

CHAPTER 6

Importance of Soft Competences in Management of Engineering Staff

Agata Przewoźna-Krzemińska

Czestochowa University of Technology, Poland

ORCID: [0000-0001-8727-0852](https://orcid.org/0000-0001-8727-0852)

Summary: The presented chapter concerns reflections regarding the image of today's engineer using not only hard skills but also soft competencies in his work. The chapter aims to present the role of soft competencies in an engineer's work based on completed empirical studies. To determine the support and soft skills needed in the work of an engineer used a piece of empirical research conducted among engineers, graduate students at the Czestochowa University of Technology. The research was conducted in May 2019 using the survey method. 133 students of the Czestochowa University of Technology were examined. Based on the presented results of empirical research, it has been established that engineers are aware that soft and social competencies are essential in life. They facilitate the acquisition of your dream job and the implementation of a professional career path. The chapter has a theoretical and empirical work.

Keywords: competence, soft competencies, manage the social capital of an organization.

Suggested citation: Przewoźna-Krzemińska A., 2021, *Importance of soft competences in management of engineering staff* [in:] *People in organization. Selected challenges for management*, Skalna I., Kusa R. (eds.), Krakow, AGH University of Science and Technology Press, https://doi.org/10.7494/978-83-66727-57-1_6.

1. Introduction

The presented chapter concerns reflections regarding the image of today's engineer using not only hard skills but also soft competencies in his work. Because of the tendency to cross various fields, soft competencies become an important asset already at the moment of recruitment and selection of candidates. Employers require engineers to have not only hard skills and experience but also soft competencies. Companies expect employees not only to represent high technical standards but also to have good communication skills that facilitate and reinforce relations with the environment. Competencies are personal resources of employees that allow them to properly perform tasks at a given position at work and manage the social capital of an organization. Competencies are personal resources of employees that allow them to properly perform tasks at a given position at work and manage the social capital of an organization. The engineer's profession has always been associated with a practical person having hard specialized knowledge and endowed with an exact and logical mind and a personality with which it is not easy to establish interpersonal contact. Engineers usually focus on tasks that they perform, do not find it necessary to build interpersonal relations, and have a sceptical attitude to changes, because they attach importance to proven methods of work. However, we could see big changes in the labour market in the last few years; today employers require candidates not only to possess highly specialized knowledge but also to have soft competencies allowing them to establish effective and permanent relations with the environment. For this reason, changes in the method of engineers' functioning in the workplace are increasingly visible; they are required to co-operate professionally not only with the internal environment but primarily with the external environment. The development of soft competences is necessary for functioning both in professional and personal life. These fields interpenetrate, particularly in the last decade, which saw a very dynamic development of modern technologies, techniques, processes and many research areas. We can also observe a demand for specific competences on the labour market – the skills that are actually indispensable in the job of an engineer and are assigned to certain professions and organizational roles. Having analysed reports presented by leading companies researching employability and demand

for specific professions on the labour market, we can conclude that the demand of the labour market for graduates with a degree in engineering exceeds the supply and is reported in all sectors of the economy both in “engineering” and “technical” positions. The chapter uses fragments (broader questionnaire surveys) of the results of empirical studies conducted among graduates of engineering studies in 2019. The studies were to determine the importance of soft competencies in the work of the contemporary engineer. The chapter presents a fragment of research conducted among engineers enrolled in Supplementary Master’s Studies at the Czestochowa University of Technology. For the last several years, entrepreneurs and businesspersons have stressed that Polish universities and other schools of higher education, not only technical ones, still devote too little attention to co-operation with enterprises. The programs still lack education in fields that will be a response to demand on the labour market. University graduates share this opinion, stating that they are insufficiently equipped with soft skills and find it difficult to cope with the labour market. Schools of higher education continuously seek specializations that will satisfy students and will match the graduate’s profile adequate to the given field of study. “The large diversification of specializations within particular fields of study results in the decreasing number of graduates who are specialists in narrow fields entering the labour market at the same time” (Szczeпаńska-Woszczyzna, 2014).

