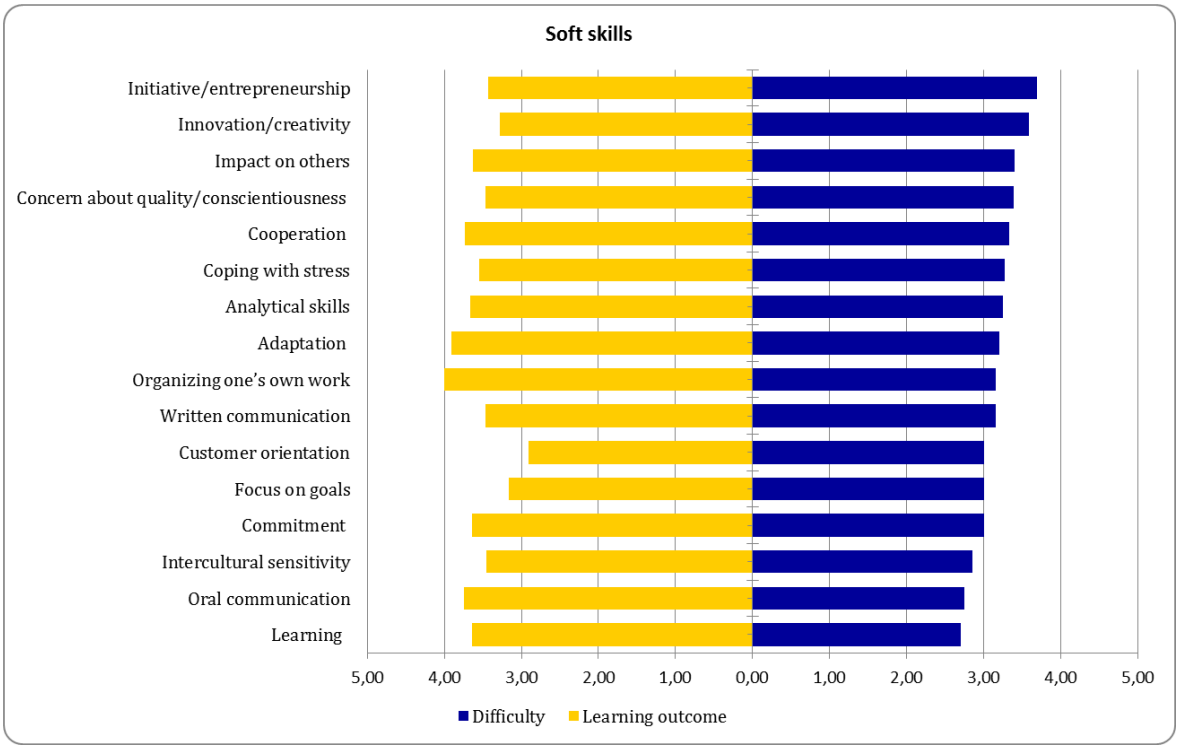

Figure 28. The construction sector. Comparison of the difficulty in acquiring competences (the employers' point of view) and the obtained learning outcomes (university point of view) in the area "Soft skills".

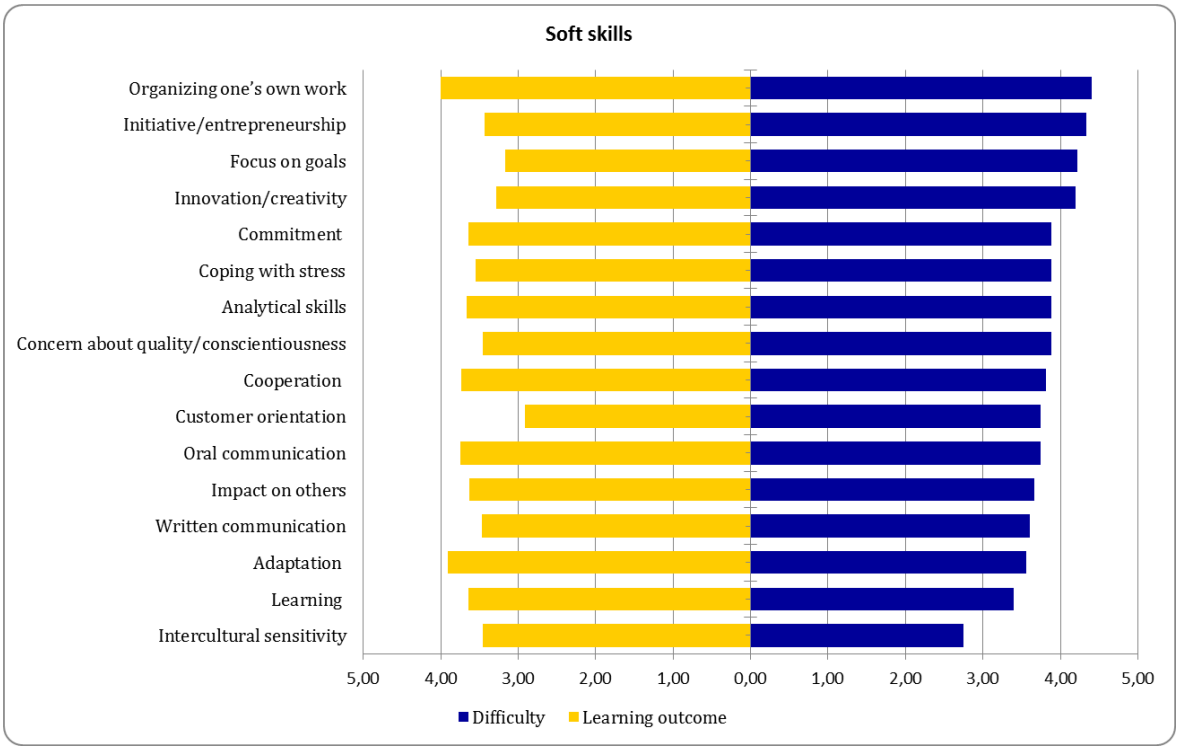

Figure 29. The architectural sector. Comparison of the difficulty in acquiring competences (the employers' point of view) and the obtained learning outcomes (university point of view) in the area "Soft skills".

In the case of other requirements in both analysed sectors, the differences relate only to the focus on development, which is relatively difficult to obtain, on the one hand, but on the other hand, is taught at universities (see Fig. 30 and 31).

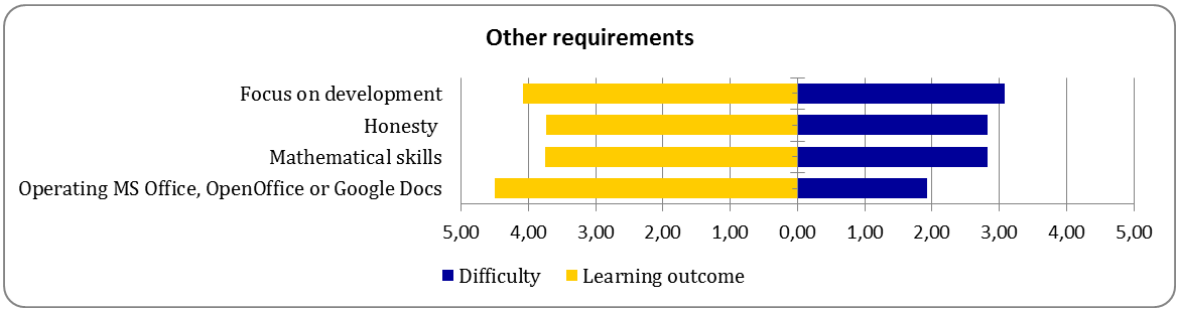

Figure 30. The construction sector. Comparison of the difficulty in acquiring competences (the employers' point of view) and the obtained learning outcomes (university point of view) in the area "Other requirements".

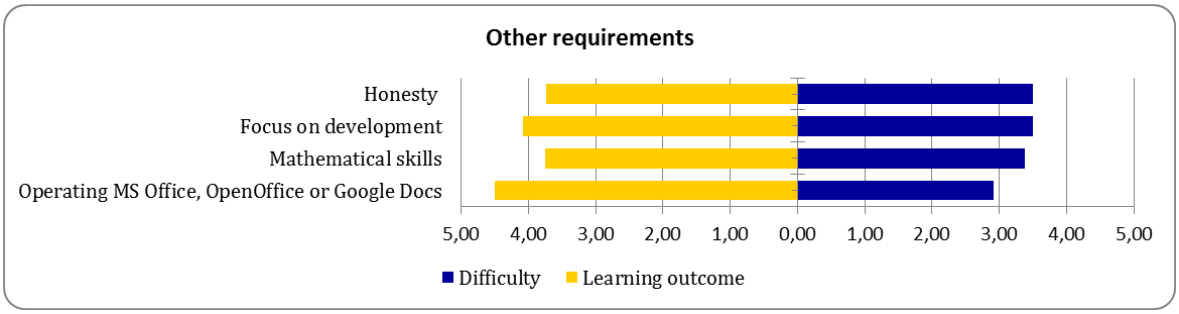

Figure 31. The architectural sector. Comparison of the difficulty in acquiring competences (the employers' point of view) and the obtained learning outcomes (university point of view) in the area "Other requirements".

TASKS OF THE UNIVERSITIES

As in 2013, one of the additional aspects analysed in the context of the Study of Competences were the opinions of the representatives of business and universities whether the teaching of particular competences should be the task of universities.

In the light of full agreement of employers and universities as to which competences should be taught at universities, we would expect a situation where the responses of both communities are highly correlated. In the case of the presented results in the construction sector, a moderate dependency of this type may be observed only in relation to soft skills (correlation r = 0.31), while for all other groups of competences, this relationship does not exist. The situation is quite different in architecture, where a similar view of business and universities relates to business knowledge and skills (r = 0.77), specialized knowledge and skills (r = 0.67) and, to a lesser extent, soft skills (r = 0.26)

In Figures 32 and 33, we present the opinion of the representatives of companies and universities whether the teaching of each of the twenty core competences is the task of universities.

