

# THE FUTURE SKILLS IN THE AGE OF DIGITAL TRANSFORMATION

## **Abstract**

*The aim of this paper is to summarize the most important findings of the past 40 years' literature regarding not only the categorization of competences needed in employment, but also the effects the current age of digital transformation has on them. Having conducted a literature review, we successfully identified, analysed in chronological order and grouped 13 key competences individuals could have within the 3 main categories established by Katz, 1974. Our research enables us to follow how each competence has appeared in the literature, and to conclude which ones affect the current labour market the most. This literature review can function as a firm base for future research, in which the current findings could be integrated into an empirical research and viewed specifically in the context of the industry 4.0.*

**Keywords:** skills, competences, categorisation, digital transformation, industry 4.0

## **Introduction**

Being successful at work is something that has attained attention for a while from both professionals and researchers. This is particularly true in the case of managers, since the higher the position, the more responsibility is involved. Researchers tried to tap how skills could be categorised, how can they be developed, and which ones are the most important for successful employment. Katz's fundamental work (1974) provided a great basis for further studies. The *Skills of an effective administrator* suggested a concept, in which three skills are essential for a manager to have, namely conceptual, human and technical. Ever since, the global environment has gone through significant changes, due to which the categorisation and structure of skills have varied in the literature.

Nowadays, in the era of digital transformation and the industry 4.0., organisations and individuals face an ever-growing problem: some skills that were deemed essential in the past, have now lost their importance, whereas others' significance rocketed only within a few years' time. How can they successfully compete in the environment of RPA, IoT, AR, AI and ML? What skills can they expect from a future candidate and which ones should they emphasise in their own learning and development program? How much have they changed over the years? As it seems, there are more questions to be answered: What skills are to be honed, in order to succeed in such a quick-paced environment? How can employers and employees adapt that quickly to changes in the era of digital transformation? Can we somehow predict how the judgement of necessary skills will alter in the future?

The present study not only continues along these questions, but also argues whether there has been a significant change considering the required skill sets. Therefore, we conducted a detailed study, namely a literature review from Katz's work (1974) till the most recent researches (2018). This study explores the different classifications of skills and how they have altered during the years, and also aims at summarising and restructuring the skill categories. Moreover, the present study also predicts that the fundamentals of the required skills have not been greatly affected by the changes the environment has recently undergone.

The main reason of writing this study is that we find the timing perfect. The concept of the digital transformation is becoming more and more acknowledged in the academic and corporate environment, as well. However, it could be difficult to decipher all the meaning behind the frequently used fancy buzzwords. Many questions in connection with skills are to be answered in the following years. We found that there is a lack of studies that aim to compare the different categorisations of skills and how they have evolved during the years. Our main aim is to fill that void and provide useful information to scholars and professionals at the same time.

## **The concept of digital transformation**

The fourth industrial revolution made its first appearance in the literature in 2011. The term itself originates from the German version "Industrie 4.0", which was first used at the Hannover Fair by a working group. A key component of the concept is the digitisation of the complete value chain. This can be achieved by cyber-physical systems and real-time data exchange. As a result, machines with AI (artificial intelligence) will be able to adapt to spontaneous and rapidly changing environmental factors. In the past few years, the literature has been replete with discussions on the crucial components of the industry 4.0., the most common terms are the following: Internet of Things (IoT), Big Data, robotics, and additive manufacturing. (Strange and Zucchella 2017)

Celaschi (2017) argues that besides the mentioned four components of the industry 4.0., there are two additional ones, namely the AR/VR technology and the cloud. While the former one enables the creation of a virtual reality, the latter provides a revolutionary solution to the issue of data storage. In addition, RPA (Robotic Process Automation) enables processes to be described with an algorithm. As a result, such recurring processes as accounting can be entirely automatized and standardised. This technology may result in the replacement of human resources not just at the production line, but also at the offices. The question of how employers and employees will be able to cope with these changes still lingers.

Apart from the main framework, it is important to mention the additional factors that enhance the application of the industry 4.0. concepts. One of the key drivers of technological growth is constant competition on the market. It is essential for companies to keep up with industrial changes in order to survive and grow constantly. As technology, consumer needs and processes are rapidly changing, constant renewal and the quick and effective adaptation and utilisation of appearing industrial innovations are crucial. Nowadays, increasing innovation capacity and productivity is vital for organisations. At the same time, product life cycles have shortened.

Consumer need are becoming more and more heterogenic, are constantly changing, meeting them often requires the alteration of the organisational structure. Moreover, the company that can launch a product the quickest, may attain competitive advantage. Altogether, the industry 4.0. will be without doubt a significant pillar in the future competency of industrial and manufacturing companies. Organisations have to face major changes both on micro and macro level. (Horvath and Szabo, 2017)

The industry 4.0. has not only affected manufacturing processes but has also evoked organisational changes. Work organisation, labour composition and the necessary skills in order to succeed are also concerned.

### **Main concepts**

The literature is replete with discussions on the exact terms of skills, competence, ability and knowledge. Essentially, this study aims at summarising and structuring the skills based on a literature review, therefore distinguishing these terms is not among its objectives. Their assessment and phrasing are continuously changing, consequently the barriers of this study make it limited to address this question accordingly. Thus, in order to focus on the primary research question, the listed terms are used as synonyms in this study. However, with no claim of being exhaustive, in this chapter we would like to present these concepts briefly, so that researchers can tap the fundamentals of them.

Since there is no established definition of “competence”, a generic concept of competence is used for identifying, classifying and aggregating competencies. Hecklau *et al.* (2017) conducted a detailed literature review in order to address this issue. They point out that "according to a wide range of authors, competence includes motivation, attitude, abilities, skills and knowledge needed by employees to cope with job-related tasks and challenges in order to reach business success." They can be separated into two main categories: “behavioural” competencies and

“technical” competencies. Behavioural competencies include motivations, attitudes and abilities. These abilities primarily rely on natural or inherent behaviours. Even though they may be acquired to some extent, their essence cannot be learned. On the other hand, technical competencies consist of the knowledge and skills elements that are learned through continuous study and practice.

Skills differ from competences to some extent. According to Hecklau *et al.* (2017), they are "the application of knowledge in a trade or profession." In Hwang's (2003) view, skills are a “set of required functions in each occupation.” For instance, programming skills involve applying knowledge of the commands and functions of a specific programming language. The combination of the two elements - competence and skill - is mandatory to achieve effective performance. Hecklau *et al.* (2017) point out that knowledge of “how” to do something does not necessarily an equivalent of carrying out the task accordingly. (Armstrong, Taylor 2014; Grassmann 2005; Solga, Ryschka, J., Mattenklott, A. 2011; Bernien 1997; Erpenbeck, Heyse 1996; Schiersmann, Thiel 2014; Wien, Franzke 2013)

### **Systematic literature review**

In order to answer the defined research questions, we developed a comprehensive approach to identify and analyse studies from suitable and reliable sources that describe competencies in general and in the context of the development of Industry 4.0 and digitization. Thus, for this study, we selected the method of systematic literature review.