2. Requirements for Obtaining Degree in Engineering in Poland

According to the Ordinance of the Ministry of Science and Higher Education of 1 September 2011 regarding professional degrees awarded to higher education graduates, requirements for the issuance of and necessary elements of university diplomas and diplomas of graduation from postgraduate studies and a diploma supplement form, the professional degree in engineering may be awarded to the graduate upon his/her acquisition of education results leading to the obtaining of engineering competences and results of education. (www.prawo.sejm.gov.pl/). To sum up, an engineer in Poland is a “person having higher technical education”. A degree in engineering is granted by schools of higher education upon graduation from engineering studies. However,

a degree in engineering does not always allow the graduate to practice the profession to the full extent because there are specializations were (by following with applicable laws) students are required to serve professional internships within the prescribed period and, upon their completion, take an examination to obtain a professional license. Strictly defined hard competencies (specialist knowledge, professional skills) adequate to the field of education have always been the most important in the engineer's profession. Hard competencies in an engineer's work often involve security and human life (e.g., construction engineers, electricians, mechanics, an example of hard competences in an engineer's work is the skill of reading a technical drawing and design documentation, the knowledge of specialist programs and foreign languages and, primarily, the knowledge and skill of interpreting provisions of law and all procedures and putting them into practice. An example of a worldwide engineer education initiative adopted by many world universities is the CDIO initiative. It is an abbreviation of the English words "conceive – design – implement – operate".

The concept of CDIO was elaborated at the Massachusetts Institute of Technology (MIT) in the late 1990s. ("The CDIO Initiative", Queen's University – Department of Mechanical and Materials Engineering, Retrieved on 12.04.2018). This idea was created as a result of criticism expressed by representatives of the global industry regarding the poor education of engineers and, primarily, their insufficient provision with competencies necessary for their work. In 2000, in co-operation with three Swedish universities: Chalmers University of Technology, Linköping University and the Royal Institute of Technology, MIT formally established the CDIO initiative ("Wallenberg CDIO documents", Archived from the original on 16.03.2005). It is based on international co-operation where universities around the world adopt the same framework for the education of engineers. CDIO is a reserved trademark for Conceive Design Implement Operate. The originators of CDIO believed that the long-year education of engineers should be backed up by solid industry practice, with the earlier provision of the fundamentals of engineering to students. The CDIO Initiative is an educational framework that emphasized the fundamentals of engineering specified in the context of the creation, design, implementation, and operation of systems and products in the real world. Participants of the CDIO initiative have adopted CDIO as a basis for planning curricula and performance-based evaluation

around the world. The CDIO approach utilizes active learning tools, such as group projects and problem-solving learning for the better provision of technical knowledge along with communication skills and social competencies to future engineers. In 2005, the CDIO concept was changed – currently, it consists of the following elements: 1) the emphasis on disciplinary knowledge and reasoning; 2) the emphasis on personal and professional skills and characteristics; 3) the emphasis on interpersonal skills, e.g., teamwork and communication; 4) the emphasis on concepts of designing and implementing operational systems in the context of enterprise, society, and environment. Analysing current tendencies and requirements towards engineers both on the Polish and international labour market, we can say that this conception is well matched to employers' expectations because the suggested curriculum recommends not only classic contents connected with exact sciences but also the development of "soft" skills and personal and professional traits (e.g., analytical reasoning and problem-solving, experimentation, research, and discovery of knowledge, systemic thinking). (Crawley, 2007). In 2005, the CDIO concept was changed – currently it consists of the following elements: 1) the emphasis on disciplinary knowledge and reasoning; 2) the emphasis on personal and professional skills and characteristics; 3) the emphasis on interpersonal skills, e.g., teamwork and communication; 4) the emphasis on concepts of designing and implementing operational systems in the context of enterprise, society and environment. Analysing current tendencies and requirements towards engineers both on the Polish and international labour market, we can say that this conception is well matched to employers' expectations, because the suggested curriculum recommends not only classic contents connected with exact sciences, but also the development of "soft" skills and personal and professional traits (e.g., analytical reasoning and problem solving, experimentation, research and discovery of knowledge, systemic thinking). This conception also emphasizes teamwork and communication, on systems of conceiving, designing, implementing, and operating systems in an enterprise, and on the social and environmental context of innovative processes. According to the CDIO conception, the curriculum assumes the pursuance of team projects encompassing a few subjects, but also the generation of proper motivation in students, the creation of fundamentals for the understanding of technical ideas, and the creation of the "project management – communication – teamwork". To sum up, integrated

education focuses on teamwork and communication, on design and production, on analysis and simulation, on industrial projects and models of their pursuance.

