

CGC-DigiTrans Report

CGC - Roundabouts for Digital Transformation (CGC–DigiTrans) - Professional Guidance & Counselling
(CGC) in Multi-Actor-Networks

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1 Introduction

1.1 Introduction

CGC-DigiTrans is a developmental project co-funded by the EU focusing on **career guidance and counselling (CGC)**¹ in the context of digital transformation in the labour market. Digital technologies have long since found their way into numerous workplaces.

“(...) the European Digital Skills Survey indicates that in some job categories more than 90% of jobs require specific types of digital skills. Basic digital skills are the most commonly required in all the occupations” (Curtarelli et al. 2016a, p. 5).

In order to keep pace with the **digital transformation**, employees need ever more pronounced **digital competences**. At the same time, unskilled and semi-skilled workers in particular are at risk of **digital exclusion**.

This is where CGC-DigiTrans comes in: Together with experts and practitioners from the fields of guidance, continuing education and human resources, the project will develop an innovative guidance method (“**roundabout for digital transformation**”) with which the digital competence needs of employees and companies on the one hand and providers of continuing education on the other can be matched. The method can be used in practice:

- to identify the needs of employers and customers
- to develop offers for digital qualification more closely tailored to the needs
- to select suitable qualification offers together with those seeking guidance and accompany the further training.

A method manual, a curriculum and seminars are being developed to accompany the method. The curriculum will be tested in the context of academic training and further education of counselling practitioners. By involving local networks of practitioners from the fields of counselling, continuing education and human resources in Germany, Italy, Austria and the Netherlands, a high level of practical relevance and openness to adaptation in the national counselling context will be ensured. More information about the project can be found online: <http://digitransformation.net/>.

1.2 Goals of the report and application in the project

This report lays the foundation for the CGC-DigiTrans project. The project focuses on a methodology that brings together different stakeholders to improve guidance counselors on digital training issues.

The report lays the groundwork for developing this methodology, as well as training and study opportunities for guidance counselors. To help guidance counselors, training providers, and employers think and talk about the training needs and opportunities for better career guidance of clients, the report provides definitions and a model for structuring digital competences. Digital competences are an important key for the employability of people in many areas of the labor market. Good training programs for employees and job seekers should be based on systematic and concise descriptions of competences. In this sense, the

¹ Terms in bold letters are described in the Glossary (Appendix).

model developed here can be used, for example, by guidance counselors to identify training needs, to differentiate existing training offers and to develop new trainings.

The process of model development should be based on current and relevant frameworks established by important institutions such as the EU or the OECD, as well as by the scientific community.

With the comparison we want to:

- Analyze and visualize the overlaps of existing models
- Identify the most relevant elements from these models
- Set an applicable framework for the project and guidance practice that is fitting to transformation in the labor market and fit for purpose in practice
- Understand what the practice needs in terms of concretization in order to be able to provide practice-oriented guidance or to develop tailored further education

It is not intended to replace existing models. Of course, in practice it is also possible to work with other models. We hope to clarify some relevant points and lay ground for further discussion.

The report does not yet translate the competences into practical examples and applications in different industries, for different activities or jobs. Such examples and assistance for users will be developed in a practical way in the further course of the project.

1.3 Structure of the report

After the introduction, the **second chapter** deals with digital trends and relevant concepts from the field of further vocational training and career guidance and counselling. The aim of the chapter is to introduce terms and problems that are of central importance for the CGC-DigiTrans project. In the **third chapter**, the state of research, the methodology for this report and the procedure for evaluating different existing models are presented. **Chapter 4** presents the developed model of digital competences and explains its differentiation. **Chapter 5** provides an outlook on the usability of the model and on further research needs. The appendix contains tables and sources as well as a glossary of the central terms used in the project.

2 Problems and digital trends in further vocational training and counselling

Current developments and trends in modern societies are having an impact on many areas of life. In both private and working life, competences that are directly or indirectly related to digitization are becoming more important. For example, citizens are increasingly able to take advantage of public services digitally, and continuing education offerings are digitally supported.