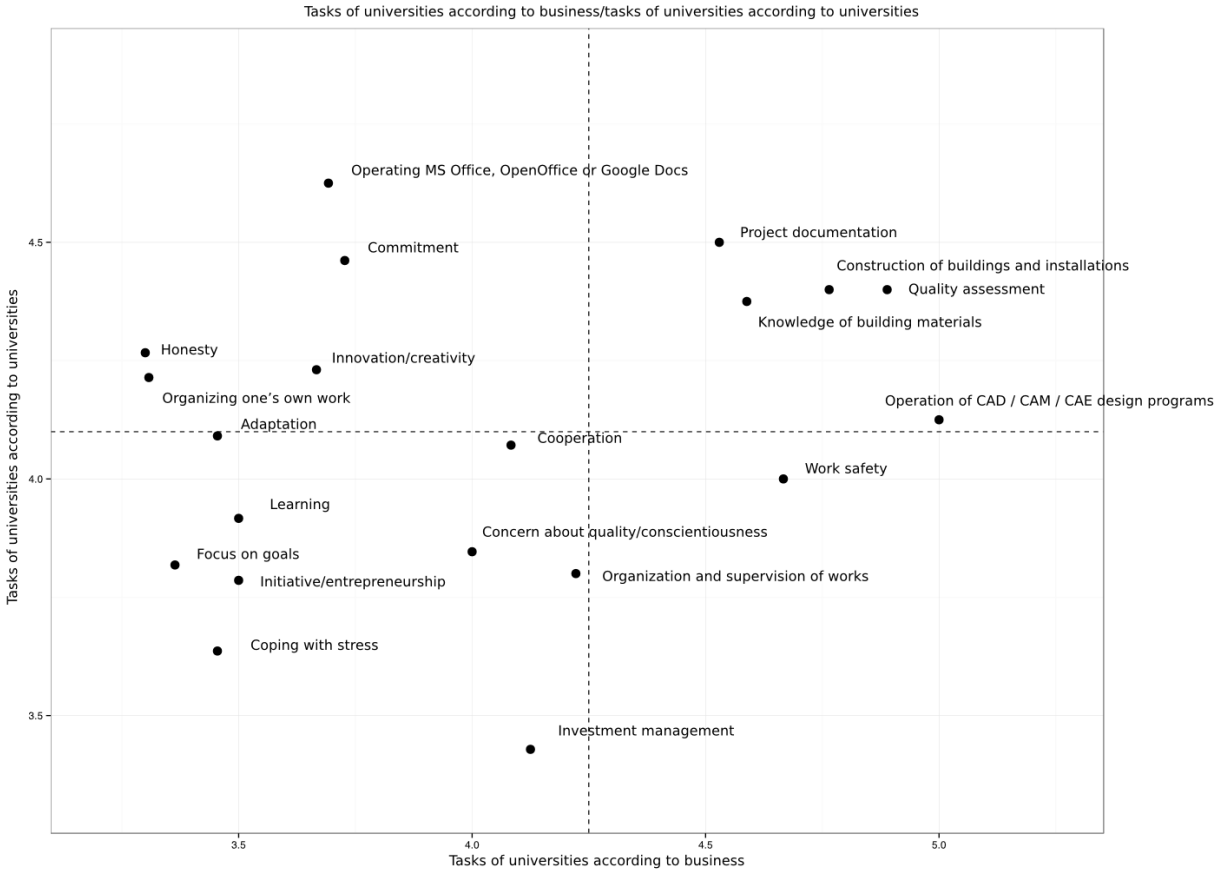

Figure 32. The construction sector. Matrix illustrating the relationship between the teaching of specific competences perceived as a task of universities by representatives of business and universities for twenty core competences in the sector. For better understanding of the chart, a trimmed scale has been used (from 3.5 to 5.0 for the views of employers and from 3.5 to 4.5 for the views of universities).

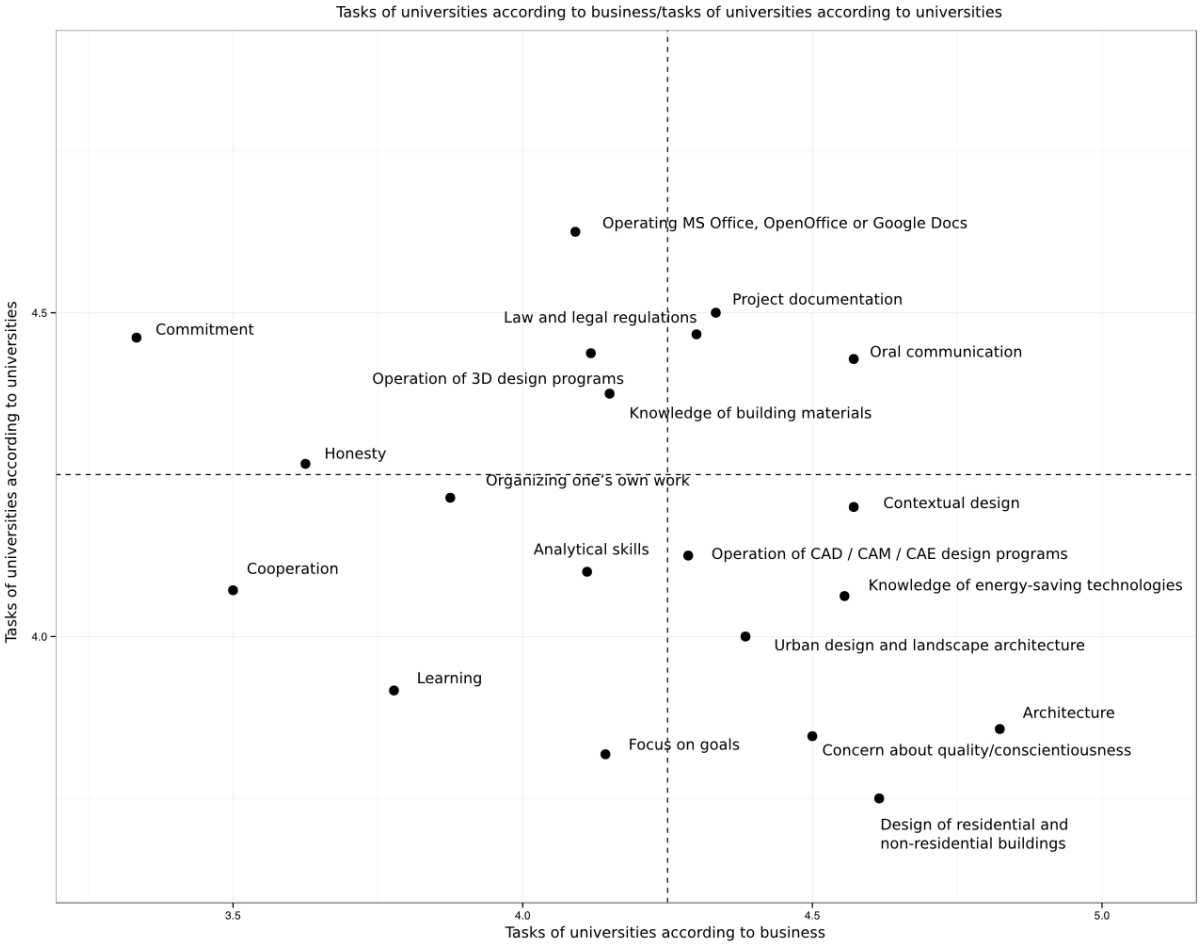

Figure 33. The architectural sector. Matrix illustrating the relationship between perceiving the teaching of specific competences as a task of universities by representatives of business and universities for twenty core competences in the sector. For better understanding of the chart, a trimmed scale has been used (from 3.5 to 5.5).

When it comes to the understanding of the tasks of universities in the context of teaching specialist knowledge and skills (Figs. 34 and 35), the opinions of business and universities are quite different. In both sectors, employers often attribute responsibility to universities. In some cases, this effect is clearly a result of adopting a different perspective in response to this question – employers take a general perspective, and representatives of universities a local perspective, concerning their own field of study. In this context, the result showing that almost all companies believe that **road design** is the task of universities, whereas most universities are of a different opinion, should not be surprising. This specific competence should not be included in the curricula of all fields of study related to the sector, but at the same time, it is reasonable to expect that it should be taught within the field of civil engineering and environmental engineering. Competences for which universities claim greater responsibility, in the case of construction, include: **technical drawing** and **measurement methods,** and in the case of architecture: **technical drawing, project documentation, knowledge of building materials,**

3D design programs, water systems and sewage systems, equipment selection and cost estimation.

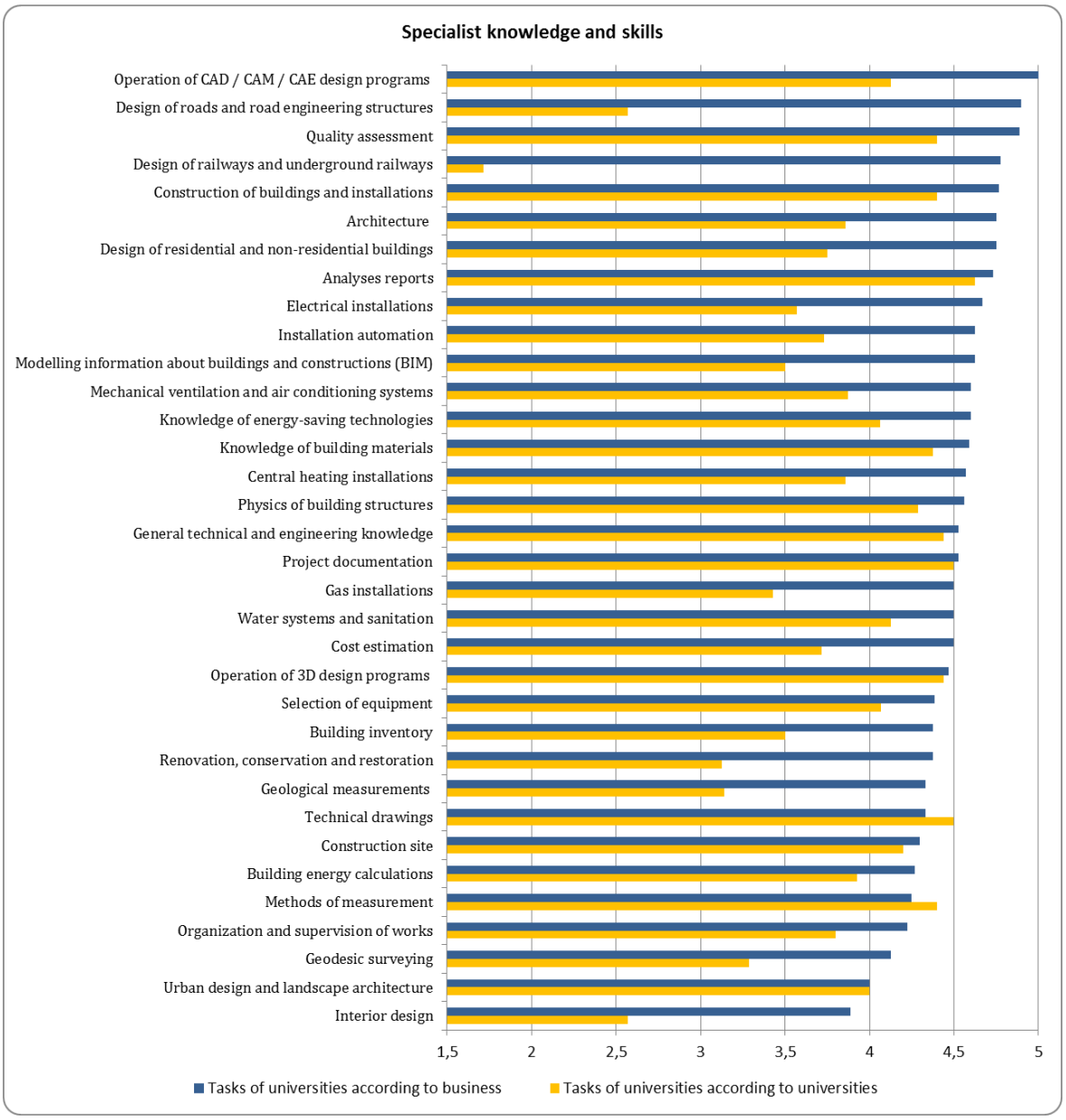

Figure 34. The construction sector. Comparison of the perceived role of universities in teaching competences in the area of "Specialized knowledge and skills".