3. Competences in the Theoretical Approach

In the last few years, Polish employers began to appreciate the impact of soft competencies on the entire work of the organization and its effectiveness. Job advertisements for engineers regularly contain not only requirements concerning the field of studies, specialization, and experience, but also requirements concerning interpersonal and social competencies (“soft” competencies) and competencies of future related to the business prediction of economic market changes to react to their needs adequately. “Competencies result from the cultural, social, economic, and scientific context and from the fourth industrial revolution that sets specific requirements. Successive industrial revolutions changed human conditions of life and work, and technological progress shaped how people acquired and produced various kinds of goods with the use of their knowledge, skills, and attitudes. To understand the essence of human needs and changes in the modern world, we must return to the past: from Industry 1.0 of first machines to the cyber-physical Industry 4.0 system” (Competences of future, Benefit 12(91)2019, p. 34). Today we witness the fourth industrial revolution (relying on the achievements of the third industrial revolution) that uses communication and information technologies. The cyber-physical system is based on the automation of production in smart factories, in which production systems, components, and people communicate via a network, and production takes place almost automatically. (Benefit, p.35). Employees’ competencies are increasingly important for the functioning of organizations. Theoreticians and practical experts define them in various ways and divide them according to various criteria to systematize knowledge about them. They constantly look for ways of managing competencies in organizations to the best possible extent. The multitude of definitions of competencies results from the fact that the subject of competences is covered by various sciences – in law, for example, competencies are identified with granting a power of attorney; in sociology, competencies are perceived as the skill of behaving by following cultural norms; in psychology, they stand for the ability to

perform activities properly and effectively, and praxeology defines competences as traits making it possible to perform tasks efficiently. (Stabryła, 2011, p. 105). According to management, competencies are the manager's ability to manage effectively and ethically (Przewoźna-Krzemińska, 2009, p. 36).

C. Levy-Leboyer writes that competences encompass the integrated use of abilities, knowledge, skills, and personality traits to bring about the successful implementation of the mission of the enterprise. T. Oleksyn defines competences as a set encompassing knowledge, abilities, styles of action, followed principles, interests, personality, and other traits being used and developed that lead to the achievement of results consistent with the plans of the enterprise (Oleksyn, 2006, p. 19). An important part of this definition is the emphasis on the need to use and develop possessed traits, skills, and abilities to achieve intended results employing them. Based on literature analysis, A. Jawor-Joniewicz and B. Sajkiewicz prepared lists of definitions of competencies. These definitions were divided into employee-oriented, work-oriented, and mixed definitions. Currently, in the technologically changing world, priority should be given to a competent human being who creates a model of a specific profession; therefore, competencies that distinguish human work from the work of IT systems or artificial intelligence become crucially important (Benefit, p. 35). In certain areas, replacing the human being with a robot is impossible, but the human being is forced to develop constantly and to acquire new competencies for the future. The concept of competence is rooted in the Latin term *competentia*, which means "usability", "responsibility". In English, this word is understood as skills or abilities to perform certain activities (Przewoźna-Krzemińska, Pabian, 2009, s.120). D. Dubois and W. Rothwell distinguish two trends in the interpretation of the essence of competence. According to D. Dubois, competence means knowledge or skills; according to W. Rothwell, the concept of competence covers each trait that enables the given person to achieve intended results. R. Boyatzis defines professional competences as characteristics of a person that allow him/her to perform professional tasks efficiently and to achieve intended goals by following expectations set for the position concerned. R. Boyatzis distinguished the following three levels of professional competences: the level of motives and personality traits, the level of self-perception and social roles, and the level of skills. The formation and development of social competences occur thanks to

abilities necessary for the processing of behavioural information, which the social psychologist defined as social intelligence. It is, therefore, worth noticing the definition of social competences coined by M. Argyle, who defines them as a set of such skills on which the possibility of an adequate reaction to a specific social situation depends (Argyle, 2004, p.24). The literature of the subject defines social competencies most often as the “practical knowledge of something, proficiency in something, the ability to do something,[...] the scope of someone’s knowledge, skills or responsibility”(Encyklopedia PWN, 1991). Each human being acquires social competencies during his entire life; this is dependent on his personality, temper, education, etc. It is a sort of social training, which influences relevant interpersonal interactions both with the internal and external environment. M. Holstein-Beck describes competencies as a scope of powers and rights to act that should belong to persons with relevant qualifications and skills (Holstein-Beck, 1996). In the literature on organization and management, competencies are also defined as abilities to utilize powers and skills that serve the effective fulfilment of the manager’s role. Thus, all managerial skills can be competencies when they are used effectively (Constable, 1998). According to C. Levy-Leboyer, competencies are a set of behaviours that some persons learn better than others do, which allows them to act more efficiently in a specific situation (C. Levy-Leboyer. 1997, p. 32). According to Ch. Woodruffe, competencies refer to a series of behaviours that must be properly selected to perform competently tasks resulting from the relevant role or position (Woodruffe, 2003).