Digitalization supports individualization, but at the same time places greater demands on self-direction. People are required to develop **adaptability** and an attitude of continuing learning. People who cannot adapt are at risk of being excluded from digitized processes (**digital divide** and **digital exclusion**). The need for support in building **digital competences** and for guidance in this complex environment is increasing. Consequently, **professionals in guidance, training** and related fields are also dependent on well-developed digital competences. They must themselves be able to act in a digitally competent manner, understand digitalization (or digitization) in the world of work and in the **education and training** system, recognize digital education needs and competence requirements in a differentiated manner, and provide services on these issues. In the following the key concepts necessary to develop the project and the guidance method are described.

2.1 Digitalization

Digitalization (or digitization) is the process of employing digital technologies and digital information to transform business operations (Muro et al. 2017, p. 5). “The progress of digitalization is crucial to track, because major economic and labor-market impacts that flow from it are redefining work and transforming the structure of the entire economy” (ibid., p.6.). Digitalization is linked to technological innovation.

“Digitalization is an often discussed but vaguely defined concept that has long since evolved beyond its original technical meaning - the conversion of analog information to a digital format. In current debates it is most often used to address two separate subjects: first, information technology artefacts and innovations (everything from artificial intelligence, machine learning, and the “internet of things” to new approaches in robotics), and second, the economic and social changes that are expected to accompany their use” (Pfeiffer, 2021, p. 535).

The world of work is affected by digitalization and digital competences are needed for success on individual and organizational level. The technical processes are directly linked to aspects of qualification and competence: “Digitisation is leading to a higher demand of human workers because humans have a comparative advantage over computers when it comes to ‘cognitive tasks’ which require thinking, improvising creative solutions and solving unexpected problems, and to also be better than machines with tasks requiring flexibility to adapt and interpersonal interactions. These human cognitive and interactive abilities are complementary to the work of computers” (Bloomberg, 2018). The terms Digitalization and Digitization are both used, and, in this report, we understand them as synonyms.

2.2 Digital literacy and digital competence

The terms “digital literacy“, „digital competence“, „digital skills“ and “ICT skills” often are used as synonym. One of the aims is to elaborate and categorize the digital competences people need in the labor market and workplaces. In this context the terms will be discussed in more detail. While the project is allocated in the

C-VET context, the terms “digital competence” and “digital competences” will be used to define what people can or should develop to be able to find and maintain sustainable work.

Jones and Flanningan (2006) suggest, “Digital literacy represent a person’s ability to perform tasks effectively in a digital environment; digital means information represented in numeric form and primarily use by a computer, and literacy includes the ability to read and interpret media, to reproduce data and images through digital manipulation and to evaluate and apply new knowledge gained from digital environments”. (Jones and Flanningan quoted from Bejaković, P., & Mrnjavac, 2020, p. 925).

“Ilomaki et al. (2011) explain that digital literacy or digital competence is the most recent concept describing technology-related skills. Over time various terms have been applied with a more or less broad scope to determine skills linked to the application and understanding of ICT and digital technologies. Such terms are ICT skills, information technology skills, technology skills, 21st century skills, digital and/or information literacy and digital skills. These terms are almost regularly used as synonyms; for example, digital competence and digital literacy” (Bejaković, P., & Mrnjavac, 2020, p. 924).

Digital competences are relevant in many fields of life. “On the one hand, the proposals emphasize that digital literacy is necessary to have a job (obtain a job or develop an enterprise), be functional in a digital environment, and be successful in the 21st-century; on the other, they speak of empowerment both at a personal and social level, as well as a vision of effective and active citizens and the construction of social and intellectual capital. Both visions complement each other and, above all, go beyond the instrumental approach of technology, aligning with social objectives focused on access and quality of education, eradication of poverty, reduction of inequities, decent work and economic growth, health and well-being, among others.” (Martínez-Bravo et al., 2021, p. 83)

Martínez-Bravo et al. (2021) point out, that the term consists of different layers and builds upon traditional literacy: “Digital literacy is a convergent concept of various literacies, which implies, more than a technical approach, a techno-social and critical vision. It makes it easier to work, live, and participate in the digital age, which drives human and economic development. This analysis leads us to understand digital literacy as a set of competences, knowledge, skills, and attitudes that allow the safe and critical use of ICT to consume, produce, and participate in the digital ecosystem. Thus, digital literacy includes the same fundamental skills as traditional literacy, that is, it implies the ability to read, interpret, give meaning, and communicate, but through different codes, formats, and digital contexts.” (Martínez-Bravo et al., 2021, p. 85).