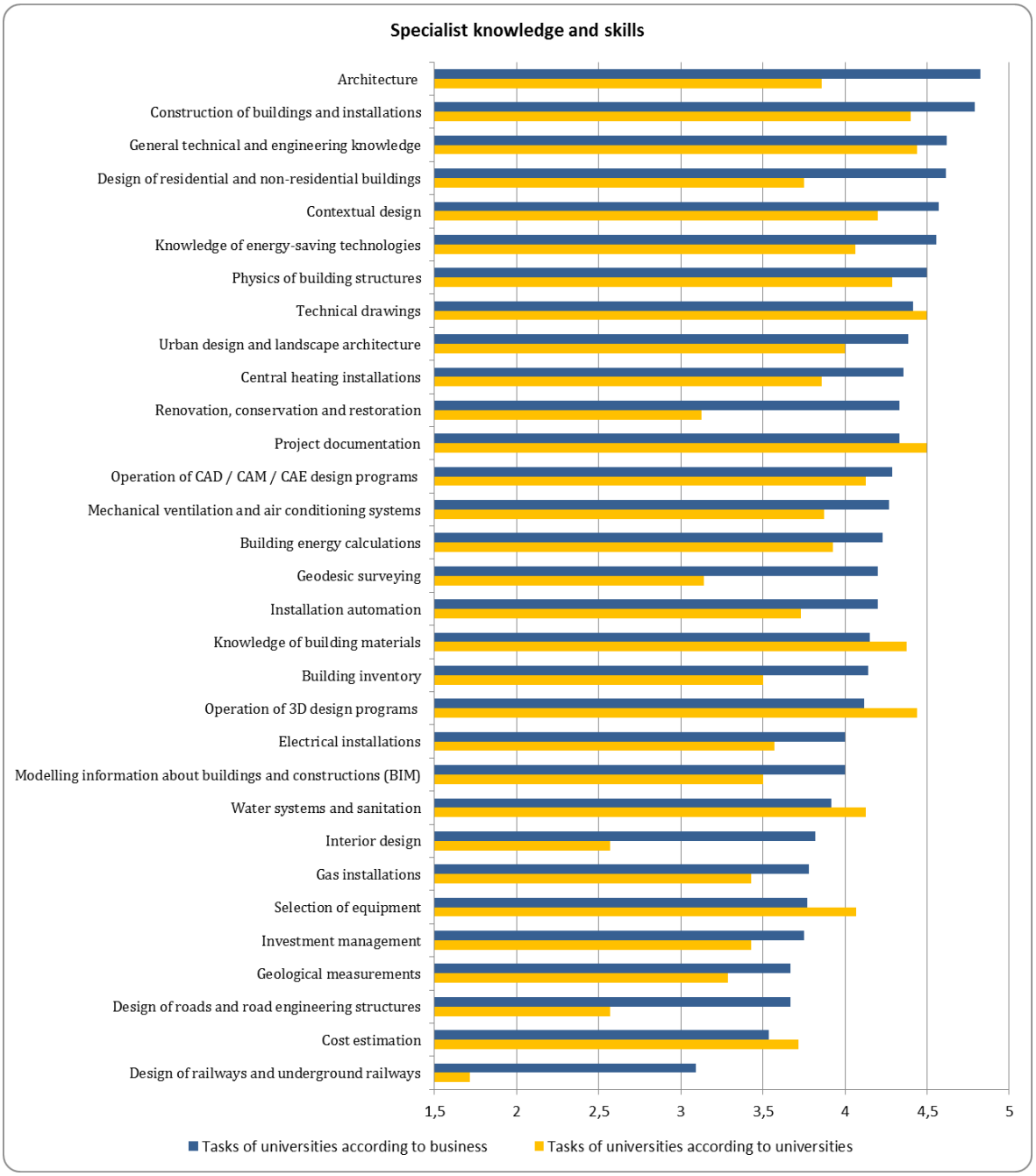

Figure 35. The architectural sector. Comparison of the perceived role of universities in teaching competences in the area of "Specialized knowledge and skills".

The results in the area of business knowledge and skills (Figs. 36 and 37) are quite interesting. In the construction sector, there was full compliance in the case of **law and legislation** and **economics**. Companies assign more responsibility to universities in such areas as **work safety, AGILE methodologies** and **knowledge of public procurement procedures**. Universities take greater responsibility in the field of **knowledge about new trends** and **general knowledge about the sector**. In the architectural sector, in the majority of cases, universities claim greater responsibilities – this is clearly visible in the example of **knowledge of the sector, economy** and **the ability to present projects**.

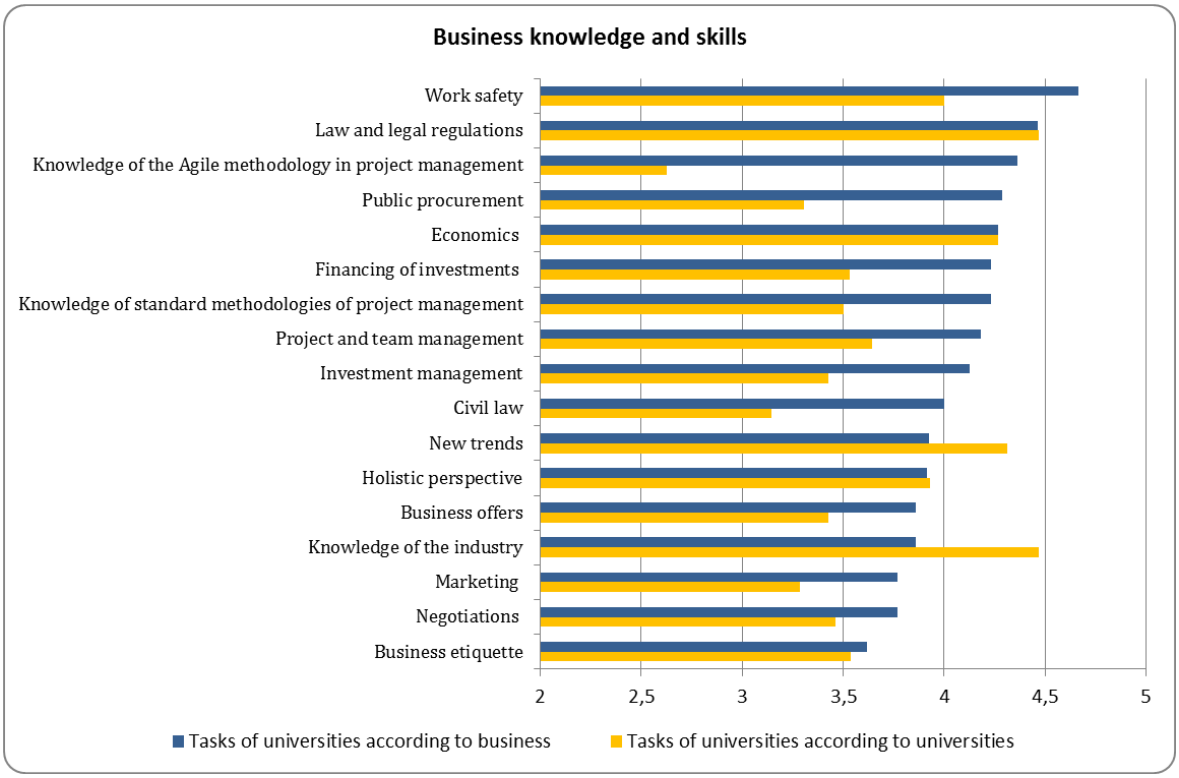

Figure 36. The construction sector. Comparison of the perceived role of universities in teaching competences in the area of "Business knowledge and skills".

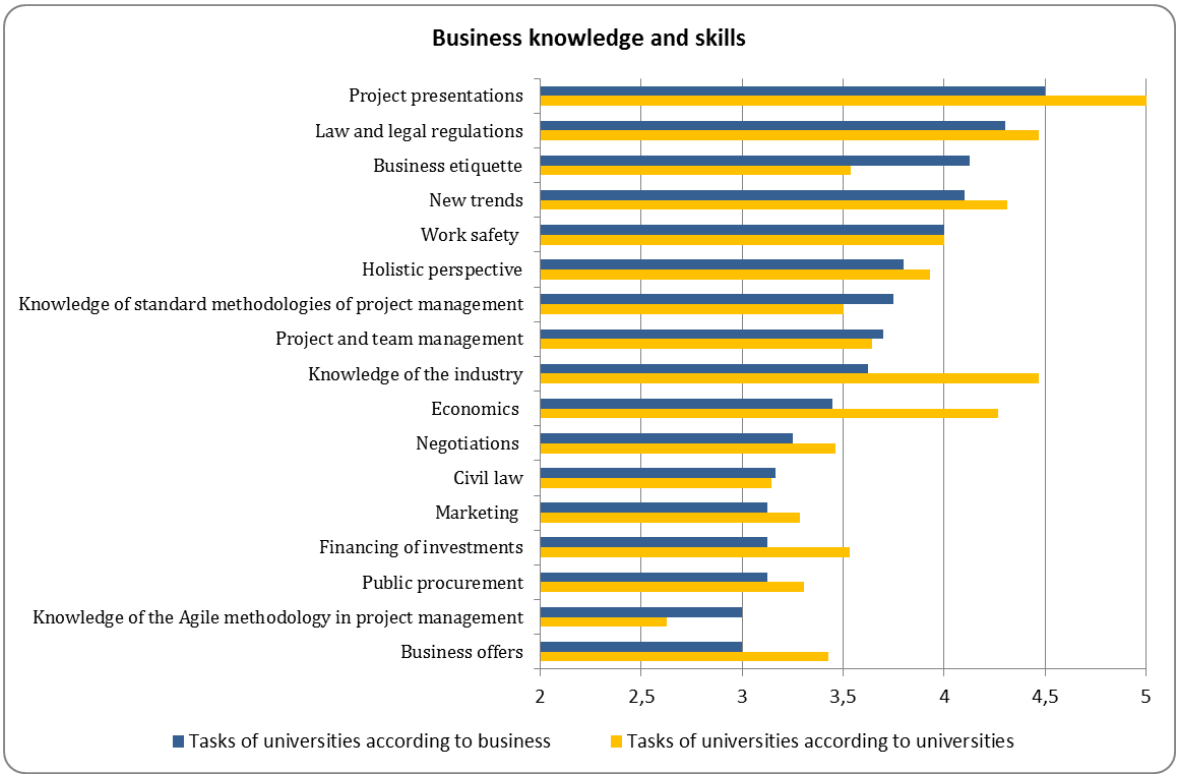

Figure 37. The architectural sector. Comparison of the perceived role of universities in teaching competences in the area of "Business knowledge and skills".