According to this approach, competencies are characterized by their connection with specific tasks or a specific kind of activity. Because professional competencies are specific to concrete situations and the organizational context, it is advisable to measure them during simulations that reflect real working conditions

Literature presents the whole spectrum of definitions and interpretations of competencies, which can be adequately categorized. According to the division introduced by Król and Ludwicyński, corporate and on-the-job competencies are distinguished. Corporate competencies encompass skills and traits required in all positions, and they aim to support the fulfilment of the mission of the enterprise. On-the-job competencies are specified for individual workstations. The authors distinguish also basic competencies that encompass social, personal, and cognitive competencies, and executive competencies that

include business and managerial competencies (Król, Ludwicyński, 2006, p. 82). “The following competencies are distinguished: general, detailed, and threshold competencies, action-related competencies, and differentiating competencies” (M. Armstrong, 2005, p. 245). It is particularly worth noting the division of competencies elaborated by K. Szczepańska-Woszczyzna, who presented the division of competencies that refers specifically to the engineering environment. This division is presented in Table 1.

Table 1. Division of competences necessary in an engineer’s work

Type of competence	Scope of competences
technical competences	they encompass manual skills and primary engineering knowledge regarding the principles of operation of concrete systems
Engineer’s competences	regarding the concrete specialization of the engineer concerned, and rarely going much beyond technical competences
managerial competences	they encompass such aspects as team management, building of relations and process management with the inclusion of not only technical but also economic and organizational aspects
social competences	that encompass acting in interpersonal relations and exerting an influence

Source: Elaborated on the basis: A. Pabian, S. Ratajczak, K. Szczepańska-Woszczyzna, 2014, p. 12

Competences are strictly connected with managerial skills and managerial predispositions – these features allow for adequate co-operation with, the motivation of, or influencing the effectiveness of the task group (Przewoźna-Krzemińska, 2017, p. 109). Defining the term “soft competencies” arouses certain disputes and controversies because there are many synonyms for this phenomenon. Soft competencies consist of skills and predispositions that are necessary for effective functioning in social life. The following terms are often used interchangeably: emotional intelligence, emotional competence, personal intelligence, intrapersonal intelligence, personal competencies, interpersonal intelligence, social intelligence, social competence.

Table 2 lists selected researchers and characterize phenomena of the synonym of competence.

Table 2. Synonyms of the term “competence”

Author of the definition	Synonym of competence
H. Gradner	emotional intelligence (according to the author – “personal intelligence”) that consists of intrapersonal and interpersonal intelligence
D. Golleman	emotional intelligence – individual ability to learn proper behaviours, based on five constituents: self-regulation, self-awareness, empathy, motivation, and interpersonal relations
P. Salovey, J. D. Mayer	Emotional intelligence – emotional intelligence is the ability to “make a proper perception, evaluate and express emotions, the skill of having access to feelings, the ability to generate them in situations when they can support thinking, the skill of understanding emotions and emotional knowledge and the skill of regulating emotions so as to support emotional and intellectual development”

Source: Elaborated on the basis of the literature of the subject

On the basis of definitions coined by P. Salovey and J. D. Mayer, researchers of this phenomenon distinguished four factors of emotional intelligence: 1) recognizing emotions (emotional expression, perception) – the ability to express one’s own feelings and to feel and receive non-verbal and verbal information on an emotional basis from the partner of the interaction; 2) making use of emotions (in order to support thinking), i.e., using emotional states for solving problems and creative thinking; 3) the understanding of emotions that includes their processing for the purpose of understanding them to such an extent that the given person can name them and establish relations between individual affective states, i.e., achieve the ability of introspection; 4) managing emotions, i.e., regulating one’s own and other people’s emotions. It is important to distinguish between emotional intelligence and emotional competence, which means the measurable level of ability

to use emotional intelligence in practice. A high level of emotional intelligence does not guarantee a high level of emotional competence. In literature, we can also come across the term “personal competence”, which means the level of skills on which we use knowledge about our own states and feelings. “Social skills” are a set of knowledge, utilized abilities, experiences, and personality traits that enable people to establish, develop and maintain interpersonal contacts and the skill of reacting adequately to the existing social situation. According to Argyle, more than 10% of the world’s total population may find it quite difficult to handle everyday social situations and may have problems with efficient social functioning and interpersonal relations. Around 35% of neurotic persons are characterized by a deficit of social skills (Argyle, 1994).