Weber and Watson (2002) define systematic literature review as a methodology, which includes the usage of scientific databases in relevance with specific keywords. Then, based on the relevant scientific articles, other referred or cited publications can be found.

In view of this, firstly the study selection process was conducted by searching the combination of the following keywords: "skill", "skill set", "competence", "ability" and "knowledge". In

**Figure I.**, the literature appearances of these basic search words are indicated from 1974 to 2017. As it can be seen in the diagram, there has been an exponential growth in the number of appearances of all the search words around 2002. It can also be deduced from the diagram, that knowledge and ability have the most appearances.

Later the search was broadened by the following key words and phrases: "competence category", "skill category", "complete skill sets". In addition, to gather more specific information about those skills that are needed in the industry 4.0., additional search words were used, such as "industry 4.0 skills", "competences industry 4.0.", "digitalization skills", "skills in digital transformation" and "smart manufacturing" for the US sources.

Besides an extensive investigation of published studies, we also used an advanced internet research and the following chosen top-databases covering a wide range of publications concerning HR, Organisational Behaviour, Information Systems and Information Technologies accessible from Corvinus University of Budapest. These databases were the following: EBSCO, Emerald Insight, Scopus and Science Direct. Moreover, for this study we also used the papers available in the library of Corvinus University of Budapest.

The search included studies that were published until **June 2018**. First, all hits were screened based on their title and abstract. Secondly, we also conducted a quick search on the articles using the same keywords as before in order to screen the complete paper. At the end of this process, a total of **20** studies were selected as acceptable and relevant. **Table I.** shows the final list of studies.

The listed studies build the data basis for the following analysis regarding the evolution of competence categories. Collectively, they cover approximately 40 years of research starting from Katz's (1974) "Skills of an effective administrator" to the latest issues, in which the essential skills in the era of the industry 4.0 are listed.

For the analysis of the categorisation of competencies over time, listed skills from each study were collected and extracted. In view of this study's objectives, firstly all skills were summed in a table. Secondly, we highlighted the competences that are similar to each other and belong to the same group. This approach enabled us to build up the categorisation of this study step by step. If the same competency was mentioned synonymously in different studies, e.g. "personality" and "personal skills", the terms were integrated into one competence using the more common term.

As a result, we identified 13 competency features altogether. The literature is replete with discussions on the different terms and definitions used for competence and its elements (e.g. "skills", "abilities", "knowledge", "know-how") inconsistently. Therefore, this present study continues along Katz's (1974) main categories: conceptual, human and technical. This approach enables us to broaden the already existing categories and to incorporate the older and newer skills. In [Table I](#), the identified competencies are clustered into the three main categories and the 13 features that suit all studies analysed. In [Table III](#), the definitions of these features are explained in details, while in [Table II](#), all the used abbreviations are listed.

### **Skill structure**

In the past, studies have identified all kinds of skills. However, the literature is replete with discussions on how they should be categorised. Some studies define the most essential managerial skills, while other focus on the specific competences that are needed in the new era of digitalization and smart manufacturing.

The most famous categorisation of skills is Katz's (1974) conceptual study, which has been cited more than 1700 times according to Google Scholar. The study argues that managers are in dire need of three essential managerial skills in their day-to-day operations, namely technical, human and conceptual skills. What is to be understood under these terms? According to Katz

(1974), "technical skills are an understanding of, and proficiency in, a specific kind of activity, particularly one involving methods, processes, procedures or techniques. Human skills are primarily concerned with 'people', in the sense of the ability to work with other people. Finally, conceptual skills mean the ability to think and conceptualize about abstract situations, to see the organization as a whole, and the relationships among its various sub-units and to visualize how the organization fits into its environment."

Even though Katz provides an essential basis to the categorisation of skills, the study is hardly detailed enough. Peterson and van Fleet (2004) updated at that time Katz's fundamental categories and identified the following managerial skills: technical, analytic, decision making, human, communication, interpersonal, conceptual, diagnostic, flexible and administrative. The present does not evaluate this later addition, instead continues along Katz's (1974) three basic skills, but it also broadens the segmentation of each category and identifies the individual competences that those contain. Essentially, this study aims at the contraction of the previous literature in the topic and the findings of our study about skill categories.

### **Conceptual skills**

Robbins *et al.* (2010) review the work of Katz (1974) and provide some additional clues to the term conceptual skills. In their view, the ability to analyse and diagnose complex situation is to be understood under this term. They argue that decision making is a key feature within this category. Moreover, they assert that for managers, it is even more important to rationally process and interpret information, i.e. to have conceptual skills. In this study we decomposed conceptual skills into two subcategories, that are the personal and management ones.

## **Personal skills**

Personal skills are the first subcategory within conceptual skills. In our view, the personal skills feature two competences/characteristics: the individual's personality and creativity. While personal attributes could be found in literature before the 2000s, creativity has just appeared in recent studies.

Dench (1997) highlights the importance of basic skills, but points out that the skills needs are changing, so other competences became essential to be employable, too. She identifies three broader areas of skills: personal attributes and attitudes, personal skills and technical skills. She defines that personal attributes are mainly innate and related to a person's character, their attitudes and their view of the world, like honesty, integrity, reliability, generally fitting in and playing the game. On the other hand, personal skills are related to an individual's innate abilities, with a slight difference: it is generally argued whether they can be developed and built on. Dench (1997) illuminates that despite the fact that previously these skills were not top priority among employers, recent studies of employers' skill needs suggest that now these types of personal skills are viewed as crucial factors among occupations and employers. The reason behind that change can be found in changing organisational needs, the development on the service economy, the increased focus on customer service and the importance of quality as a competitive advantage.

Along the same lines, Stevens and Campion (1994) also focus on personal and interpersonal skills, although from a different approach: they assess the skills that are useful when it comes to teamwork. Thus, it is reasonable to conclude that in the 1990s both personal and interpersonal skills gained higher importance. The skill that seem to be essential is communication.

Later, Yen *et al.* (2001) conducted a research about what are the most important skills among IS practitioners. The sample of 90 IS practitioners provided a clear message: even in the field of IS, interpersonal and personal skills are deemed to be essential from the employers' side.

Even though Yen *et al.* (2001) focus on IS skills, it is clear that even in that field personal skills are needed indeed, moreover, employees are well aware of that, so they could highlight their strengths when applying for an IS related job.