In the case of soft skills and other requirements, we observe similar trends as in the case of the sectors analysed last year. Especially in the construction sector, universities take on more responsibility than would result from the opinions of representatives of companies (Figs. 38, 39, 40 and 41).

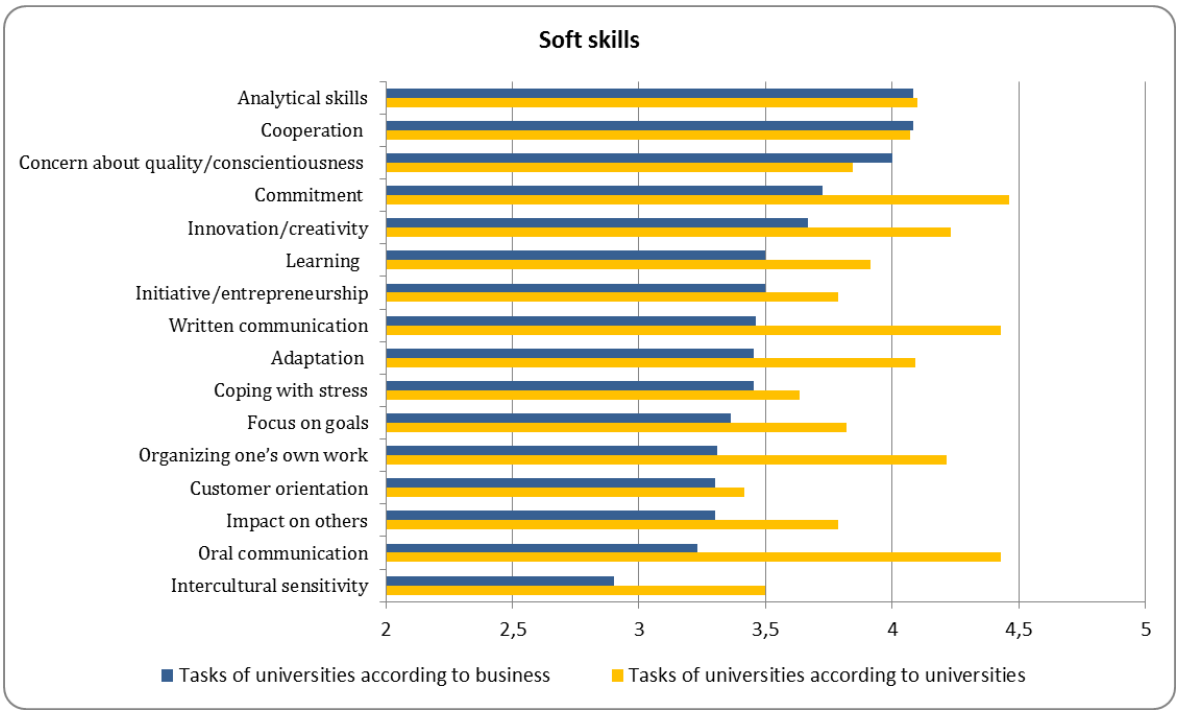

Figure 38. The construction sector. Comparison of the perceived role of universities in teaching competences in the area of "Soft skills".

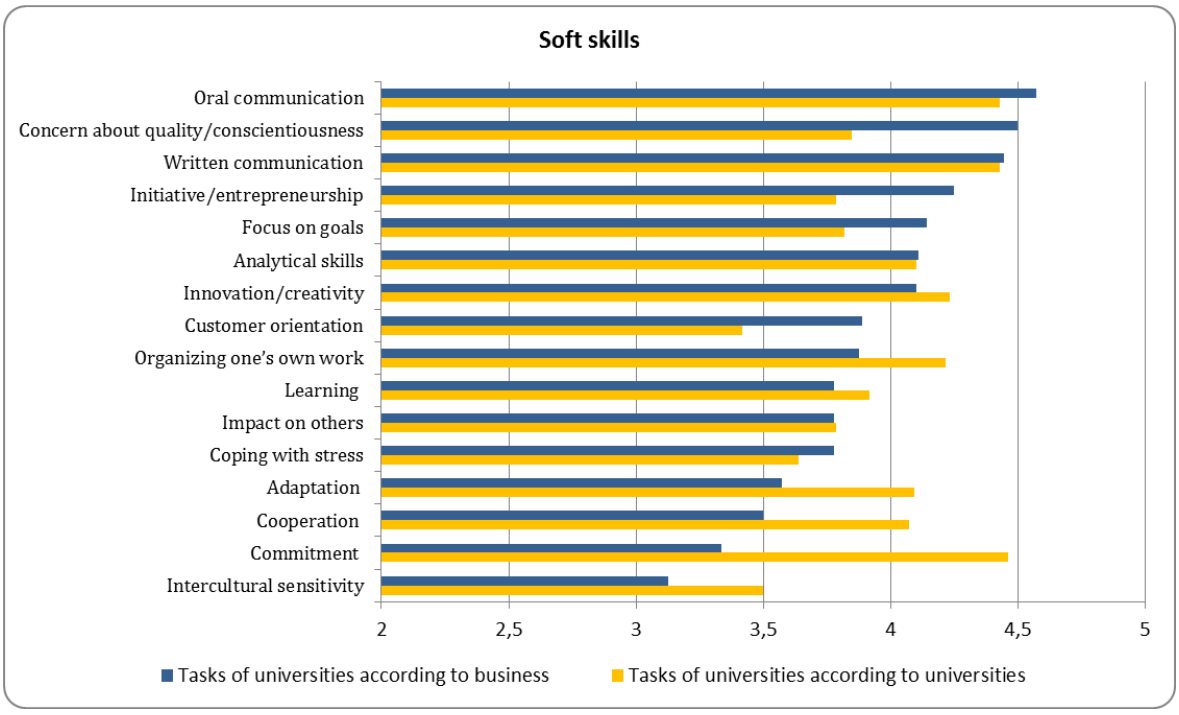

Figure 39. The architectural sector. Comparison of the perceived role of universities in teaching competences in the area of "Soft skills".

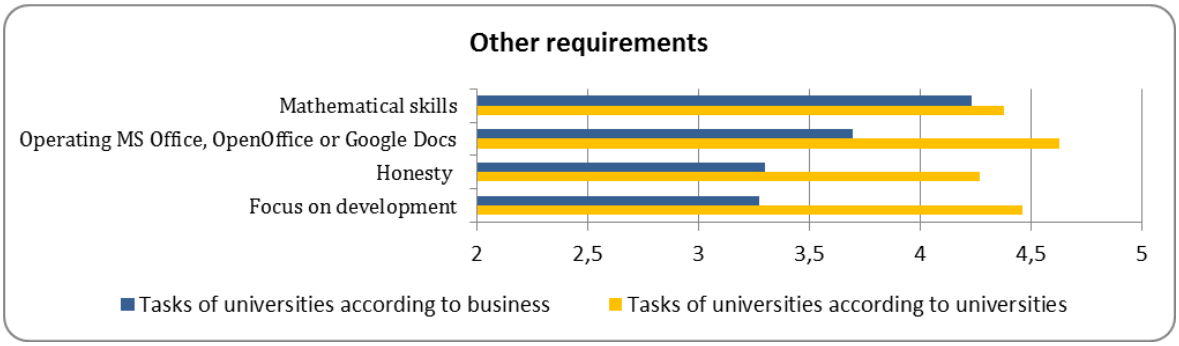

Figure 40. The construction sector. Comparison of the perceived role of universities in teaching competences in the area of "Other requirements".

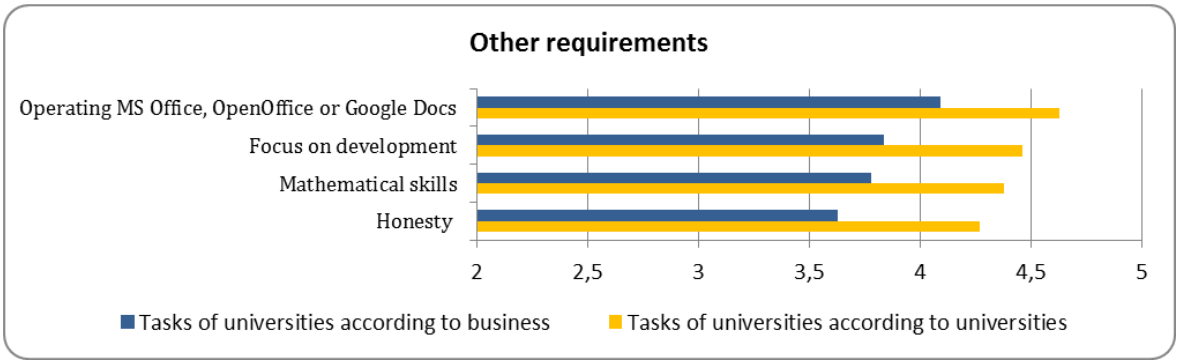

Figure 41. The architectural sector. Comparison of the perceived role of universities in teaching competences in the area of "Other requirements".

FINAL CONCLUSIONS AND RECOMMENDATIONS

Due to their great importance for the development of the city, the construction and architectural sectors should be considered as one of the key elements of the development strategy. This is of fundamental importance as **Kraków has great potential** with regard to both universities and employers. **Industry representatives recognize the positive development trends concerning the number and quality of investments, the availability of qualified staff and, insufficient, though increased cooperation between science and business.** Both sectors have their problems and shortcomings. There is virtually no problem with the number of graduates who can find employment in the sector, but both universities and companies report concerns about the quality of a relatively large group of students and graduates of studies related to the sectors. The situation is somewhat better in the construction sector, but with the growing aspirations of companies and the increasing complexity of investments, there is a deficiency of the most qualified graduates. Frequently, companies are forced to look for specialists outside the province and, in certain cases, also recruit people from abroad. **Other restrictions affecting the development of the sectors are related to administrative and legal barriers that hinder the implementation of investments and discourage potential investors**.

When it comes to the demand for competences, representatives of the construction sector are more optimistic as to the preparation of graduates for careers in the profession. A summary of the main findings in the two sectors is presented in Table 13. When interpreting the results, we should keep in mind that companies in various sectors recruit for different types of positions, a fact which has already been mentioned. In particular, architectural companies look for specialists in the field of construction, whereas construction companies look for designers and architects. This means that **the catalogue of core competences for each of the sectors is a conglomeration of different expectations which do not always apply to only one position**, and it is impossible for a graduate of one field of study to possess them all. The presented results do not suggest that companies expect graduates of architecture to be able to design all types of industrial installations, but in order for the sector to develop, it is important that the labour market has qualified specialists, graduates of construction studies, with this type of knowledge and skills. **However, taking into account the investment process, it is important that graduates of different fields of study possess the core competences at least in an extent that allows for effective cooperation and practical use of expertise in different areas.** In this context, as in the case of passive and energy-saving construction, postgraduate and specialist training courses also play an important role, as dealing with more specialised issues, they are more likely to take into account the interdisciplinary perspective.