3.1. Engineer’s Competences of Future

Until recently, the stereotype of an engineer suggested that an engineer focuses entirely on technical issues. An engineer ignoring the importance of soft competencies in his job ceases to function properly. This theory can be confirmed by a list containing many skills falling within the scope of soft competencies desirable in engineers. In the Future of Job Report 2018 (www.webforum.org), the following desirable skills are distinguished: comprehensive solving of problems, critical thinking, creativity, management of people, co-operation, emotional intelligence, decision-making, service-oriented attitude, negotiations, cognitive flexibility. These competencies were enriched by further studies presented in the Future Work Skills Report 2020 that was conducted by the U. S. Institute for the Future. Soft competencies of the future are presented in Table 3.

The primary requirement set for engineers is the ability to act according to rules and procedures and to deliver high-quality tasks. A huge advantage of the engineer of the future is the ability to communicate effectively, i.e., to share information in a manner comprehensible to the recipient and evoking positive feelings of both sides. The engineer of the future is active and open to changes, appreciates diversity in performing tasks and in interpersonal contacts, appreciates teamwork, and does not have problems with it. It is also worth noting the profile of the modern engineer and the

engineer of the future elaborated based on Thomas International PPA – a fast and reliable tool supporting decision-making processes in people management areas (www.corsonhr.pl/oferta/testy-rekrut). This profile is presented in Table 3.

Table 3. The engineer of the past vs. the engineer of future

The engineer of the past	The engineer of future
an analytical, logical and systematic person complying with procedures, with an inborn need to perform tasks perfectly and focus on them rather than on people,	an active open-minded person who likes diversity in interpersonal contacts and the performance of tasks,
can co-operate with people (without knowing them personally), but does not like new situations and changes without knowing the team ,	has the ability to communicate detailed/technical information with enthusiasm and optimism to other people and inspire positive feelings regarding the subject area shared by him,
works in a systematic and thoughtful manner, sees things through to the end, is careful, kind, organized, and tidy-minded.	attaches great importance to details, strives for perfection, performs work according to quality standards, complies with rules and procedures.

Source: own work based on: A. Biegańska et al., 2017, p. 47

Polish employers increasingly often invest in employed engineers, helping them develop soft competences by sending them to training and coaching sessions or organizing workshops within the organization. Analysing theories that refer to competences, we can distinguish the engineer's most important competencies that will respond to the needs of the labour market, i.e., needs of employers and employees and the need to design the operation of advanced technologies. These competencies include, among others, the friendly attitude to people, enthusiasm, empathy, creative skills, problem-solving, critical thinking, innovation, problem-solving (ad hoc), designer's insight (the ability to understand the outcome of the task), artistic insight (the ability to create and implement a vision), professional skills, organization and creation of plans, planning, time management, management of meetings, knowledge of technologies, knowledge of technological trends, knowledge of business trends, the ability to search for information, knowledge of business ethics,

knowledge of intercultural differences, awareness of personal diversity, awareness of the shortage of skills in other colleagues, learning, teaching, process improvement, knowledge management, creation of reports and statements, customer service, talking to customers and entrepreneurial thinking. It is crucial for engineers must be aware of their own competences, which they should constantly develop and use skilfully at work.