### *Creativity*

The result of recent studies shows the growing importance of creativity, as well. Although personality traits and personal skills could be found in the literature for a while, a few empirical studies in the area suggest that creativity is also a key factor when it comes to successful employment. Robbins *et al.* (2010) define creativity as "the ability to produce novel and useful ideas". They highlight that creativity is especially important and highly correlates with decision making, a managerial skill, as it enables to appraise and understand the problem at hand completely. Not to mention the fact that creativity has been functioning as one of the primary driving forces for economic growth. Developing new products, services and improving speed or quality of business processes would be unimaginable without creativity.

Van Laar *et al.* (2017) depict creativity as a core competence among the 21st century digital skill dimensions. The rationale behind this thinking is that creativity comes handy, when generating previously unknown, completely new ideas, or when these ideas have to be transformed in a specific product or service. In practice, creativity is useful in content creation, for example.

Nevertheless, creativity is not only valued among IT professionals or strategists. In Banai and Tulimieri's view (2013), it is also advantageous for a business consultant to be effective. They refer to creativity as a "soft" skill that is often overlooked, but nonetheless important. On the contrary to analytical skills, creativity is not a competence someone may easily obtain and improve via traditional education. However, Banai and Tulimieri (2013) point out that creativity is extremely useful, when comprehending clients' needs and resolving their issue.

## **Management skills**

Management skills are also part of the broader conceptual skills category, as they include such features that are useful when leading and managing a company. Namely business management, leadership, decision making and critical thinking are the key competences that aggregate the category. Management skills can be defined as a complex set of skills that are needed in order to successfully coordinate a company. This includes planning, organising, leading and controlling whether the organisational goals are met. (Rosenberg *et al.*, 2012) Sousa and Rocha (2013) complement this list with the following competences among others: adaptability to changes, flexibility and managing strategic deals and alliances.

### *Business management*

As Chen *et al.* (2005) review the work of Bolino and Feldman (2000), empirical research on managerial skill utilisation is rather limited. Although only a few studies have examined managerial skills before, Trauth *et al.* (1993) argued that they can be viewed as a separate competence category. Along the same lines, their study approached the topic from a strictly IS technology point of view and referred to managerial skills as business skills. Trauth *et al.* (1993) argue that under the term "business skills" the understanding the business environment, the obtained knowledge of a specific business function and the sensitivity to organisational culture and politics are to be understood. Two years later, Trauth *et al.* (1995) conducted another research with a similar research question, in which they modified the definition of business skills to business functional.

Even though its classification may be argued, Stevens and Campion (1995) also define an essential part of managerial skills, which is goal setting and performance management. According to their perspective, this skill is part of self-management, which could belong to the

personal skills category, as well. However, as this skill is described as abilities such as team goal setting, monitoring, evaluating and giving feedback, in the present study we use goal setting and performance management as a managerial competence.

In addition, innovation skills are incredibly useful in order to successfully coordinate a company, especially through different phases and in acute competition. Sousa and Rocha (2013) list innovation skills as a key component when managing disruptive digital businesses. In their view, innovation skills involve such features as being able to diversify the business area, to identify and exploit new arising opportunities, to link project goals to business context, the willingness to undertake risks, etc. According to this perspective, creativity is also an innovation skill, however, in this study we categorised it as separate feature within the personal subcategory, as mentioned above.

However, a few empirical researches have been carried out to identify managerial skills as a separate category prior to business management. For instance, Devins et al. (2004) conducted a detailed study on the nature of the required skills. The result of this study shows that managerial skills - as a separate category - had the highest significance among the skills surveyed based on the relevant training received at the company. This study predicts that managerial skills are deemed to be important on the labour market, and employers are willing to spend resources in order to educate their employees in that field.

It can be deducted from the literature that even in the span of a decade, the judgement of managerial skills has not lost its importance. According to Kosaroglu and Hunt (2009), above all, managerial skills are of key importance to project managers. Rosenberg *et al.* (2012) agree and consider managerial skill a basic employability skill. In addition, Branchet and Sanseau (2017) depict that these competences are the most important of all the new critical “soft” skills that IS suppliers should have.

### *Leadership skills*

Sousa and Rocha (2013) agree that leadership is an important feature regarding successful management. Their study points out that leadership skills contain knowledge in such fields as employees' performance development, coaching and mentoring, motivating employees in order to enhance their performance. Klagge (1998) deem the latter ones so important, that he considers developing and mentoring others a separate skill category. Rosenberg *et al.* (2012) add that the typical characteristics of effective leadership include for example responsibility, self-esteem and honesty.

Harrison *et al.* (2017) refer to managerial skills as entrepreneurial skills, although it may be controversial, as this view includes individual competences that could belong to either managerial, either leadership skills. In order to identify the relevant skills regarding entrepreneurial leadership, they conducted a study from a qualitative approach, in which the findings indicate that there are three main competence categories: technical/business skills, interpersonal skills and entrepreneurial skills. This research adds to the knowledge how differently skills could be categorised, especially in the field of management.

### *Decision making skills*

This paper argues that decision making skills are also important features of the broader managerial subcategory. In the present study, we suggest that problem solving skills are similar to these, so they can be addressed simultaneously. Van Laar *et al.* (2017) define problem solving as skills "to cognitively process and understand a problem situation in combination with the active use of knowledge to find a solution for the problem".

According to the perspective of Mansfield (2004), in the UK, core skills that were developed by a national training programme were split into five main categories. Problem solving and decision making is one of them. In addition, Mansfield (2004) also reviews the work of a British

agency and their categorisation. Although some skills differ from the ones identified by Mansfield, problem solving is defined as a separate category of core skills in that study, as well. Costache *et al.* (2017) point out that making decisions and solving complex problems are among the top 10 most important competences a virtual enterprise actor would need at work to meet any knowledge demand in the era of digital transformation. They define decision making skills as a "complex package of interconnected competences" including perceiving details, analysing, evaluating, selecting the right conclusions, forming an opinion and giving critical feedback. Costache *et al.* (2017) highlight this is the most difficult skill to acquire properly: it requires the combined use of all the other competences listed in the study. However, Robbins *et al.* (2010) suggest that these skills could be improved by trainings, which is especially useful for managers, who have to perform non-routine tasks and regularly solve problems on their job. They strive to sharpen their logic, reasoning and problem-solving skills, so that they would be more adapt at assessing causation, analysing alternatives and selecting a final solution.

### *Critical thinking*

One of the listed competences is critical thinking, which is interpreted as a separate feature within the managerial skills subcategory in this study. This categorisation may be argued, as this competence could fit into the personal group of skills, as well. Even though it could be a personal skill, critical thinking is essential when managing a company, therefore this study suggests that it is rather considered as a managerial skill.