Main findings of the Study of Competences (extract)		
	Construction sector	**Architectural sector**
Core competences sought by employers today	Honesty, knowledge of building materials, operating office software, initiative/enterprise, organization and supervision of work, work safety, commitment, time availability, construction of buildings and installations, operation of CAD / CAM / CAE design programs	Honesty, oral communication, concern for quality/conscientiousness, design of residential and non-residential buildings, operation of CAD / CAM / CAE design programs, operating office software, project documentation, focus on goals, learning, organizing one's own work
The largest relative increase in the importance of competences in 5 years	Cooperation, focus on development, analytical skills, analysis reports, labels, business labels, equipment selection, design of railways and underground	Concern about quality/conscientiousness, operation of CAD / CAM / CAE design programs, analytical skills, knowledge of energy efficient technologies, operation of

	railways, project and team management, urban design and landscape architecture, geodesic surveying, modelling information on buildings and structures (BIM)	3D design programs, English, presentation of projects, modelling information on buildings and structures (BIM), road design and road engineering
Competences most difficult to obtain in the labour market, yet important	Initiative/entrepreneurship, innovation/creativity, investment management	Project documentation, focus on goals, knowledge of energy-saving technologies, organizing one's own work
Competences most readily obtained in the labour market, and also important	Honesty, operating office software, work safety, learning	Operation of CAD / CAM/ CAE design programs, operating office programs, English language
The most commonly obtained learning outcomes important from the point of view of employers	Operating office software, work safety, operation of CAD / CAM / CAE design programs, cooperation, quality assessment, general technical and engineering knowledge, new trends, technical drawing, oral communication, knowledge of the industry, operation of 3D design programs, law and legal regulations	
The main tasks of universities in terms of core competences according to business	Operation of CAD / CAM / CAE design programs, quality assessment, construction of buildings and installations, work safety, knowledge of building materials, project documentation, organization and supervision of works, investment management, cooperation, concern for quality/conscientiousness	Architecture, design of residential and non-residential buildings, oral communication, contextual design, knowledge of energy-saving technologies, concern for quality/conscientiousness, urban design and landscape architecture, project documentation, English, operation of CAD / CAM / CAE design programs
The main tasks of universities in terms of core competences according to universities	Operating office software, project documentation, commitment, operation of 3D design programs, oral communication, construction of buildings and installations, quality assessment, knowledge of building materials, honesty, innovation/creativity, organizing one's own work, contextual design, operation of CAD / CAM / CAE design programs, analytical skills	

Table 13. Synthetic summary results of the Study of Competences for the construction and architectural sector in Kraków.

Cooperation between universities and representatives of the industry seems to be increasing, although it is still perceived in the context of potential and less formal relationships than a systemic solution. It also seems that **it would be desirable to strengthen the cooperation between the architecture and construction faculties, as well as between companies of the two sectors.** The preparation and implementation of investments, especially the most technologically advanced, requires permanent and flexible cooperation between experts from different disciplines – the development of such interdisciplinary cooperation might strengthen both the companies and universities related to architecture and construction.

The comments of employers concerning competency deficiencies of graduates are often met with the understanding and confirmation of universities, as shown by the collected data and in-depth interviews. It seems to be another field in which cooperation between companies and universities can bring benefits. Joint informational and promotional activities for students of universities, but also students of secondary schools, would certainly be beneficial for the students themselves by allowing them to choose the optimal career path. In the context of competency deficiencies, we confirmed the results obtained in last year's study in the field of passive and energy-efficient construction – **the number of graduates is not a problem, whereas the quality of their competences often is.** Greater openness to cooperation between the two communities would also facilitate the adjustment of the curriculum to the requirements of the changing labour market, including the opening of specialized postgraduate studies and additional forms of education (e.g. additional training courses). The problem with the flow of

this type of knowledge between universities and companies is relatively smaller in the case of architecture, where a significant part of university representatives are also directly involved in business activities. One of the architectural faculties has the so-called "master studio" system that allows students to familiarize themselves with the practical side of the entire design process during the course of their studies, under the supervision of practitioners. This kind of tutorial model seems to be perfectly tailored to the specific nature of the sector.

A major constraint and challenge for companies in the analysed sectors are formal, legal and administrative matters. As it has been mentioned, not everything depends on the representatives of the Municipality, but certainly there are some things that can be improved. Representatives of companies expect a kinder and more helpful approach in the development and processing of documents. One of the initiatives of the Department of Architecture and Urban Planning of UMK in this area that is worth mentioning is the Workshops for Investors organized since 2013 [33] – the continuation of this formula and its wider promotion will certainly be beneficial.

Development plans, which are still in preparation, will certainly facilitate the functioning of entities operating in the sectors. Some representatives of companies draw attention to the aspect of **promotion of the city and creating an atmosphere of support for investors**. The city of Wrocław is given as an example, where the "bureaucratic" process associated with investment servicing is as lengthy as in Kraków, but thanks to the presented concern and manner of communication, its perception by investors is much better. The establishment of cooperation between representatives of universities and UMK and the organization of more meetings for students and active participation of officials in the learning process would also be beneficial for sectors and students (e.g. participation in classes, guest lectures).

[33] http://www.Kraków.pl/biznes/144521,artykul,warsztaty_dla_inwestorow.html

ANNEX 1. LIST OF COMPETENCES AND LEARNING OUTCOMES[34]

ARCHITECTURE

Specialist knowledge and skills			
No	Name	Description of competences	Learning outcomes
1	Architecture	General knowledge of architecture and building design	Student has knowledge of architecture and building design.
2	Automatic installation	Knowledge of automation of internal installations in construction and intelligent control of buildings	Student has knowledge of automation of internal installations in construction and intelligent control of buildings (BMS systems).
3	Equipment selection	Ability to select appropriate equipment to ensure maximum energy and economic efficiency of the project	Student is able to select appropriate equipment to ensure maximum energy and economic efficiency of the project.
4	Project documentation	Ability to prepare and verify understandable and graphically attractive project documentation in accordance with the requirements and laws	Student is able to prepare and verify understandable and graphically attractive project documentation in accordance with the requirements and laws.
5	Physics of building structures	Knowledge of the heat flow in buildings and the physical properties of materials	Student has knowledge of the heat flow in the building and the physical properties of the materials.
6	Central heating installations	Knowledge and skills to design a central heating system	Student has the knowledge and skills to design a central heating system.
7	Electrical installations	Knowledge and skills to design electrical installations	Student has the knowledge and skills to design electrical installations.
8	Gas installations	Knowledge and skills to design gas installations	Student has the knowledge and skills to design gas installations.
9	Mechanical ventilation systems and air conditioning	Knowledge and skills to design a central heating system, a mechanical ventilation system and air conditioning (heat recovery and ground heat exchangers)	Student has the knowledge and skills to design a central heating system, a mechanical ventilation system and air conditioning (heat recovery and ground heat exchangers) (GWC/GPWC).
10	Water systems and sanitation	Knowledge and skills to design a water and sanitation system	Student has the knowledge and skills to design a water and sanitation system.
11	Building inventory	Ability to prepare a building inventory	Student is able to prepare a building inventory.
12	Construction of buildings and installations	Knowledge of various types of building construction and installations that allows for the understanding and preparation of technical documentation	Student has knowledge of various types of building construction and installations that allows for the understanding and preparation of technical documentation.
13	Cost estimation	Ability to prepare and verify construction cost estimates	Student is able to prepare and verify construction cost estimates.
14	Modelling information on buildings and structures (BIM)	Ability to prepare and manage digital models of buildings and structures and their practical use in the course of the investment	Student is able to prepare and manage digital models of buildings and structures and their practical use in the course of the investment.

[34] The presented catalogues of competences and learning outcomes are the result of the analysis of job advertisements, analysis of existing data and consultations with industry experts and companies. An important caveat relates to the fact that companies recruit for various positions, requiring a diverse catalogue of competences (often also intersectoral). For example, architectural companies, in addition to designers, also look for specialists in industrial installations in the labour market, whereas construction companies also employ architects. The study of competences assumed a perspective of a comprehensive need for competences in each of the analysed industries. This does not mean that all the presented competences should be taught in one field of study or be possessed by a particular employee – in both cases, this would be impossible. The detailed structure of the need for analysis in both sectors is presented in the section "Demand analysis".

15	Building Energy Calculation (audit)	Ability to perform detailed calculations of the energy performance, energy demand and heat flow of the building in winter and summer	Student is able to perform detailed calculations of the energy performance, energy demand and heat flow of the building in winter and summer.
16	Operation of 3D design programs	Ability to operate programs for three-dimensional graphics design (e.g. Maya, 3D Studio Max)	Student is able to operate programs for three-dimensional graphics design.
17	Operation of CAD / CAM / CAE design programs	Ability to operate CAD / CAM / CAE design programs (e.g. CATIA, AutoCAD, Unigraphics)	Student is able to operate CAD / CAM / CAE design programs (e.g. CATIA, AutoCAD, Unigraphics).
18	General technical and engineering knowledge	Structured knowledge of processes and phenomena in physics, chemistry and mathematics associated with work in the industry	Student has structured knowledge of processes and phenomena in physics, chemistry and mathematics associated with work in the industry.
19	Geodesic surveying	Ability to perform and analyse the results of geodesic surveying	Student is able to perform and analyse the results of geodesic surveying.
20	Geological measurements	Ability to perform and analyse the results of geological measurements	Student is able to perform and analyse the results of geological measurements.
21	Design of residential and non-residential buildings	Skills to design and/or support the process of designing a residential and non-residential building	Student has the skills to design and/or support the process of designing a residential and non-residential building.
22	Design of roads and road engineering facilities	Skills to design and/or support the design of roads and road engineering facilities	Student has the skills to design and/or support the design of roads and road engineering facilities.
23	Designing of railways and underground railways	Skills to design and/or support the design process of railways and underground railways	Student has the skills to design and/or support the design process of railways and underground railways.
24	Contextual design	Ability to design buildings and structures taking into account the urban, cultural and social context of the area	Student is able to design buildings and structures taking into account the urban, cultural and social context of the area
25	Urban design and landscape architecture	Skills to design and/or support the process of urban, spatial and landscape design	Student has the skills to design and/or support the process of urban, spatial and landscape design.
26	Interior design	Skills to design and/or support the process of interior design	Student has the skills to design and/or support the process of interior design
27	Renovation, conservation and restoration	Knowledge of renovation, conservation and restoration of buildings and structures	Student has knowledge of renovation, conservation and restoration of buildings and structures.
28	Technical drawing	Ability to understand and prepare technical drawings	Student is able to prepare and analyse technical drawings.
29	Investment management	Knowledge of conducting investments and its practical use in carrying out projects (including contact with the relevant authorities, permits, etc.)	Student has knowledge of the principles of conducting investments and knows how to use it in order to effectively carry out investment projects.
30	Knowledge of building materials	Knowledge of various building materials (including those related to insulation) and their physical properties	Student has knowledge of various building materials (including those related to insulation) and their physical properties.
31	Knowledge of energy-saving technologies	Knowledge of the technologies related to alternative energy sources (e.g. solar, photovoltaics, hydro, geothermal, etc.) used in the design of energy efficient and/or passive buildings	Student has knowledge of the technologies related to alternative energy sources (e.g. solar, photovoltaics, hydro, geothermal, etc.) used in the design of energy efficient and/or passive buildings.