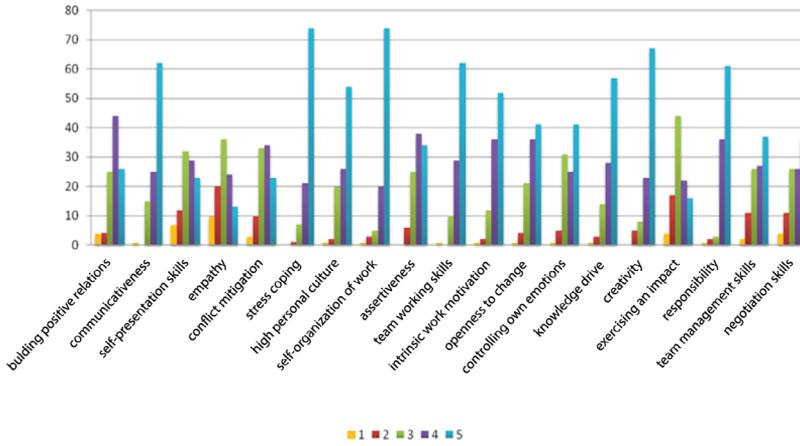
4. Research Characteristics

To define soft competencies that support and are necessary for an engineer's work, a fragment of empirical studies conducted among engineers and students of master's programs at the Częstochowa University of Technology was used. These studies were carried out using the questionnaire method in May 2019. The respondents were students (both of full-time and extramural courses) of the following fields: welding, information technology, insurance mathematics, and financial mathematics, production management and engineering, power engineering, and mechanical engineering. From among a total of 150 anonymous questionnaires handed out to respondents (open-ended and closed-ended questions), 133 questionnaires were filled in reliably and subjected to a final analysis. Engineers filled in the specification that was the last part of the questionnaire. They answered questions referring to age (22–30 years: 121 persons; 31–40 years: 12 persons), sex (34 women, 99 men), length of service, length of service in their current job position, the company in which they work and the type of employment. More than half of the respondents (68) work under an employment contract. 32 respondents serve an internship or a practice period, which means that these persons are only becoming familiar with the character of an engineer's work. 12 respondents are self-employed persons, 11 persons work as freelancers, and the remaining persons (10) do not work. As many as 98 out of 121 respondents in the age bracket of 20–30 years have a work experience of up to 3 years. They are beginner engineers, who still become familiar with the tricks of their job. In the age bracket of 31–40, 4 persons have worked for more than 10 years, 5 persons have a work experience exceeding 11 years, and 3 persons have worked for less than 3 years. In the first question of the questionnaire, respondents were asked to define the concept of competence. It was a general question,

and respondents were asked to define the concept of competence at work in their own words. Respondents defined competencies most frequently as theoretical knowledge, practical skills, personality traits, and a set of employee skills. Many respondents defined competencies as skills or knowledge acquired or learned by experience. Respondents suggested that employees prove their competences by performing their job tasks carefully and by delivering top quality results. They proved that they know the concept of competencies at work and can define them. They filled in the questionnaire with understanding, which makes the research results even more reliable. In the second question, respondents estimated whether they regard hard competences and specialist knowledge as sufficient in their work as an engineer. They could choose from three answers: “yes”, “no”, or “I don’t know”. More than 100 respondents answered “no”, the answer “yes” appeared only in 9 questionnaires, and other respondents answered “I don’t know”. Nearly 115 respondents stated that having only specialist knowledge is not sufficient in an engineer’s work; they answered that soft competencies are also necessary for their job. 15 respondents admitted that they did not know the answer to that question, and 3 persons answered that hard competencies are insufficient. The lack of specific opinion on that subject may result from the lack of sufficient knowledge regarding the type of competence or insufficient work experience necessary to form one’s own opinion. Another closed-ended question (“yes”, “no”) concerned the knowledge of the term “soft competencies” (personal and social competencies). Nearly 100% of respondents said “yes”; this means that the knowledge of this concept and the awareness that such competencies are necessary at work to confirm that the approach and requirements towards the modern engineer have changed. In connection with the growing tendency to create project teams performing joint tasks in companies, engineers were asked if soft competencies are necessary during the work of such teams. The persons who checked “yes” were asked to justify their answer. 128 respondents answered that soft competencies are of key importance during the implementation of projects. When justifying their answers, the respondents most often referred to the need for effective communication with other team members, the ability to co-operate, the joint motivation to act, having internal resistance to stress, and negotiation skills. 5 respondents believed that soft competencies are not necessary for work in engineers’ teams. In the subsequent question, respondents were asked to evaluate

the degree of usefulness of various soft competencies in an engineer's work. The grading scale was 1–5, where 1 meant the least useful skill at work and 5 meant the most useful one. The distribution of answers is presented in Figure 1.

Figure 1. Degree of the usefulness of soft competencies in an engineer's work



Source: Own work based on research results

The respondents gave the highest grades to such skills as coping with stress and the self-organization of work, communicativeness, teamwork skills, creativity, and responsibility. The competencies indicated by the respondents correspond to those that are mentioned most often in job advertisements by employers (desirable competencies for engineering positions). Empathy and self-presentation skills were evaluated as not very significant. However, we can conclude from the analysis of answers that all the aforementioned soft competencies play a significant role in engineers' work. When asked about the soft competencies that they use in their work, the respondents answered as follows: communicativeness, teamwork skills, responsibility, and high personal culture. Based on these answers, we can conclude that these are the fundamental soft competencies that every engineer should have, regardless of his job position and type of work. The smallest number of respondents indicated that they need the skills of exercising an impact, managing a team, and mitigating conflicts at work. This may result from the fact that part of the respondents