These authors identify six key ideas to find convergence between the different concepts and to define digital literacy as a multidimensional term:”

1. Being literate in the 21st-century requires the ability to read, interpret, give meaning, and communicate in the digital ecosystem.
2. Digital skill is a core skill and fundamental foundation in the frameworks of 21st-century skills.
3. Digital literacy is a convergent concept of different approaches, covering many areas and literacies.
4. It is the set of knowledge, skills, attitudes, and values.
5. It involves the safe, critical, effective, efficient, appropriate, creative, autonomous, flexible, ethical, thoughtful use of ICT and digital media, tools, and platforms.
6. It favors participation in society, personal and professional development, and empowerment in daily life, contributing to the construction of an equitable society” (Martínez-Bravo et al., 2021, p. 92).

2.3 Digital Transformation

Digital transformation refers to the changes brought about by the spread of digital technologies in companies and society. This can affect the way companies design their business processes and offer their products and services, as well as the way people interact with each other (OECD, 2019a) and with companies. It can also impact the way governments and society as a whole function.

Digital transformation describes a process in which new digital technologies (e. g. computers, the internet, artificial intelligence and digital platforms) create new or change existing processes, products and services. Digital transformation also has an influence on the labor market by upcoming new skills needs (Zinke, 2018) and the automation of routine-based tasks.

“In reality, digital transformation requires the organization to deal better with change overall, essentially making change a core competency as the enterprise becomes customer-driven end-to-end. Such agility will facilitate ongoing digitalization initiatives but should not be confused with them” (Bloomberg, 2018, p. 5).

Digital transformation is likely to impact many aspects of people's lives. Some of the potential impacts may include:

- Changes in jobs: Automation and artificial intelligence may lead to certain types of work being replaced by machines, while other types of work become more important (Kropp & Dengler, 2019). While some jobs are disappearing, many jobs fundamentally changing in their content and demands.
- Changes in the way we connect and communicate: Digital technologies make it easier to connect and communicate with people around the world. However, they also involve new challenges such as limited nonverbal communication (Gerdenitsch & Korunka, 2019).
- Changes in health and well-being: digital technologies can help identify and treat health problems, but it can also have an impact on our social life and mental health, e.g. through social media (Jisc data analytics, 2022).
- Changes in privacy and security: the proliferation of digital technologies increases the possibilities for data collection and analysis, which can have an impact on privacy and security.

The impact of digital transformation will not be positive for all and it is important to consider the potential negative impacts and try to minimize them e.g. by inclusive practices like better access to further education and training.

There are several ways in which people can be prepared for digital transformation:

- Continuing education and training: People should continuously educate themselves to keep their competences and knowledge up to date (OECD, 2016).
- Learning technology: It is important to become familiar with the latest technologies and apply them in practice.
- Creativity Problem Solving Skills: The ability to solve problems creatively and innovatively is increasingly important in the digital world.

- Teamwork and communication: In a digital world, teamwork and good communication are becoming increasingly important.
- Flexibility: People need to be flexible and ready to adapt to rapidly changing technologies and working conditions (OECD, 2005).

This list makes it clear that, in addition to digital competences in the narrower sense, overarching, so-called transversal competences are important for dealing with the digital transformation (see Chapter 4.3).

2.4 Digital divide

The **digital divide** refers to the gap between individuals or groups who have access to technology and digital competences and those who do not. Of course, the situation is not only black and white but shows several shades of grey. As the workplace increasingly requires digital competences, there is a risk of a widening divide between those who have more elaborated competences and those who do not, leading to potential exclusion from job opportunities and other areas of life. This digital skills gap poses a serious risk of long-term unemployment and exclusion in an environment of fast-increasing digitalization.

As result of the polarizing trend that higher skilled workplaces require also higher digital skills and low-skilled occupations do not require or develop digital skills, there is a risk of a widened "digital divide" and the risk of **digital exclusion** (Curtarelli et al. 2016a, p. 8). Workers who are "lagging behind" (...) would (..) benefit from specific attention" (ibid.). In turn we can assume that the digital divide at the workplace corresponds with exclusion from participation in other fields of life.