Costache *et al.* (2017) assert critical thinking as a mixture of competencies that support the mental process of analysing and evaluating an idea or situation, the ability to reflect on one's experience and find a logical connection between ideas and arguments, to understand the relevance of information or knowledge in a specific subject, and to build new arguments in debates, as well as the ability to distinguish between facts, opinions and judgments. Moreover,

Van Laar *et al.* (2017) add that there are some key components, which make an individual capable of thinking critically, including clarification, assessment, justification, linking ideas and novelty.

Critical thinking and its academic appearance are diverse. Flexible thinking and systems thinking are in fact quite similar to critical thinking, only with some minor differences. Thus, in our study, we consider them as the same feature. Leopold *et al.* (2018) assert that complex problem-solving and critical thinking are among the top 3 most valuable skills detected in 2018. Costache *et al.* (2017) agree with that view and predict in their study that both critical and flexible thinking are among the top 10 competences that would meet the knowledge requirement in 2020. According to them, flexible thinking differs from critical thinking, because it is the ability to give up ineffective actions and solve problems in order to achieve the desired results, the ability to approach new strategies easily, to see the situation in development so that it would be easier to adapt to changes, to predict the outcome of different variants, and the ability to select information and find solutions by using a variety of approaches. This implies that flexible thinking is basically versatility and open-mindedness, whereas critical thinking is rather rationality and logics.

However, critical thinking is a useful skill not only for the era of digital transformation around 2020 as Costache *et al.* (2017) suggested, but it has already gained importance recently. Rosenberg *et al.* (2012) even consider it as a basic employability skill. Moreover, their perspective sees systems thinking skills another, separate competence on the same level.

## **Human skills**

The main category of human skills is special among the others, because it has only one subcategory, therefore basically human skills could be referred as social ones one-to-one. It

features interpersonal competences, communication skills, relationship management and emotional intelligence. There is a wide gap among these skills, as the first two have been mentioned in studies before the 2000s, however it has been only recently that researchers have attached more importance to the latter ones, relationship management and emotional intelligence.

Le Deist and Winterton (2005) conducted a detailed research and conclude that social competences as one of the four dimensions they identified. In addition, the few empirical studies in this area suggest that interpersonal skills could be referred as social skills, but they are a broader category. Therefore, in the present study we use social skills as a subcategory, and interpersonal skills as a feature. Thus, we consider interpersonal skills in this study in general. This implies that according to the literature, interpersonal skills in general have existed long before other social skill features. In spite of that, the exact definition of social skills does not seem to be phrased sufficiently, it is more like a complex set of individual competences.

What are human/social competences? Trauth *et al.* (1993) provides some clues as to what the main components of this category are. Among others, such features are listed in their study as accomplishing assignments, working cooperatively, dealing with ambiguity, participating in projects and teaching others. This study predicts, that for instance accomplishing assignments was and will be important, however, the significance of relationship management would most likely rocket in the future. Altogether, Kearns *et al.* (2015) identify that human skills are much more frequently mentioned on interviews than the other two main categories, its dominance accounts for 51% of the total skill constructs.

Later, Robbins *et al.* (2010) provide some additional clues to the concept of human skills. In their view it is "the ability to work with, understand and motivate other people, both individually and in groups". Robbins *et al.* (2010) also highlight that in order to be able to constantly

motivate and delegate, human skills are especially important to managers as they get things done through other people.

Yen *et al.* (2001) also conducted a detailed study concerning the critical knowledge and skills that are required. Their study identifies the features of interpersonal competences: interpersonal behaviour, communication skills, capability and teaching/training skills. Evidence from research suggests that interpersonal skills are incredibly important from both the demand and supply side on the labour market. The result of their study shows that interpersonal behaviour skills and interpersonal communication skills are among the top 3 skills needed. Therefore, in our study, we examine these with detail.

#### *Interpersonal skills in general*

Stevens and Campion (1994) assert interpersonal competences in general as the other major requirement besides personal skills regarding teamwork. According to them, all other features, such as conflict resolution, collaborative problem solving, and communication add up to that subcategory. However, for this study, we chose to differentiate between them, and consider them as separate features.

It can be deduced from the literature that behavioural knowledge and interpersonal skills are equally important for IS professionals, as well. Trauth *et al.* (1995) conducted a detailed research on how skills, which are essential for IS professionals are most likely to change in the future. The result of their study predicts that there will be a significant growth in the following years regarding the importance of interpersonal skills, which can be affected by the era of digital transformation. However, such a conclusion on its own may be inadequate, because when compared to other competences, the predicted growth is not that significant, in fact, it might not be that essential either. The above argument leads us to question whether there are significant changes in skill requirements at all.

Following Horvath and Szabo (2017), it is argued that social skills are gaining more and more importance in the era of digital transformation. Their study illuminates that besides being able to communicate and cooperate with co-workers efficiently, because of the globalisation, individuals have to understand different cultures, as well. Along with the same lines, human skills could be incredibly important from a management point of view, too.

Kearns *et al.* (2015) review the work of Katz (1974) and focus attention to which interpersonal skills have the most significance by a leader. The rationale behind this thinking is that the leader has to work with different groups of people, such as subordinates, peers, and superiors; meanwhile helping these people to work cooperatively toward a common goal. The crucial interpersonal skills of a leader include motivating employees, communication and active listening, persuasion, and building trust. Mumford *et al.* (2000) also broaden Katz's first depiction of human skills with other competences that are useful to have as a leader. These are perceptiveness, social awareness and empathy. They also add social performance to the knowledge of human skills, which includes communication, mediation and coaching.

### *Communication*

The literature is replete with discussions on the importance of communication as a social skill. For instance, Stevens and Campion (1994) identify communication as one the three subcategories within interpersonal skills. That study explores what do we mean by effective communication. They list such competences as communicating openly and supportively, using active listening techniques, maximizing consonance between nonverbal and verbal messages, engaging in ritual greetings and small talk, and finally understanding the communication networks. Klagge (1998) expands these competences by the following ones: giving constructive feedback, making presentations, and public speaking.

Mansfield (2004) also assess communication as one of the five core areas, in which employees' core skills were developed. In addition, Banai and Tulimieri (2013) provide an extensive review on the literature concerning communication, its definition and evaluation. In their view, communication is one of the most significant skills an effective business consultant could have besides creativity and analytical skills. They review the work of Sharma and Patterson (1999) and found that effective communication is "the single most powerful determinant of customer relationship commitment". The rationale behind this thinking is that they define communication based on their literature review as "complex process of imparting or exchanging thoughts, opinions, beliefs or information by speech, writing or signs, i.e. non-verbal communication." Robbins *et al.* (2010) provide a clearer and more concise description: communication is "the transfer and understanding of meaning."