Business knowledge and skills			
No	Name	Description of competences	Learning outcomes
1	Work safety	Knowledge and understanding of health and safety and fire protection regulations	Student has knowledge of and understands the importance of health and safety and fire protection regulations.
2	Economics	Ability to analyse, calculate and use basic profitability parameters of different	Student is able to use knowledge of the profitability of different solutions (e.g.

		solutions (e.g. profit from investment, return on investment, depreciation, etc.)	profit from investment, return on investment, depreciation, etc.).
3	Business etiquette	Knowledge of and ability to apply the principles of business savoir-vivre. Ability to behave in accordance with the standards, choosing the right dress and language adequate to the situation, also in the context of relationships with customers and international cooperation	Student has knowledge of the principles of business savoir-vivre. He/she is able to behave in accordance with the standards (e.g. chose the right dress and language adequate to the situation, etc.).
4	Financing of investments	Knowledge of the various forms and methods of financing investments and other projects	Student has knowledge of the various forms and methods of financing investments and other projects.
5	Marketing	Knowledge of the methods and techniques of marketing	Student has general marketing knowledge.
6	Negotiating	Ability to conduct business negotiations and the knowledge of the rules that govern them	Student is able to conduct business negotiations according to the rules that govern them.
7	New trends	Knowledge about new trends in the industry, developments and technological innovations specific to the industry	Student has knowledge of technological innovations, developments and trends of development of the industry related to the profile of study.
8	Business offers	Ability to prepare and analyse commercial and business offers, including the diagnosis of customer needs and expectations, and the development of solutions, etc.	Student is able to prepare and analyse commercial offers, taking into account customer needs and expectations, different solutions, etc.
9	Holistic perspective	Knowledge and understanding of the social and professional roles occurring in the implementation of the project (e.g. investor, customer, internal and external customer, user, designer, contractor, technician, etc.). Adapting one's activities and coordinating the implementation of one's tasks with regard to the differences arising from the specific nature of these roles.	Student has knowledge of different social and professional roles occurring in the implementation of the project related to the industry (e.g. investor, customer, internal and external customer, user, designer, contractor, technician, etc.). Student can adjust and coordinate his/her activities with regard to the differences arising from the specific nature of these roles.
10	Civil law	Knowledge of the basic issues of civil law	Student has basic knowledge of civil law.
11	Law and legal provisions	Knowledge about and understanding of the law, regulations, ordinances, laws and norms and standards specific for the operation of the industry	Student has knowledge of the law and legal regulations specific for the industry related to the profile of study. He/she has knowledge of and understands particular regulations, ordinances, norms and standards.
12	Presentation of projects	Ability to create, submit and defend a project presentation	Student is able to create, submit and defend a project presentation.
13	Knowledge about the industry	Knowledge of the entities operating in the industry and their environment, understanding the specific nature and context of the functioning of the industry, knowledge of key opinion leaders	Student has knowledge of the specific nature of the industry related to the profile of study. Student has knowledge of and understands the role of particular entities operating in the market and their business and organizational surroundings.
14	Public procurement	Knowledge of the existing law on public procurement	Student has knowledge of the law on public procurement.
15	Project and team management	Ability to effectively manage the work of the project team	Student is able to effectively manage the work of the project team.
16	Knowledge of AGILE methodology in project management	Ability to work effectively in groups using soft project management methodologies (AGILE, SCRUM, etc.)	Student is able to work effectively in project groups managed in accordance with soft management methodologies (e.g. AGILE, SCRUM).
17	Knowledge of standard project management methodologies	Ability to work effectively in groups using standard ("hard") project management methodologies (e.g. PMBok, PRINCE2)	Student is able to work effectively in project groups managed in accordance with standard management methodologies (e.g. PMBok, PRINCE2).

Soft skills			
No	Name	Description of competences	Learning outcome
1	Adaptation	Ease and speed of acting in changing conditions	Student is able to adapt his/her habits and behaviour to changing conditions.
2	Initiative/entrepreneurship	Initiating new activities and accepting the related responsibilities	Student is able to initiate new activities (initiative) in a specific organizational and social context, taking responsibility for their implementation.
3	Innovation/creativity	Generating ideas, creating and implementing new solutions facilitating work	Student is able to generate new ideas (innovation) in a specific organizational environment, develop and implement them in an innovative way by solving problems.
4	Written communication	Preparation and presentation of written communications, producing clear written reports	Student is able to prepare and present communications, professional documents and reports in written form, using adequate language and form understandable to the customer/ordering party.
5	Oral communication	Presenting and communicating information in verbal form, fluency in speech	Student is able to communicate with others by properly preparing and submitting the information in verbal form, using language and form that is understandable to the recipients.
6	Organizing one's own work	Planning one's own work and organizing activities aimed at implementing the plan, prioritizing tasks	Student is able to adequately organize his/her own activities and time, prioritize and optimize the way to perform them. Student is able to set clear and challenging targets when working on a specific task.
7	Focus on goals	Realization of short-term and long-term goals allocated to the given position	Student is able to understand and accept the short-term and long-term goals in the organization in which he/she operates and take action for their timely implementation.
8	Customer orientation	Meeting the needs and expectations of customers, taking into account the customer's perspective when offering solutions	Student is able to identify the needs and expectations of the recipients of his/her actions (customers or beneficiaries) in the organization in which he/she operates and then use this knowledge to undertake actions aimed at satisfying these needs.
9	Coping with stress	Ease and effectiveness of acting in difficult situations	Student is able to work under pressure, using effective strategies for coping with stress.
10	Concern about quality/conscientiousness	Compliance with the rules, regulations and procedures of the organization, accuracy and thoroughness in implementing the tasks	Student identifies the criteria of quality performance of his/her own work (understood as meeting the expectations of the customer or beneficiary of the actions). Student is able to identify how his/her actions affect the results of the organization and take action in accordance with the rules applicable in a specific organizational context, is accurate and meticulous in their execution. Student cares about the quality and thoroughness of the performed tasks.
11	Learning	Ease and speed in assimilating new knowledge	Student is able to efficiently and quickly assimilate new knowledge.
12	Impact on others	Impact on others, the ability to convince with factual arguments and other means of control, self-confidence in communicating one's	Student is able to conduct a substantive discussion, use arguments to convince others and to defend his/her own opinion in a particular

		point of view	organizational environment without antagonizing relationships.
13	Intercultural sensitivity	Practical application of knowledge about cultural differences, adapting one's activities to different cultural patterns	Student is able to adjust his/her behaviour to different cultural patterns in the organization. He/she can identify the cultural background of different behaviours of people in the organization. Respects the diversity of worldviews and the culture of co-workers and customers.
14	Cooperation	Effective teamwork, focus on group objectives	Student is open to cooperation and can cooperate with others in the group, assuming roles that serve the objectives of the team.
15	Commitment	Enthusiasm and passion for work, the "can do" attitude, caring for the company's image	Student is able to engage in activities and shows enthusiasm and passion in implementing the tasks. Student understands the importance of caring for the company's image in a specific organizational context.
16	Analytical skills	Ease, speed and reliability of obtaining and processing information	Regardless of the conditions, the student is able to quickly and reliably find, analyse and process information necessary to complete the task.

Foreign languages and other requirements			
No	Name	Description of competences	Learning outcomes
1	Time availability	Flexibility in working hours, working overtime with the possibility of later use of accrued overtime hours	Not applicable
2	English	Ability to speak a foreign language in a way that enables efficient and effective communication, both oral and written	Student is able to speak a foreign language in a way that enables efficient and effective communication, both oral and written.
3	German		
4	Mobility	Accepting proposals of business trips related to the performance of professional duties or learning (conferences, training) outside the workplace	Not applicable
5	Focus on development	The desire to develop one's own knowledge and skills, also in new fields and areas	Student understands the need to continually develop his/her own knowledge and skills, also in new fields and areas.
6	Operating MS Office, OpenOffice or Google Docs	Effective use of the possibilities of basic office software packages	Student is able to operate and use basic office software in his/her work (MS Office, OpenOffice, Google Docs).
7	Driving license	Category B driving licence	Not applicable
8	Technical English	The ability to use a specialist foreign language in a manner that enables the handling, understanding and creation of technical documentation, efficient and effective communication with other representatives of the industry, both oral and written	Student is able to use specialist foreign language in a way that allows for the understanding and creation of technical documentation, efficient and effective communication with other representatives of the industry, both oral and written.
9	Technical German		
10	Honesty	Adherence to accepted moral standards	Student accepts the need for the

			existence of standards of ethical behaviour and integrity and applies them in his/her actions.
11	Mathematical skills	Ability to carry out advanced mathematical operations	Student is able to perform various mathematical operations to solve problems and generate knowledge.

THE CONSTRUCTION SECTOR

Specialist knowledge and skills			
No	Name	Description of competences	Learning outcomes
1	Architecture	General knowledge of architecture and building design	Student has knowledge of architecture and building design.
2	Automatic installation	Knowledge of automation of internal installations in construction and intelligent control of buildings	Student has knowledge of automation of internal installations in construction and intelligent control of buildings (BMS systems).
3	Equipment selection	Ability to select appropriate equipment to ensure maximum energy and economic efficiency of the project	Student has the ability to select appropriate equipment to ensure maximum energy and economic efficiency of the project.
4	Project documentation	Ability to prepare and verify understandable and graphically attractive project documentation in accordance with the requirements and laws	Student is able to prepare and verify understandable and graphically attractive project documentation in accordance with customer requirements and laws.
5	Building physics	Knowledge of the heat flow in buildings and the physical properties of materials	Student has knowledge of the heat flow in buildings and the physical properties of materials.
6	Central heating installations	Knowledge and skills to design a central heating system	Student has knowledge concerning the design of central heating systems.
7	Electrical installations	Knowledge and skills to design electrical installations	Student has knowledge concerning the design of electrical installations.
8	Gas installations	Knowledge and skills to design gas installations	Student has knowledge concerning the design of gas installations.
9	Mechanical ventilation system and air conditioning	Knowledge and skills to design a central heating system, a mechanical ventilation system and air conditioning (heat recovery and ground heat exchangers)	Student has knowledge concerning the design of central heating systems, mechanical ventilation systems and air conditioning, including knowledge about heat recovery and ground heat exchangers (GWC/GPWC).
10	Water and sanitation system	Knowledge and skills to design a water and sanitation system	Student has knowledge concerning the design of water and sanitation systems.
11	Building inventory	Ability to prepare a building inventory	Student is able to prepare a building inventory.
12	Construction of buildings and installations	Knowledge of various types of building construction and installations that allows for the understanding and preparation of technical documentation	Student has knowledge of various types of building construction and installations that allows for the understanding and preparation of technical documentation.
13	Cost estimation	Ability to prepare and verify construction cost estimates	Student is able to prepare and verify construction cost estimates.
14	Measurement methods	Ability to perform and analyse the results of geophysical, geochemical and seismic measurements	Student has knowledge of geophysical, geochemical and seismic measurement methods.
15	Modelling information on buildings and structures (BIM)	Ability to prepare and manage digital models of buildings and structures and their practical use in the course of the investment	Student is able to prepare and manage digital models of buildings and structures and use them in the course of the investment.