"In an environment of fast-increasing digitalisation, this digital skills gap implies serious risks of exclusion and long-term unemployment as digital skills become a prerequisite, not only for entry into many jobs, but increasingly for the job search itself" (Guitert, et al. 2020, p. 3).

Several groups are particularly affected by the digital divide, including:

- *Low-income individuals and families who may not have the financial resources to afford technology and internet access.*
- *Rural communities, who may not have access to the same level of technology infrastructure as urban areas.*
- *Elderly individuals and people with disabilities, who may not have the physical or cognitive abilities to use technology effectively.*
- *People with low educational levels or limited literacy, who may have difficulty understanding and utilizing digital technology.*
- *Individuals from marginalized communities, such as people of color, immigrants, and indigenous peoples, who may face additional barriers to accessing and using technology.*
- *Community and regions with low-density population, where the market doesn't incentivize the companies to provide the infrastructure.*

In the context of the project, these groups are of specific importance. The CGC services should give support and act to develop the support systems i. e. for training to build **digital competences** and digital

capabilities (Jisc data analytics 2022). In this understanding **Career Guidance and Counselling** is one measure to reach out for people who are at risk and need more support and orientation to gain access to training and education.

2.5 Divergence of supply and demand of digital needs and digital competence training

The divergence of supply and demand of digital needs and digital competences training refers to the mismatch between the skills and knowledge that are needed in the job market, and the skills and knowledge that individuals and groups have access to. This is also described as the digital skills challenge with skills shortages and a skills gap.

On one hand, there is a growing demand for digital competences in the job market as more and more industries are being impacted by digitalization. This means that employers are seeking employees with specific digital competences and knowledge, such as proficiency in certain software or programming languages. On the other hand, there is a lack of supply of individuals with the necessary digital skills and knowledge. This can be due to a variety of reasons, such as a lack of access to technology and digital competence training in certain communities, or a lack of investment in digital competence training programs.

This divergence can lead to a situation where certain individuals and groups are not able to access job opportunities that require digital competences, and where employers are not able to find employees with the necessary skills and knowledge. This can contribute to the widening of the digital divide and can have long-term consequences for the economy and society.

2.6 Multi Actor Career Guidance

The CGC-Digi-Trans project want to address the above describes issues (risk of digital divide and mismatch of supply and demand). That fore, the networking of actors plays a special role. More intensive cooperation is intended to contribute to providing better advice in the context of digitization and continuing education. The Method we develop ("Roundabout for Digital Transformation") builds upon training needs analysis, networking and the collaboration of actors.

Networking and 'multi-actor approaches' have been developing in guidance since recent years (ELGPN, 2013; Schiersmann and Weber, 2013). We propose to widen the understanding of Guidance as a network activity. In this understanding, networks are part of (career) guidance on different levels. (1) In a specific local area, different actors are involved in offering and coordinating guidance and support structures. Guidance is "structurally integrated" (Rämer and Scheffelt, 2016). (2) No single actor can provide qualitatively appropriate guidance alone; cooperation and collaboration are necessary to define and offer the desired quality (Weber, 2013). However, at its core, multi actor career guidance processes are about direct, case-based collaboration involving actors with different backgrounds. In this sense, standards for guidance have been defined: "Working and interacting with the social context: Guidance practitioners are willing and able to use and further develop their personal professional network as well as the societal environment in relation to proper and target-group specific information, cooperation and networks" (nfb, 2012, p 12).

Based on these definitions, we specify the approach of multi actor career guidance (MACG) in this project. Multi actor career guidance (MACG) comprises different forms of guidance. The common element is always that for the guidance of a person or the consultancy of a company the relevant network of actors is

considered. This can be done on the micro-level by addressing the relevant network, its actors or their offers in the individual guidance (indirect inclusion), or by including one or more actors of the network within a process of individual guidance, i. e. case-related (direct inclusion).

MACG can also be located at the meso-level and designed as consulting at the network level. In this case, CGC practitioners use their knowledge from working with clients (businesses or individuals) to contribute to product or service development with other actors (e.g., providers of educational services, companies). This type of consulting can also be understood as contributing to system development and should be part of the professional competence set (NICE, 2016).