do not hold executive positions and, therefore, cannot make use of such competencies. Empathy received few votes once again. More than half of the respondents (66 persons) stated that work will be more effective and efficient thanks to the exercise of soft competencies by the manager. When giving arguments for such an opinion, respondents included the fact that it is easier to establish communication with such a manager, which makes employees feel at ease, and that a manager with soft skills communicates orders in a more accessible manner. Another group of arguments refers to the fact that such a manager has the ability to manage a team, is less confrontational, can mitigate conflicts, motivates others to act with his attitude and personal authority, and has the skill of influencing others without causing stress to his subordinates. Thanks to his intrapersonal and interpersonal skills, he can assign tasks adequately to the needs and predispositions of employees. 28 persons decided that they had no opinion about that and 9 persons that soft competences of superiors do not have an impact on the efficiency and effectiveness of work of employees' teams. When asked whether a manager having soft competence can make the atmosphere within an employee team more friendly, engineers answered as follows: 88 engineers believed that the manager's soft competencies improve the atmosphere of the workplace. According to respondents, the most influential factors in this respect are communicativeness, the skill of resolving conflicts, high personal culture, motivation and cooperation skills, composure, responsibility, and the level of empathy; 10 respondents had no opinions on that subject, and others stated that soft skills are not influential. The engineers answered that their superiors should work on their soft competencies such as openness to changes, assertiveness, fair treatment, the delegation of rights, responsibility, and motivation. In the case of questions about training courses improving soft competences in the engineers' workplace, most engineers who had attended such training courses jointly confirmed that these courses had improved the quality of their work, justifying their opinion as follows: the training courses helped them acquire theoretical knowledge that brought favourable results when put into practice. They noticed that the atmosphere in the workplace improved, which increased satisfaction with professional work. Apart from that, engineers noticed an improvement in negotiations, effective

communication with the superior, and the self-organization of work. This changed their approach to working with people.

5. Conclusions

Based on current literature and completed empirical studies (only a fragment of them was presented due to the volume of the paper), the author analysed the knowledge and awareness of engineers regarding soft competencies and their influence on engineers' work. Summarizing the above reflections, we can say that young engineers realize that having technical knowledge in itself is not sufficient to meet the expectations of employers and customers today. This is largely due to such factors as the change in the method of education and the specificity of the job (task groups and project teams). To find one's place in such teams, it is necessary to be able to co-operate and communicate effectively with team members. The requirements of employers and customers constantly improve, and the surrounding conditions are highly variable; to cope with this, employees need the ability to think creatively and to solve various current problems. Other skills used by contemporary engineers include establishing friendly relations, self-presentation, empathy, mitigating conflicts, high personal culture, self-organization of work, assertiveness, inner motivation to work, openness to changes, emotional self-control, the need of continuous self-education, exerting an influence, responsibility, team management and negotiation skills. The subject of soft competences (their level) will constantly evaluate because they are the way to the success of the individual and his/her environment and help to build a competitive edge. Recently, the most desirable are the so-called transferable competencies, which are also referred to as meta-competencies (universal, digital, and interdisciplinary competence). Hiring competent employees influences the development of the organization. Some recommendations for engineers to acquire interdisciplinary competences can be proposed. Education at universities should be more practical. Universities should develop and strengthen the entrepreneurial attitude. In education, cooperation, team activity and team success should be promoted. Finally, studies should be creative, not imitative.

References

- Argyle M., 2004, *Psychologia stosunków międzyludzkich*, Warsaw, Wydawnictwo PWE.,
- Armstrong M., 2005, *Zarządzanie zasobami ludzkimi*, Cracow, Oficyna Ekonomiczna.
- Twaróg-Kanus A., Pietrzyk S., 2019, *Kompetencje przyszłości*, „Benefit” No. 12(91).
- Boyatzis R. E., Sala F., 2004, *The Emotional Competence Inventory(ECT)*, [in:] *Measuring emotional intelligence: Common ground and controversy*, G. Geher (eds.), New York.
- The CDIO Initiative*, Queen’s University – Department of Mechanical and Materials Engineering, www.me.queensu.ca/Undergraduate/The-CDIO-Initiative.html (Accessed 20.11.2021).
- CDIO Collaborators*, www.web.archive.org/web/20120102000515/http://www.cdio.org/cdio-collaborators (Accessed 20.11.2021).
- Join CDIO*, www.web.archive.org/web/20100325073650/http://www.cdio.org/participate/join-cdio-o (Accessed 20.11.2021).
- Constable C. J., 1988, *Developing the Competent Manager in a UK Context*, Report for the Manpower Services Commission Sheffield: Manpower Services Commission.
- Dubois D. D., Rothwell W. J., 2008, *Zarządzanie zasobami ludzkimi oparte na kompetencjach*, Gliwice, Helion.
- Encyklopedia Popularna PWN*, 1991, Warsaw, Wydawnictwo PWN.
- Gardner H., 2002, *Inteligencje wielorakie. Teoria w praktyce*, Poznań, Wydawnictwo Media Rodzina.
- Goleman D., 1997, *Inteligencja emocjonalna*, Poznań, Wydawnictwo Media Rodzina.
- Górski P. et al., 2015, *Absolwenci Wydziału Zarządzania AGH u progu kariery zawodowej*, Cracow, Wydawnictwa AGH.
- Gracel J. et al., 2017, *Inżynierowie 4.0. (Nie) gotowi do zmian?*, Cracow, ASTOR Publishing, www.researchgate.net/publication/320806673_Inzynierowie_40_Nie_gotowi_do_zmian (Accessed 20.11.2021).
- Holstain-Beck M., 1996, *Jak być menedżerem*, Warsaw, CIM.
- Król H., Ludwiczynski A., 2006, *Zarządzanie Zasobami Ludzkimi. Tworzenie kapitału ludzkiego organizacji*, Warsaw, Wydawnictwo Naukowe PWN.
- Kuczmaszewski J., 2004, *Zawód: Inżynier*, “Forum Akademickie” No.3.