16	Energy calculations of the building (audit)	Ability to perform detailed calculations of the energy performance, energy demand and heat flow of the building in winter and summer	Student is able to perform calculations of the energy performance, energy demand and heat flow of the building in winter and summer.
17	Operation of 3D design programs	Ability to operate programs for three-dimensional graphics design (e.g. Maya, 3D Studio Max)	Student is able to operate programs for three-dimensional graphics design.
18	Operation of CAD / CAM / CAE design programs	Ability to operate CAD / CAM / CAE design programs (e.g. CATIA, AutoCAD, Unigraphics)	Student is able to operate CAD / CAM / CAE design programs (e.g. CATIA, AutoCAD, Unigraphics).
19	Quality assessment	Ability to select adequate methods and performance of evaluation of the quality of performed work	Student is able to make accurate assessment of the quality of performed work using adequate methods.
20	General technical and engineering knowledge	Structured knowledge of processes and phenomena in physics, chemistry and mathematics associated with work in the industry	Student has the knowledge of processes and phenomena in physics, chemistry and mathematics associated with work in the industry.
21	Organization and supervision of works	Ability to organize and control the course of works and construction works	Student is able to organize and control the course of works and construction works.
22	Geodesic surveying	Ability to perform geodesic surveying	Student is able to perform and analyse the results of geodesic surveying.
23	Geodesic surveying	Ability to perform and analyse the results of geodesic surveying	Student is able to perform and analyse the results of geodesic surveying.
24	Design of residential and non-residential buildings	Skills to design and/or support the process of designing a residential and non-residential building	Student is able to design and/or support the process of designing a residential and non-residential building.
25	Design of roads and road engineering facilities	Skills to design and/or support the design of roads and road engineering facilities	Student is able to design and/or support the design of roads and road engineering facilities.
26	Design of railways and underground railways	Skills to design and/or support the design of railways and underground railways	Student is able to design and/or support the design of railways and underground railways.
27	Urban design and landscape architecture	Skills to design and/or support the process of urban, spatial and landscape design	Student is able to design and/or support the process of urban, spatial and landscape design.
28	Interior design	Skills to design and/or support the process of interior design	Student is able to design and/or support the process of interior design
29	Reports on analyses	Ability to prepare reports on performed analyses	Student is able to prepare reports on performed analyses.
30	Renovation, conservation and restoration	Knowledge of renovation, conservation and restoration of buildings and structures	Student has knowledge of renovation, conservation and restoration of buildings and structures.
31	Technical drawings	Ability to understand and prepare technical drawings	Student is able to prepare and analyse technical drawings.
32	Construction site	Knowledge of the principles and elements of construction site management	Student has knowledge of the principles and elements of construction site management.
33	Knowledge of building materials	Knowledge of various building materials (including those related to insulation) and their physical properties	Student has knowledge of various building materials (including those related to insulation) and their physical properties
34	Knowledge of energy-saving technologies	Knowledge of the technologies related to alternative energy sources (e.g. solar, photovoltaics, hydro, geothermal, etc.) used in the design of energy efficient and/or passive buildings	Student has knowledge of the technologies related to alternative energy sources (e.g. solar, photovoltaics, hydro, geothermal, etc.) used in the design of energy efficient and/or passive buildings

Business knowledge and skills			
No	Name	Description of competences	Learning outcomes
1	Work safety	Knowledge of and understanding of health and safety and fire protection	Student has knowledge of and understanding of health and safety and

		regulations	fire protection regulations
2	Economics	Ability to analyse, calculate and use basic profitability parameters of different solutions (e.g. profit from investment, return on investment, depreciation, etc.)	Student is able to use the knowledge of the profitability of using different solutions (e.g. profit from investment, return on investment, depreciation, etc.)
3	Business etiquette	Knowledge of and ability to apply the principles of business savoir-vivre. Ability to behave in accordance with the standards, choosing the right dress and language adequate to the situation, also in the context of relationships with customers and international cooperation.	Student has knowledge of the principles of business savoir-vivre. He is able to behave in accordance with the standards (e.g. chose the right dress and language adequate to the situation, etc.)
4	Financing of investments	Knowledge of the various forms and methods of financing investments and other projects	Student has knowledge of the various forms and methods of financing investments and other projects
5	Marketing	Knowledge of the methods and techniques of marketing	Student has general marketing knowledge
6	Negotiating	Ability to conduct business negotiations and knowledge of the rules that govern them	Student is able to conduct business negotiations according to the rules that govern them
7	New trends	Knowledge about new trends in the industry, developments and technological innovations specific to the industry	Student has knowledge about technological innovations, developments and trends of development of the industry related to the profile of study.
8	Business offers	Ability to prepare and analyse commercial and business offers, including the diagnosis of customer needs and expectations, and the development of solutions, etc.	Student is able to prepare and analyse commercial offers, taking into account customer needs and expectations, different solutions, etc.
9	Holistic perspective	Knowledge and understanding of the social and professional roles occurring in the implementation of the project (e.g. investor, customer, internal and external customer, user, designer, contractor, technician, etc.). Adapting one's activities and coordinating the implementation of one's tasks with regard to the differences arising from the specific nature of these roles.	Student has knowledge of different social and professional roles occurring in the implementation of the project related to the industry (e.g. investor, customer, internal and external customer, user, designer, contractor, technician, etc.). Student can adjust and coordinate his/her activities with regard to the differences arising from the specific nature of these roles.
10	Civil law	Knowledge of the basic issues of civil law	Student has basic knowledge of civil law
11	Law and legal provisions	Knowledge about and understanding of the law, regulations, ordinances, laws and norms and standards specific for the operation of the industry	Student has knowledge of the law and legal regulations specific for the industry related to the profile of study. He/she has knowledge of and understands particular regulations, ordinances, norms and standards.
12	Knowledge about the industry	Knowledge of the entities operating in the industry and their environment, understanding the specific nature and context of the functioning of the industry, knowledge of key opinion leaders	Student has knowledge of the specific nature of the industry related to the profile of study. Student has knowledge of and understands the role of particular entities operating in the market and their business and organizational surroundings.
13	Public procurement	Knowledge of the existing law on public procurement	Student has knowledge of the law on public procurement.
14	Investment management	Knowledge of conducting investments and the ability to use it effectively in carrying out investment projects.	Student has knowledge of the principles of conducting an investment and is able to use it for effective implementation of investment projects.
15	Project and team management	The ability to effectively manage the work of the project team	Student is able to effectively manage the work of the project team.
16	Knowledge of AGILE methodology in project management	Ability to work effectively in groups using soft project management methodologies (AGILE, SCRUM, etc.)	Student is able to work effectively in project groups managed in accordance with soft management methodologies (e.g. AGILE, SCRUM).

17	Knowledge of standard project management methodologies	Ability to work effectively in groups using standard ("hard") project management methodologies (e.g. PMBok, PRINCE2)	Student is able to work effectively in project groups managed in accordance with standard management methodologies (e.g. PMBok, PRINCE2).

Soft skills			
No	Name	Description of competences	Learning outcomes
1	Adaptation	Ease and speed of acting in changing conditions	Student is able to adapt his/her habits and behaviour to changing conditions.
2	Initiative/entrepreneurship	Initiating new activities and accepting the related responsibilities	Student is able to initiate a new activity (initiative) in a specific organizational and social context, taking responsibility for its implementation.
3	Innovation/creativity	Generating ideas, creating and implementing new solutions to improve work	Student is able to generate new ideas (innovation) in a particular environment organization, develop and then implement them in an innovative way by solving problems.
4	Written communication	Preparation and presentation of written communications, producing clear written reports	Student is able to prepare and present communications, professional documents and reports in written form, using adequate language and form understandable to the customer/ordering party.
5	Oral communication	Presenting and communicating information in verbal form, fluency in speech	Student is able to communicate with others by properly preparing and submitting the information in verbal form, using language and form that is understandable to the recipients.
6	Organizing one's own work	Planning one's own work and organizing activities aimed at implementing the plan, prioritizing tasks	Student is able to adequately organize his/her own activities and time, prioritize and optimize the way to perform the activities. Student is able to set clear and challenging targets when working on a specific task.
7	Focus on goals	Realization of short-term and long-term goals set for the position	Student understands and accepts short-term and long-term goals in the organization in which he/she operates and takes action for their timely implementation.
8	Customer orientation	Meeting the needs and expectations of customers, taking into account the customer's perspective when offering solutions	Student is able to identify the needs and expectations of the recipients of his/her actions (customers or beneficiaries) in the organization in which he/she operates and use this knowledge to undertake actions aimed at satisfying these needs.
9	Coping with stress	Ease and effectiveness of acting in difficult situations	Student is able to work under pressure, using effective strategies for coping with stress.
10	Concern about quality/conscientiousness	Compliance with the rules, regulations and procedures of the organization, accuracy and thoroughness in implementing the tasks	Student identifies the criteria of quality performance of his/her own work (understood as meeting the expectations of the customer or beneficiary of the actions). Student is able to identify how his/her actions affect the results of the organization and take action in accordance with the rules applicable in a specific organizational context, is accurate and meticulous in their execution. Student cares about the quality and

			thoroughness of the performed tasks
11	Learning	Ease and speed in assimilating new knowledge	Student is able to efficiently and quickly assimilate new knowledge.
12	Impact on others	Impact on others, the ability to convince with factual arguments and other means of control, self-confidence in communicating one's point of view	Student is able to conduct a substantive discussion, use arguments to convince others and to defend his/her own opinion in a particular organizational environment without antagonizing relationships.
13	Intercultural sensitivity	Practical use of knowledge about cultural differences, adapting one's activities to different cultural patterns	Student is able to adjust his/her behaviour to different cultural patterns in the organization. He/she can identify the cultural background of different behaviours of people in the organization. Respects the diversity of worldviews and culture of co-workers and customers.
14	Cooperation	Effective teamwork, focus on the objectives of the group	Student is open to cooperation and can cooperate with others in the group, assuming roles that serve the objectives of the team.
15	Commitment	Enthusiasm and passion for work, the "can do" attitude, caring about the company's image	Student is able to engage in activities and shows enthusiasm and passion in implementing the tasks. Student understands the importance of caring for the company's image in a specific organizational context.
16	Analytical skills	Ease, speed and reliability of obtaining and processing information	Regardless of the conditions, the student is able to quickly and reliably find, analyse and process information necessary to complete the task.