2.7 Demand-driven information management

In a multi actor guidance network, good information management to support demand-driven counselling should ensure that the guidance process keeps the clients' information needs in mind. Guidance is based on the information needs of the advice seekers and not on the information available. Case-related information must be selected appropriately and used meaningfully and appropriately for case processing and problem solving. Since the CGC practitioner often does not have all the necessary information (e. g. on current offers of further education or on the needs of employers), the network must be used for information management.

Information management in the field of CGC services is one of the central tasks in professional guidance. (Ertelt u.a. 2020, p. 162). "Management" in this context means both the professional handling of information with a view to the various target groups and the competence to use appropriate networks and to actively participate in their further development, to collect relevant information and to use it in CGC services (Ertelt u.a. 2017, p. 162).

The methodological tasks of information management in professional CGC include techniques of collecting and analyzing the information needs of clients, assessing the efficiency of information services using specific controlling procedures, presenting information in a way that is appropriate for the target group, contributing to the development and enhancement of information systems, and coordinating information and communication processes in guidance service organizations (Ertelt u.a. 2017, p. 162).

When working with clients, the CGC practitioner is always faced with the task of transferring data to information to problem-solving knowledge, taking into account the client's cognitive and psychological (motivation, involvement, trust) framework conditions (Ertelt u.a. 2017, p. 162).

3 Review of actual literature on digital competence needs

The following chapter presents the state of discussion on the current and future need for digital competences. A particular focus here is on the labor market, job seekers and career guidance. The second part of the chapter presents competence models that reflect the need for digital competences. It describes how we proceeded with the analysis and comparison of the competence models.

Since the invention of the Internet, a variety of networking possibilities have emerged, which, together with increasing computing power, have facilitated rapid technological change. This change is characterized by the digitalization of work and everyday processes, the spread of computers and technical devices in all areas of life and work, and the increasing use of digital platforms (cf. Raintier, 2019). Parallel to the new possibilities of digitalization, new competences became necessary, which have also appeared in the literature since the 1990s under the term digital literacy (cf. Bawden, 2008). Gilster (cf. Gilster & Pool, 1997) already attempted a concretization in 1997 and described digital literacy as the ability to understand, critically evaluate, and use information from digital sources as well as to produce digital information. Digital competences play a central role for the 21st century. They are needed to participate in society and digital culture (see Martínez-Bravo, Sádaba Chalezquer & Serrano-Puche, 2021). Already in 2015, seven out of ten workers in the EU needed at least advanced digital competences to accomplish job tasks. Around 42% of workers in elementary jobs also needed digital competences in their jobs (cf. Cedefop, 2015, p. 70).

The Internet has also developed rapidly in recent years. As part of Web 2.0, users are becoming more involved on the Internet. New activities are being added and include the creation of content, interaction via and with websites, and communication on the Internet (Petz, 2019, p. 113f.).

The developments of the Covid 19 pandemic catalyzed the process of the new, digital way of working and living and currently - after the end of strict contact restrictions - require digital competences: online meetings and online services require a new form of digital communication and the use of video conferencing programs. Information from digital media must be collected, organized, evaluated, and distinguished from false reports. For conscientious work from the home office, control of digital well-being is important.

In the future, Industry 4.0 will enable a wide range of data to be comprehensively recorded and networked in all value-added and customer areas, for example by using the Internet of Things. They are analyzed, processed, and evaluated on an internet basis in order to flexibly adapt and optimize production and value-added processes more quickly (Bundesministerium für Wirtschaft und Energie, 2019, p. 3; Hänisch, 2017, p. 14). The novel aspect consists of a merging of the boundaries between the real and virtual worlds and a comprehensive expansion of information and communication technologies between the different areas (Gorltdt, Wiesner, Heuermann & Duin, 2019, p. 95). In this context, the term Industry 4.0 indicates a further development of the previous three industrial revolutions and was established particularly in Germany (Röben, 2019, p. 27). Industry 4.0 changes jobs and therefore places new demands on the education and training of the employees working in it (Hermann et al., 2017, p. 242). Hermann et al. (2017, p. 251) predict that further training will become more important for experienced professionals and young professionals after completing their training.

It is to be expected that the role of **digital competences** will expand in the future. In its Learning Compass, the OECD (2019) defines key foundations that will be significant for lifelong learning in the future. Digital competences were also included in the „Learning Compass 2030“, as the way and density in which people communicate and interact with the digital world has changed rapidly (cf. OECD, 2019).