Banai and Tulimieri (2013) also illuminate the importance of such other factors as the act of listening, for example. They point out that listening is in fact part of the exchange mechanism in communication, not to mention that in their view, it is the most difficult part to master by far. They comment on the research of Berry *et al.* (1994), highlighting that the ability of active listening is inevitable for a business consultant in order to deliver a proper service and to avoid serious consequences.

However, effective communication skills are useful in other fields, as well. Van Laar *et al.* (2017) point out that communication is essential when using ICT in order to transmit information to others and insure that the meaning is effectively expressed. It is important to add that the era of digital transformation does not necessarily mean that communication will strictly be conducted by ICT. It is negotiation that Costache *et al.* (2017) identify as a competence that a virtual enterprise will need so as to meet future knowledge demand. Their perspective sees negotiation as the capacity to find the win-win solutions in which both parties gain, and which

are deemed favourable by both participants. Moreover, it also includes the ability to create a compromise that both parties benefits from, without imposing the view on others.

### *Relationship management*

It has been only recently that researchers have attached more importance to the latter two features of interpersonal competences: relationship management and emotional intelligence. Even though there have been some academic appearances of these two skills before, these exact terms are relatively new to use. For instance, Stevens and Campion (1994) give us some clues about relationship management, although they identify it as conflict resolution KSA. According to their perspective this skill includes recognizing the type and source of the conflict, employing an integrative (win-win) negotiation strategy and encouraging desirable, but discouraging undesirable conflicts.

In the era of digital transformation relationship management gained more importance and instead of conflict resolution, relationship management itself as a skill and collaboration with others are the terms more widely used. Some papers, like Costache et al. (2017) suggest that these are two separate skills, but what are they exactly? Costache et al. (2017) define relationship management as "the ability to maximize the efficiency and productivity of interaction with others for the benefit of all". On the other hand, they assert coordination with others as the ability to organize your own activity in accordance with the common goal by participating, the ability to cope with obstacles, not to give up and to keep moving towards reaching the goal, separating tasks and correlating each of them with work, and the ability to prioritize activities so as to ensure logical, fluid performance to the entire package, as a whole. The concepts cited above show that both relationship management and coordination with others focus on the effective cooperation with other individuals regardless the part which rather resembles to self-motivation. Therefore, in our study, we examine them as similar skills.

Van Laar *et al.* (2017) point out that collaboration is one of the most important 21st century skills, which can be used with ICT, as well. They define it as the ability to develop a social network and work in a team in order to enhance the information exchange, help negotiating agreements, and make decisions with mutual respect for each other, so that achieving a common goal would be a priority to all parties. In view of this, it is argued what components are needed for effective collaboration. Van Laar *et al.* (2017) provide a review on the literature and suggest that interactive communication and participation in discussions are the two key features of collaboration skills.

### *Emotional intelligence*

Even lately little research has been carried out to examine the importance of emotional intelligence. The term itself is not used to identify a skill, however in view of this study's objectives, we define it as a competence with growing significance, which is more likely to develop further in the era of digital transformation. It can be deduced from the literature that there are some individual skills that are similar to the concept of emotional intelligence, consequently we examined those and grouped them together. Among the eight dimensions of basic employability skills for example, Rosenberg *et al.* (2012) identify work ethic disposition, which - in our view - could fit into this category.

But what is emotional intelligence? The term itself was created by two psychologists in 1990. Mersino (2007) reviews the work of Salovey and Mayer (1990), according to whom emotional intelligence is "the ability to one's own and others' feelings and emotions, to discriminate among them and to use this information to guide one's thinking and action". The topic inspired researchers, especially Goleman, who wrote several books on emotional intelligence from various views. In his view, (2001) EI is composed of abilities to recognise and regulate emotions in ourselves and in others. In spite of the fact that the concept emotional intelligence

originates back to 1990, its importance has been only recently acknowledged. Previously researchers could tap that there is a competence, by which one could understand others better, however it was not considered as a separate skill category.

The fact that the importance of emotional intelligence is quite new when defining required competences is shown by the study of Van Laar *et al.* (2017), who identify five contextual skills that are essential in the 21st century. Out of these five, we focus on two in the present study: ethical awareness and cultural awareness. Van Laar *et al.* (2017) review the work of Claro *et al.* (2012) and Janssen *et al.* (2013) when defining the concept ethical awareness. They depict that as a skill in connection with socially responsible behaviour, demonstrating awareness and obtaining necessary knowledge of legal and ethical aspects. In regard to ICT, responsible use and social impact are the key features highlighted. Cultural awareness on the other hand show a proper understanding and respect to other cultures. Our study predicts that this skill is likely to gain more importance because of the scattered, globalised offices. In the following years, cross-cultural communication will gain more significance, as it will be inevitable to work with co-workers from different countries that is with different cultures.

### **Technical skills**

It can be deduced from the literature that it is the main category of technical skills which has been focused on mostly in previous studies. The reason for this may lay within the significant growth of technology, which requires people who have acquired wide range of knowledge in various techniques and technologies. Even though it contains the most basic competences: literacy and numeracy, the main focus of this category is on the technological part. In this study we divided this subcategory into IT related and domain related fields. This approach enables us to distinguish between those studies that revolve around the IS and the competences needed to succeed in that field and other areas.

In this regard, Agut *et al.* (2003) conducted a detailed study on the generic and technical competency need in managers. The result of this research show that within technical skills, industry knowledge, customer and employee management and infrastructure management are essential. Moreover, Leopold *et al.* (2018) not only point out, that some elements of technical skills – namely analytical thinking and innovation – are the most important skills nowadays, but also predict that they will hold this title in 2022, as well.

But what are technical skills exactly? Kearns *et al.* (2015) review the work of Katz (1974) in order to define technical skills. They assert that technical skills are the knowledge and proficiency in a particular type of work or activity that is organisation or industry specific. Moreover, it is indicated that these skills may be referred to as business skills, as they can greatly contribute to the mission of the given organisation. However, the present study continues among a different approach, in which business skills are considered as a subcategory of personal skills.

Thus, according to the perspective of Katz (1974) technical skills have more significance at lower level employees and management, while upper level leaders tend to rely more on conceptual skills. Robbins *et al.* (2010) add that usually professionals start to learn the special knowledge and practices of their field through extensive formal education. Many of them have more practical knowledge, too, as they develop their technical skills further on the job.