Foreign languages and other requirements			
No	Name	Description of competences	Learning outcomes
1	Time availability	Flexibility in working hours, working overtime with the possibility of later use of accrued overtime hours	Not applicable
2	English	Ability to speak a foreign language in a way that enables efficient and effective communication, both oral and written	Student is able to speak a foreign language in a way that enables efficient and effective communication, both oral and written.
3	German		
4	Mobility	Accepting proposals of business trips related to the performance of professional duties or learning (conferences, training) outside the workplace	Not applicable
5	Focus on development	The desire to develop one's own knowledge and skills, also in new fields and areas	Student understands the need to continually develop his/her own knowledge and skills, also in new fields and areas.
6	Operating MS Office, OpenOffice or Google Docs	Effective use of the possibilities of basic office software packages	Student is able to operate and use basic office software in his/her work (MS Office, OpenOffice, Google Docs).
7	Driving licence	Category B driving licence	Not applicable

8	Technical English	Ability to use a specialist foreign language in a way that enables the handling, understanding and creation of technical documentation, efficient and effective communication with other representatives of the industry, both oral and written	Student is able to use specialist foreign language in a way that allows for the understanding and creation of technical documentation, efficient and effective communication with other representatives of the industry, both oral and written.
9	Technical German		
10	Honesty	Adherence to accepted moral standards	Student accepts the need for the existence of standards of ethical behaviour and integrity and applies them in his/her actions.
11	Mathematical skills	Ability to carry out advanced mathematical operations	Student is able to perform various mathematical operations to solve problems and generate knowledge.

ANNEX 2. METHODOLOGY AND DESCRIPTION OF THE TOOLS USED

The methodology was based almost entirely on the schemes developed in the previous year. The initial stage included a number of consultations with industry experts and an analysis of job advertisements. Preliminary lists of competences developed in this manner were then consulted with representatives of companies in the course of in-depth interviews with experts. Upon completing the qualitative research, we conducted in-depth quantitative surveys among companies and universities. In the case of the latter, further in-depth interviews were carried out.

In terms of sampling, wherever possible, we used the PKD classification supplemented with the opinions of experts and an analysis of trade fairs. In this context, we would like to once again express our gratitude to the representatives of ASPIRE, SARP and GIB, whose assistance proved to be extremely important. In each of the analysed sectors, all major companies with their registered seats in Kraków were invited to participate in the study, as well as a selected intentional sample of smaller entities. In the case of the construction sector, due to the nature of the sector, we also invited the largest companies from outside Kraków that carry out construction and investment work in the city to participate in the study. Although a direct consequence of this approach is the inability to evaluate the overall level of employment in the sector (lack of a random sample), and certain restrictions in the conclusions, this approach, as shown by last year's survey, allows for better estimation of market trends and the expected growth in demand for competences.

In order to reduce the time burden of the respondents, we decided to combine the category of specialized knowledge and skills. The fact that the study has been carried out for the third year in a row carries an additional risk. For some companies and a relatively large group of faculties and specializations, this was not the first contact with the tool and the research process. According to the respondents, the current edition of the Study was too time-consuming, despite the fact that the average time for filling in a survey in the case of companies was approx. 30 minutes, and for universities and secondary schools, approx. 20 minutes (less than in the first edition of the Study). This may be a result of the specific nature of the analysed sectors or the perceived usefulness of the research. As a result, the research encountered significant difficulties in persuading the respondents to dedicate their time, especially in a situation where e.g. curriculum changes were insignificant or there were no changes at all. In such a situation, part of the results obtained in the previous year were re-examined (re. the construction and information technology sector).

As in the previous years, a significant difference was observed in the level of development of the strategic HR function in companies (SHRM Strategic Human Resource Management), which was particularly evident in the construction sector. A direct consequence of this diversity is the fact that some companies do not have specific competence profiles or employment plans for the future. This is also related to subjecting the level of employment, including employment of college and secondary school graduates, to the condition of winning contracts and projects.

Below is a step-by-step presentation of all the major stages of the conducted research work:

1. **Initial stage**
    a. In-depth interviews with experts, people associated with the sector and consultations with the Municipality of Kraków and the Provincial Labour Office in Kraków, aimed at clarifying the definition of the sector, recognizing the context of its operation and identifying key entities (on the side of business and universities).
    b. Desk research analysis of the sector and analysis of job advertisements, whose main objective was to identify the key challenges facing the sector and to create an initial list of competences sought by employers.

2. **Analysis of the demand for competences**
    a. In-depth interviews with representatives of selected companies allowing for insight into the experience of the sector related to recruitment, selection and employee development, evaluation and supplementing the list of sought competences (demand sheet).
    b. The creation and testing of the Demand Sheet tool.
    c. The creation of a research sample of companies (in the case of the construction sector, on the basis of PKD, desk research analysis of expert opinions and companies; the initial list of companies invited to participate in the study included a total of 105 entities. After verification, e.g. removing entities that no longer exist, do not conduct business activity related to the analysed sector or have declared that they do not employ, and in the next five years will not employ, graduates of universities, the basis for the research sample included 92 entities; in the case of the architectural sector, the figures were, respectively, 82 and 72).
    d. A survey questionnaire in construction and architectural companies, enabling the collection of quantitative data on the current and projected needs of the market in terms of core competences of graduates of Kraków universities, the evaluation of the difficulty in obtaining them and opinions on the role of the universities in terms of providing relevant training. In addition, information concerning the following issues was also collected: plans of employment (in 2015 and 2020), competences necessary for the graduates to get promoted within the company and the best, according to companies, fields of study and specializations tailored to the profile of the company (in the case of the construction sector, the analysis used data from 21 companies, including 7 as a result of reanalysis, employing, in various forms, approx. 3,100 employees; surprisingly, nearly 60% of the companies refused to participate in the study; others declared to participate in the project, but ultimately decided not to fill out the questionnaire; in the case of the architectural sector, we used data from 27 companies, including 7 from reanalysis, employing, in various forms, over 500 employees).

3. **Analysis of the supply of competences**
    a. The creation and testing of the Supply Sheet tool.
    b. The creation of a research sample of fields of study and specializations at universities (in the case of the construction sector, on the basis of information obtained from the analysis of desk research, opinions of experts and companies, the initial list of courses, including postgraduate courses, invited to participate in the study, totalled 23, and in the case of the architectural sector, 10).

c. Structured interviews connected with completing the supply sheet, aimed at not only obtaining quantitative data on the effects of on-going learning outcomes and projections of the number of graduates in the future, but also getting to know the overall context of a given field of study, challenges in cooperation with businesses and the expectations regarding the company and UMK.
d. An online survey among representatives of universities responsible for the shape of the curriculum. The main objective was to collect quantitative data on on-going learning outcomes and projections of the number of graduates in the future. In addition, information on additional learning outcomes achieved within a given field of study was obtained, which may be important for the sector. Due to the related and mutually overlapping nature of work positions in both analysed sectors, the responses of universities were analysed together. We used data from 16 fields of study (20 specializations), which, in 2015, will be completed by approx. 2,500 people.

DEMAND SHEET

A tool designed to test the demand for competences used in two forms: on-line (using Limesurvey software) and MS Excel (in cases where the surveyed companies preferred direct contact with the interviewer).

The tool consisted of 3 parts:

1. **Company data sheet and plans**

- name of company;

- number of persons employed by the company or its Kraków branch on the basis of a contract of employment;

- number of persons employed by the company or its Kraków branch on the basis of a civil law contract or self-employment;

- name of the position to which companies most often recruit (up to 5 positions);

- a plan for the employment of graduates (persons who completed higher education in the last 12 months) on the basis of a contract of employment, civil law contract or self-employment (in 2015 and 2020).

2. **The assessment of competences from the 4 thematic groups (in the following order: specialist knowledge and skills, business knowledge and skills, soft skills, foreign languages and other requirements – the list is available in Annex 1) on the basis of four criteria:**

- important now (How important is it from the point of view of the needs of your company for students and graduates to have a given competence, where 1 means "completely unimportant", and 5 means "definitely important")

- important in 5 years (How important will it be from the point of view of your company for students and graduates to have a given competence in five years, where 1 means "completely unimportant", and 5 means "definitely important");

- difficulty in obtaining (How difficult is it to recruit a person with the expected level of competences, where 1 means "very easy", and 5 means "very difficult");

- the task of the university (Do you think that the teaching of a given competence should be the task of universities? Please answer using a scale from 1 to 5, where 1 means "the teaching of a given competence should not be the task of universities", and 5 means " the teaching of a given competence should belongs to the tasks of universities");

- identification and assessment, based on the same criteria, of up to four additional competences in each category not included in the previously presented lists.

3. **Additional information:**

- indication of 5 courses of study best adjusted to the needs of the company (up to 5 courses; if it is relevant, also the name of the university);

- indication of a maximum of 5 competences that are critical in the context of promotion of the graduate employed in the company;

- additional comments.

SUPPLY SHEET

A tool designed to test the supply of competences, similarly to demand, used in two forms: on-line (using Limesurvey software) and MS Excel (in cases where the surveyed companies preferred direct contact with the interviewer).

The tool consisted of 3 parts:

1. **Company data sheet:**

- name of university, faculty/department, institute and the field of study;

- indication of the learning modes available in the field of study (full-time, part-time, etc.);

- indication of the levels of study offered in the given field (first degree, second degree, postgraduate studies, etc.)

- indication of the different specialization paths/profiles/specializations pursuing similar learning outcomes in terms of the analysed sector;

- planned number of graduates from each of those paths (in 2015 and 2020).

2. **The assessment of competences from the 4 thematic groups (in the following order: specialist knowledge and skills, business knowledge and skills, soft skills, foreign languages and other requirements – the list is available in Annex 1) on the basis of two criteria:**

- obtained learning outcome (To what extent does the field of study covered by the survey provide particular learning outcomes?, where 1 means "It is not obtained", and 5 means "Obtained in a very high degree");

- the task of the university (Do you think that the teaching of a specific learning outcome should be the task of universities?, where 1 means "definitely not", and 5 means "definitely yes").

3. **Additional information:**

- indication of additional learning outcomes achieved in a given field of study which are not included in the list, but are, or may potentially be, important from the point of view of the sector;

- providing information about obligatory classes in modern languages and the ability to learn other languages free of charge;

- additional information.