At the same time, the increasing need for digital competence also brings with it the risk of being left behind. Being left behind due to a lack of digital competences or only poorly developed digital competences is one dimension of the **digital divide**. On the one hand, there is little research on the objective distribution and expression of digital competences in society and on the labor market, as these have so far mainly been learned through practical experience (**informal learning**). However, it can be assumed that people with low qualifications also have lower digital competences (cf. Van Dijk, 2017). The establishment of digital competence development in **formal learning**, also **T-VET** and **C-VET** is needed. People with lower formal qualification should have access to forms of formal qualification and re-training.

On the other hand, numerous competence frameworks (see, for example, CSIS Indonesia, 2022; Jisc data analytics, 2022; Vuorikari, Kluzer & Punie, 2022) have been created in the last five years, which record, categorize and classify the requirements for digital competences. There are competence frameworks that point to the **digital divide**, but rarely address individual groups or include the group of individuals with low digital competences (cf. Atherton, Crosling, Siew Hoong & Elson-Rogers, n.d.). Atherton et al. (n.d.) therefore emphasize that it is important to include the needs of all user and addressee groups of digital literacy frameworks when creating them, as digital literacy frameworks can otherwise represent a further barrier to the transition to the labor market and employment if they are interpreted in a deficit-oriented manner.

Reducing **mismatches** between the competences required by employers and the competences offered by employees helps unemployed people find sustainable employment in the right job (cf. Cedefop, 2015). Digital competences have a special role in the labor market in general and for the unemployed in particular: they are doubly important, as a lack of digital competences can increase the risk of long-term unemployment. On the one hand, digital competences are the basic prerequisites for many job offers and thus act as an entry barrier. On the other hand, digital competences are already required for the job search alone. The reason for this is the increasing shift of job searches and job advertisements to the Internet. Access to information about job vacancies thus remains difficult for people without digital competences (cf. Guitert, Romeu & Colas, 2020). At the same time, companies are increasingly demanding digitized forms of application, such as application documents in PDF format by e-mail, applications on human resource platforms and selection interviews in online meetings or IA based.

When teaching digital competences in **continuing vocational education**, it is important to note that the needs of unemployed and job-seeking individuals differ from other adult learners without the threat of unemployment. This is due to a different context (voluntariness vs. coercion) and different feelings (interest-driven or employer-intended training vs. existential fear) (cf. Whitters et al., 2015). The guidance and implementation of continuing education for digital competences must therefore consider not only the content, but also the needs of those interested in continuing education and their context.

Not only those seeking advice, but also **CGC practitioners** need digital competences. On the one hand, digital competences enable guidance counselors to offer remote consultations and thus, for example, to reach people seeking advice in sparsely populated areas or with mobility restrictions. In addition, guidance counselors need digital competences to guide and support clients who themselves need help in using digital devices and software (cf. Kettunen, 2021). Urdzina-Merca and Dislere (2018) highlight that the use of digital media is particularly suitable for reaching young advice seekers. At the same time, digital guidance services can also bring together those seeking support in networks and in different (virtual) locations. There is already a wide range of digital guidance and counselling services, such as digital self-service tools, self-**assessment** tools, online counselling, and digitally supported face-to-face counselling (cf. Kraatz, Rübner & Weber, 2021).

Although digital competences also play an important role for counselling practitioners, they have so far been given only secondary priority in education and training formats. Kettunen (2021) points out that the use of information and communication technologies is not taught in most educational programs for guidance counselors. Guidance related digital competences are, for example, technical operation, collection and evaluation of digital information, and the creation of digital content (cf. Kettunen, Sampson & Vuorinen, 2015).

In summary, the importance of digital competences in the past, at present and in the future is apparent. These competences enable people to participate in society and in working life. In addition, people with low levels of digital competence in particular are at risk of being left behind. Job seekers increasingly need digital competences to find a job and as a ticket to employment. Employees with no or low digital competences are at risk of losing their jobs. Guidance counselors need digital competences to deal confidently with digitized guidance settings and orientation services on the one hand, and to guide individuals with low digital competences on the other. And CGC practitioners need to know about the **digital demand** on the labour market. This raises the question of which digital competences are needed on the labor market.