The differences between how technical skills can be interpreted is visible in the study of Trauth *et al.* (1993), who differentiates between technical skills and abilities, but altogether their interpretation is more similar to technological skills than technical ones. In their study, among technical abilities such competences are to be found as the ability to learn about new technology and to be able to understand technology trends. On the other hand, they argue that technical skills basically revolve around IS. Thus, they list numerous IS fields, in which IS professionals

have to excel. The skills illuminated are knowledge about networks, telecommunications and rational databases.

Van Laar *et al.* (2017) also view them as technological skills. In their opinion, technical skills in other words are the competences to use devices and applications in order to accomplish tasks, in addition to recognizing online environments. Thus, the key components are ICT knowledge, ICT usage and navigation. However, this approach might be inadequate because it views technical skills from a digital point of view, therefore some other features might be missing.

### **Basic functional skills**

The literature is replete with discussions on basic functional skills, even though they are not considered as revolutionary competences: the present study views them as the most basic skills an employee should need, including literacy and numeracy. These competences are fundamental at any workplace, Rosenberg *et al.* (2012) depict them as the first among the basic employability skills.

The few empirical studies in the area suggest the same. Mansfield (2004) compared different lists of core skills in the UK. The study shows that "application of numbers" is identified as the first core skill in the 1980s and 1990s. Devins *et al.* (2004) conducted a detailed study in order to define, which skills have the highest significance in trainings and personal development. Among the studied acquired skills, literacy and numeracy lagged behind the other competences listed. Thus, we expect that these skills will be so evident among employees and employers, that they might lose acknowledgement.

All these concepts and findings lead us to the conclusion, according to which, basic functional skills are evident to have and might not be considered as a relevant category in the future. However, such an approach may be inadequate, as there are still current studies, which show their importance. In view of this, Robbins *et al.* (2010) argue that the lack of basic literacy and

numeracy skills could pose huge problems not only in developing, but in some developed countries, as well. According to them two-fifths of the organisations in the UK have serious concerns regarding the illiteracy and basic numeracy skills of their employees, therefore one in three of them sends part of the staff to related trainings.

Following this thinking, Banai and Tulimieri (2013) list analytical skills as one of the three significant competences that an effective business consultant needs. In their study, analytical skills are similar to numeracy; therefore, in the present study we regard them as the same subcategory. According to them, analytical skills include performing quantitative and qualitative evaluations, assessment and examination in connection with a project. This varies from simple, routine computations to complex mathematical modelling and problem solving. Moreover, they point out that even though most of these skills are acquired at school at a younger age, the consultant has to regularly refresh this knowledge.

### **Technological skills**

Within the main category of technical skills, technological skills are quite the opposite to the basic functional skills, as they are gaining more and more importance nowadays. But what are technological skills? The present study continues among the approach of Horvath and Szabo (2017), who review the work of Gehrke *et al.* (2015) and Hecklau *et al.* (2016). They provide some clues as to what abilities could be understood under the term of technological skills. In their study they list knowledge in the following fields: general IT, information security, databases, analysis, statistics, process management, programming, media and other. These findings indicate that even though most of these skills could be categorised as IT related, some other are domain specific. Thus, in our study we examine them as separate subcategories.

#### *IT related technological skills*

Nowadays IT related technological skills are essential in order to succeed in such a fast-paced business environment. Rosenberg *et al.* (2012) consider them as one of the eight basic employability skills. Devins *et al.* (2004) depict in their study that IT related skills are the second most important skill set an employee could acquire besides management skills. They also argue that a separate category, the knowledge of new production technologies (newtech) are relatively important, however, in this study we consider them as a competence similar to IT related skills. They have various appearances in the literature, as well; for instance: computing, which involves the basics of IT, such as the usage of operational systems, MS Office programs and e-mails. (Klagge, 1998) However, recently its spectrum has become much wider and more complex.

Even though researchers have attached more importance to IT related technological skills mainly in the 2000s, there have been some appearances in the literature before. For instance, Mansfield (2004) refers to previous surveys in the UK from the 1980s, in which information technology knowledge was already considered as a core skill. Although some of the listed skills have changed over the years, information technology skills remained a key category.

The improved significance of the technology is apparent within only two years' time, moreover, the study of Trauth *et al.* (1995) are among the pioneers who having realised the growing significance of technological skills, they view them as a separate category. It includes abilities, such as to be able to learn new technologies, to focus on technology as a mean, not an end; and to understand the ongoing technological trends.

It can be deduced from the literature that IT related technological skills have a wide spectrum, as IT itself is constantly improving, always new technologies are being created and used. Not to mention, that they are becoming more and more important in such industrial fields, as retail, for instance. Yen *et al.* (2001) conducted this detailed study regarding what are the critical skills sets required by industries, thus, it is reasonable to expect that IT skills are the most influential

ones. Surprisingly, this was not the case. The findings indicate that altogether IT competences were the least important, which means that organisational, interpersonal and personal skills might have more significance regardless the constant technological improvement. Among IT related technological skills implementation, operation and maintenance seem to be the most important according to this research. However, they still lag behind such competences as communication and interpersonal behaviour. Consequently, their prominent importance remains questionable.

### *Domain related*

Within the subcategory of technological skills, the domain related skills are the other feature besides the IT related ones. Compared to all the other features detailed above this is latest one to appear in the literature. This may seem surprising, as it is not that dependent on technology as the IT related skills, not to mention that there have been hints and references to them in the past, but it has been only recently, since they are acknowledged as a separate feature that demands attention. In view of this study's objectives, we aim to merge the individual concepts in this topic and establish a new category, the domain related skills.

The concept of domain related skills is so revolutionary, that there is no common agreement either on their naming or their content. For instance, Horvath and Szabo (2017) review the work of Erol *et al.* (2016) and point out that there are activity-based and industry-based competences. While activity-based skills have an operational nature, industry-based skills are all the specific knowledge that is essential so as to function in a specific area, domain. However, this paper argues whether there is a difference, so that they should be treated as separate categories, thus the present study continues along considering them as similar concepts.

Hecklau *et al.* (2017) also have a different approach to domain related skills. In their view, domain related skills are a mixture of IT related and industry related competences. For instance,

they list such features here as digital networks, digital security, coding competence, process understanding and interdisciplinary competence. This paper argues that these competences would fit into the same category. The rationale behind this thinking is that nowadays due to the current effects of industry 4.0., IT related skills are not domain specific, but there is a need for them in every industry. This study predicts that domain related skills are industry specific competences, that constantly vary, and which require increased adaptability from the employees in the era of industry 4.0.

### **Managerial/business skills - where do they belong?**

The most controversial subcategory concerned in the present study is the group of managerial skills. Harrison *et al.* (2017) – for instance - view them as the same main category, called technical/business skills. The literature is replete with discussions how managerial skills should be treated and what are they exactly: Are they more like an innate ability, which means that they are closer to personal skills, consequently belonging to the conceptual category? Or are they rather a subcategory of technical skills, because they involve competences that are industry related?