- Levy-Leboyer C., 1997, *Kierowanie kompetencjami. Bilans doświadczeń zawodowych*, Warsaw, Wydawnictwo Poltext.
- Mayer J. D., Salovey P., Caruso D. R., 2004, *Emotional intelligence: Theory, findings, and implications*, "Psychological Inquiry" No. 60.
- Nowa Encyklopedia Powszechna PWN*, 1996, Warsaw, Wydawnictwo PWN.
- Oleksyn T., 2006, *Zarządzanie kompetencjami. Teoria i praktyka*, 2006, Cracow, Oficyna Ekonomiczna.
- Pabian A., Ratajczak S., Szczepańska-Woszczyzna K., 2014, *Kształtowanie kluczowych kompetencji inżynierskich w perspektywie oczekiwań podmiotów otoczenia społeczno-gospodarczego*, Dąbrowa Górnicza, Wydawnictwo Wyższej Szkoły Biznesu.
- Przewoźna-Krzemińska A., 2019, *Analysis of Competence Resources as a Key Recruitment in Tool in Organizations People, Planet and Profit: Sustainable Business and Society*, Illes Csaba Balint (ed.), Godolo, Szent Istvan University Publishing.
- Przewoźna-Krzemińska A., 2017, *Wpływ predyspozycji i kompetencji menedżerskich na efektywność pracy zespołowej [in:] Ludzie – przedsiębiorstwa – instytucje. Współdziałanie i współdzielenie się w relacjach społecznych i gospodarczych*, Kukowska K., Skolik S. (eds.), Częstochowa, Wydział Zarządzania. Politechnika Częstochowska.
- Przewoźna-Krzemińska A., 2009, *Kompetencje menedżera w zarządzaniu potencjałem społecznym organizacji [in:] Marketing społeczny oraz perspektywy jego rozwoju na świecie*, (eds.). Pabian A., Częstochowa, Wydział Zarządzania. Politechnika Częstochowska.
- Przewoźna-Krzemińska A., 2018, *Revolution in the Labour Market as a Challenge for the Polish Freelancer [in:] Challenges of Management in Modern Organizations*, Albrychiewicz-Słocińska A., Czarnecka A., Dunay A. (eds.), Godollo, Szent Istvan Egyetemi Kiado Nonprofit Kft.
- Stabryła A., 2011, *Przegląd problemów doskonalenia systemów zarządzania przedsiębiorstwem*, Cracow, Mfiles.pl.
- Szczepańska-Woszczyzna K., 2013, *Zarządzanie zasobami ludzkimi w oparciu o kompetencje. Perspektywa uczenia się przez całe życie*, Warsaw, Instytut Badań Edukacyjnych.
- Szczuka-Dorna L. et al., 2010, *Professionally Qualified Graduate of a Technical University Diversity Unifies – Diversity in Engineering Education*, Trnava.
- www.talentclub.pl/wiedza3.php.

Test Thomas International PPA, www.corsonhr.pl/oferta/testy-rekrutacyjne/test-thomas-international-ppa (Accessed 20.11.2021).

Wallenberg CDIO documents, www.web.archive.org/web/20050316045719/http://www.cdio.org/Wallenberg_docs/wallenberg_docs.html (Accessed 20.11.2021).

www.wartowiedziec.org/index.php/transport/prawo-i-zarzadzanie/20418-pojecie-wyksztacenia-wyszego-technicznego-raz-jeszcze.

Woodruffe Ch., 2003, *Ośrodki Oceny i Rozwoju*, Cracow, Oficyna Ekonomiczna.