In Katz's words (1974) "conceptual skills mean the ability to think and conceptualize about abstract situations, to see the organization as a whole and the relationships among its various sub-units and to visualize how the organization fits into its environment." On the other hand, "technical skills are an understanding of, and proficiency in, a specific kind of activity, particularly one involving methods, processes, procedures or techniques." Based on these descriptions managerial/business skills could fit into both categories, its position is unclear.

This paper argues that even if there is rationale behind the thinking that managerial skills are technical ones, they should be considered as a conceptual subcategory. This perspective sees general management skills as broader category of competences like critical thinking and

decision making, which is essential in conceptualising and leading an organisation. However, this study agrees that in some cases managerial skills could be considered as technical skills, or domain related ones to be more precise. Consequently, it is important to distinguish between the managerial skills depending on the context. The above arguments lead us to consider general management skills as a conceptual subcategory, whereas industry related managerial knowledge could belong to domain related skills in our view.

### **Current effects**

The era of digital transformation and industry 4.0. has been a recent topic in the previous years, as it affects many fields of the economy. Recently, researchers have attached more importance to its relationship with the needed skills and competences, to see whether there is a change among them.

Hecklau *et al.* (2017) provide an extensive review of the literature on the current skill categories that have the highest importance. The model used is based on a four-step approach. The systematic review helps to identify and structure competencies that are necessary for both individuals and businesses in order to adapt to the changes that Industry 4.0 awakens. This study explores and summarises a vast amount of enterprise surveys, expert interviews, scenario analyses and case studies. As a result, Hecklau *et al.* (2017) define four basic competence categories: social, methodological, personal and domain. Personal competences include the individual's motivation, attitudes and social values. Relationship forming and communication skills can be found among social competences. Methodological competencies include abilities in connection with problem solving and decision making. Finally, domain competencies basically are the same as technical ones in other categorisations.

Horvath and Szabo (2017) depict another categorisation of the skills needed in the era of the industry 4.0, although from a managerial approach. The literature review is replete with

discussions on the different skill categories. Horvath and Szabo point out six main competence categories: technological, personal, technical, social, activity related and industry related.

These findings indicate the ongoing specialisation in the labour market. In order to be successful, not only does an employee have to possess personal, technical and social skills in general, there are special skills that are specifically activity or domain related. Thus, according to this perspective, it may become more difficult to switch between industries, as they focus on a highly different set of skills. In order to be able to do so, employees have to be especially versatile and adaptable.

Costache *et al.* (2017) add to this knowledge, according to which there is a gap between existent and demanded knowledge that has to be filled. There are two sides of every question. Firstly, good knowledge management is essential from the organisations' side. Secondly, the virtual enterprise actor not only has to be aware about the knowledge criteria in the era of industry 4.0., but he also has to constantly improve his skills. Costache *et al.* (2017) have defined the top 10 competences that are necessary so as to meet the knowledge demand. Most of these competences are relatively new, the competences that have been considered essential before - like communication or personal skills - are either missing or have been altered. This approach enables us to re-evaluate competences and to identify the most important features within broader categories. For instance, negotiation has been highlighted over communication; in addition, emotional intelligence, coordination with people and relationship management become conspicuous instead of social skills in general. These concepts and findings lead us to argue whether there are new competences arising related to industry 4.0., or whether they are the same ones as before, only more detailed, with different emphasis.

Sousa and Rocha (2013) illuminate the skills that are essential for a disruptive digital business. This study explores the necessary skills mostly on a managerial level. Therefore, in the study the methodology used was qualitative at the first phase, in which seven semi-structured

interviews were conducted. Thus, IT specialists were asked to share their experiences so as to collect in-depth information. In the second phase, a structured questionnaire was used that could have been filled out online. It was based on the data collected from the first interviews and from literature review. As the result of the study, three main dimensions of skills were created: innovation, leadership and management skills. However, the size of the sample might be small to conclude relevant messages. In view of this, it can be argued whether these three are truly the three most important skills in the era of the industry 4.0. This is the reason why in our study innovation was treated differently than the other two skills, which are part of the management skill subcategory.

## **Conclusion**

The main findings of our study are the following: industry specific knowledge is a key competence. Its significant importance is clear compared to the other skills included in the literature review. In addition, quick adaptation is incredibly important - both from the individual and the corporate side -, especially regarding technical and technological competences. Due to the rapid change of information technology, fancier and more user-friendly programming languages, applications and platforms tend to appear more and more rapidly. Constant self-education could greatly help to succeed in nowadays' labour market.

Altogether, this study concludes that even though some competence-categories have altered and broadened, there has not been a significant change in their overall typology. Although there have been slight differences in their detected role and importance over the years, this paper argues that the main concepts remained similar. All skills that are nowadays deemed important could be grouped into one of Katz's three main categories. Expanding the literature review with empirical research is currently our main aim. This study will focus on the competences to overcome digital skill shortage.

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Main categories	Subcategories	Features	Academic appearances
<b>Conceptual</b> (Katz, 1974; Robbins et al., 2010; Kearns et al., 2015; Harrison et al., 2017)	<b>Personal</b> (Dench, 1997; Yen et al., 2001; Hecklau et al., 2017; Horvath and Szabo, 2017)	<i>Personality</i>	Personal (Dench, 1997; Yen et al., 2001; Hecklau et al., 2017; Horvath and Szabo, 2017) Self-management (Stevens and Campion, 1994) Personal attributes and attitudes (Dench, 1997)
		<i>Creativity</i> (Banai and Tulimieri, 2013; Van Laar et al., 2017; Costache et al., 2017)	Creativity (Banai and Tulimieri, 2013; Van Laar et al., 2017; Costache et al., 2017)
	<b>Management</b> (Devins et al., 2004; Rosenberg et al., 2012; Sousa and Rocha, 2013)	<i>Business management</i>	Management (Devins et al., 2004; Rosenberg et al., 2012; Sousa and Rocha, 2013) Business (Trauth et al., 1993) Business Functional (Trauth et al., 1995) Goal setting and performance management (Stevens and Campion, 1994) Innovation (Sousa and Rocha, 2013)
		<i>Leadership</i> (Rosenberg et al., 2012; Sousa and Rocha, 2013)	Developing and mentoring others (Klagge, 1998) Leadership (Rosenberg et al., 2012; Sousa and Rocha, 2013) Entrepreneurial (Harrison et al., 2017)
		<i>Decision making</i> (Mansfield, 2004; Robbins et al., 2010; Costache et al., 2017)	Decision making (Mansfield, 2004; Robbins et al., 2010; Costache et al., 2017) Problem solving (Robbins et al., 2010; Van Laar et al., 2017) Solving complex problems (Costache et al., 2017)
		<i>Critical thinking</i> (Rosenberg et al., 2012; Van Laar et al., 2017; Costache et al., 2017)	Critical thinking (Rosenberg et al., 2012; Van Laar et al., 2017; Costache et al., 2017) Flexible thinking (Costache et al., 2017) Systems thinking (Rosenberg et al., 2012)

<b>Human</b> (Katz, 1974; Trauth <i>et al.</i> , 1993; Robbins <i>et al.</i> , 2010 Kearns <i>et al.</i> , 2015; Harrison <i>et al.</i> , 2017)	<b>Social</b> (Le Deist and Winterton, 2005; Hecklau <i>et al.</i> , 2017; Horvath and Szabo, 2017)	<i>Interpersonal in general</i> (Stevens and Campion, 1994; Yen <i>et al.</i> , 2001; Robbins <i>et al.</i> , 2010; Rosenberg <i>et al.</i> , 2012)	Social (Le Deist and Winterton, 2005; Hecklau <i>et al.</i> , 2017; Horvath and Szabo, 2017) Interpersonal (Stevens and Campion, 1994; Yen <i>et al.</i> , 2001; Robbins <i>et al.</i> , 2010; Rosenberg <i>et al.</i> , 2012) Interpersonal and Management (Trauth <i>et al.</i> , 1995)
		<i>Communication</i> (Stevens and Campion, 1994; Mansfield, 2004; Banai and Tulimieri, 2013; Van Laar <i>et al.</i> , 2017)	Communication (Stevens and Campion, 1994; Mansfield, 2004; Banai and Tulimieri, 2013; Van Laar <i>et al.</i> , 2017) Personal communication (Klagge, 1998) Negotiation (Costache <i>et al.</i> , 2017)
		<i>Relationship management</i> (Costache <i>et al.</i> , 2017)	Conflict resolution (Stevens and Campion, 1994) Coordination with others (Costache <i>et al.</i> , 2017) Collaboration (Van Laar <i>et al.</i> , 2017)
		<i>Emotional Intelligence</i> (Costache <i>et al.</i> , 2017)	Ethical awareness (Van Laar <i>et al.</i> , 2017) Cultural awareness (Van Laar <i>et al.</i> , 2017) Work ethic disposition (Rosenberg <i>et al.</i> , 2012)
<b>Technical</b> (Katz, 1974; Trauth <i>et al.</i> , 1993; Agut <i>et al.</i> , 2003; Robbins <i>et al.</i> , 2010 Kearns <i>et al.</i> , 2015; Harrison <i>et al.</i> , 2017; Van Laar <i>et al.</i> , 2017; Horvath and Szabo, 2017)	<b>Basic Functional</b> (Le Deist and Winterton, 2005)	<i>Basic literacy and numeracy</i> (Robbins <i>et al.</i> , 2010; Rosenberg <i>et al.</i> , 2012)	Literacy (Devins <i>et al.</i> , 2004) Analytical (Banai and Tulimieri, 2013) Numeracy (Devins <i>et al.</i> , 2004) Application of numbers (Mansfield, 2004)
	<b>Technological</b> (Horvath and Szabo, 2017)	<i>IT related</i> (Devins <i>et al.</i> , 2004)	IS technology (Yen <i>et al.</i> , 2001) Information technology (Mansfield, 2004; Rosenberg <i>et al.</i> , 2012) New technologies (Devins <i>et al.</i> , 2004) Computing (Klagge, 1998) Technology management (Trauth <i>et al.</i> , 1995) Technical specialties (Trauth <i>et al.</i> , 1995)
		<i>Domain related</i> (Hecklau <i>et al.</i> , 2017)	Domain-related (Hecklau <i>et al.</i> , 2017) Industry based (Horvath and Szabo, 2017) Acitivity based (Horvath and Szabo, 2017)

Table I.: Skill structure based on the literature review

Table II.: Abbreviations of used terms

<b>Abbreviation</b>	<b>Meaning</b>
HR	Human Relations
IS	Information Systems
IT	Information Technology
SME	Small- and medium sized Enterprises
KSA	Knowledge, skill and ability
ICT	Information and Communication Technology
EI	Emotional Intelligence

Table III.: Summary of the concepts

Personality	Skills related to a person's character, their attitudes and their view of the world. (Dench, 1997)
Creativity	The ability to produce novel and useful ideas. (Robbins <i>et al.</i> , 2010)
Business management	The understanding the business environment, the obtained knowledge of a specific business function and the sensitivity to organisational culture and politics. (Trauth <i>et al.</i> , 1993)
Leadership	Knowledge in such fields as employees' performance development, coaching and mentoring, motivating employees in order to enhance their performance. (Sousa and Rocha, 2013)
Decision making	To cognitively process and understand a problem situation in combination with the active use of knowledge to find a solution for the problem. (Van Laar <i>et al.</i> , 2017)
Critical thinking	An amount of competencies that support a mental process of analyzing and evaluating an idea or situation, the ability to reflect and find a logical connection between ideas and arguments, to understand the relevance of information or knowledge, and to build new arguments, as well as the ability to distinguish between facts, opinions and judgments. (Costache <i>et al.</i> , 2017)
Interpersonal (in general)	A mixture of human skills in general including competences such as accomplishing assignments, working cooperatively, dealing with ambiguity, participating in projects and teaching others. (Trauth <i>et al.</i> , 1993)
Communication	The complex process of imparting or exchanging thoughts, opinions, beliefs or information by speech, writing or signs, i.e. non-verbal communication. (Banai and Tulimieri, 2013)
Relationship management	The ability to maximize the efficiency and productivity of interaction with others for the benefit of all. (Costache <i>et al.</i> , 2017)
Emotional intelligence	The ability to one's own and others' feelings and emotions, to discriminate among them and to use this information to guide one's thinking and action. (Salovey and Mayer, 1990)
Basic literacy and numeracy	Besides literacy, performing quantitative and qualitative evaluations, assessment and examination in connection with a project. (Banai and Tulimieri, 2013)
IT related	IT related skills include IS technology, IS management and IS development methodology knowledge. The first subcategory has the strongest connection to IT: it involves the knowledge and usage of hardware, package products, operating systems, networking, communication software and programming languages. (Yen <i>et al.</i> , 2001)
Domain related	Domain related skills include activity-based skills, which have an operational nature, and industry-based skills, which are all the specific knowledge that is essential so as to function in a specific area, domain. (Horvath and Szabo, 2017)

Figures I.: Literature appearances of the used search words