What did we analyze and how? The following describes how we proceeded in analyzing the needs for digital competences. As part of a literature study, we examined a total of eleven sources of already existing competence frameworks and scientific literature reviews regarding named digital competences (**see appendix 2**). We selected the sources according to the criteria of labor market relevance, actuality, and differentiation. The included sources cover a period of 18 years (2005 to 2022), with eight sources being at most 5 years old at the time of our investigation.

The sources studied describe digital competences in the form of a separate, detached digital competence framework, in the form of a competence class as part of a broader competence framework, or as a collection of digital competences without a framework.

The following content represents stand-alone digital competency frameworks and was included in the study:

- **Digital Competence framework EU:** DigComp 2.2 (Vuorikari, Kluzer & Punie, 2022)
- **Digital Competence framework JISC:** Building Digital Capabilities (Jisc data analytics, 2022)
- **Digital Competence framework:** Martínez-Bravo, Sádaba Chalezquer und Serrano-Puche (2021)
- **Digital Competence framework:** Digital Skills Accelerator (Różewski et al., 2019)
- **Digital Competence framework:** Health and Care Digital Capabilities (NHS, 2018)

In the following content examined, digital competences represent a competence class as part of a broader framework:

- **Competence framework:** Dondi, Klier, Panier und Schubert (2021)
- **Competence framework:** Future Skills 2021 (Stifterverband für die deutsche Wissenschaft e.V., 2021)
- **Competence framework:** OECD Learning Compass (OECD, 2019a; OECD, 2019b)
- **Competence framework:** European skills and jobs (ESJ) survey included competence system (Cedefop, 2015)

- **Competence framework:** DeSeCo (OECD, 2005)

In addition, we included a collection of digital competences by Curatelli, Gualtieri, Shater Jannati, and Donlevy (2016) into the study. The references to these sources can be found in appendix 2.

After the initial review of the sources, basic information about the sources was created in a comparison table (**appendix 2**). For this purpose, we recorded the name of the competency framework or literature review, the names of the authors and institutions, the year of the source, the background of its creation, and a rationale for including this source in our comparison.

We then used the method of comparative analysis to identify similarities and differences to develop our own framework for the project. The system is not intended to replace the examined competency frameworks, but rather to organize basic digital competences in such a way that they can be identified by guidance counselors in a multi-actor network and transferred by providers of continuing vocational training into a curriculum that is close to the world of work.

To create the synthesis, we initially screened the sources for the competences listed and collected the relevant content. It was striking that ten of eleven sources categorized digital competences on two levels. In addition to a superordinate category (first level), further sub-competences or explanations (second level) were named. Therefore, we initially listed first and second level competences separately for each source. First-level competences that overlapped in content were then categorized in relation to each other.

Thematically, we identified five first-level categories (level 1): technical proficiency, communication and collaboration, digital content creation, information, data and media literacy, and transversal competences.

Subsequently, we assigned the second-level competences to the first-level competences. Second-level competences that overlapped in terms of content were collected and condensed by paraphrasing. The steps of assignment, collection, and paraphrased condensation were repeated until consistent and overlap-free second-level competences emerged, each of which could be assigned to exactly one first-level competence.

The resulting model is presented in the following chapter. The evaluated model can be further consulted in order to reproduce the named competences with examples and concretizations. The models DigComp 2.2 (2022), JISC (2022) and the report of NHS (2018) seem most suitable for this purpose.

4 Analyses of actual and innovative typologies of digital competences and digital literacy

The central aim of this report is to present a typology of digital competences for cross-occupational application to different employees and applicants. However, this primarily considers basic competences and not the technical competences within IT occupations. Our objective is to use such a model of basic digital competences for the improvement of guidance services and the development of educational offers. Chapter 4 presents the criteria for the developed typology as well as this typology on 2 levels of differentiation.

4.1 Criteria for the comparison

The selection of the evaluated models and the competences was based on criteria. The following criteria were considered and should apply to the individual competences:

- **Relevance to the world of work.** The competences are directly related to the world of work or can be meaningfully related to activities in the world of work.
- **Relation to competences.** The competences should be compatible with a current concept of competence (competence as a potential for action based on knowledge, skills, and attitudes).
- **Transformational reference.** The competences should have the potential to deal with transformation processes and their specifics, especially regarding permanent changes and one's own (active) **adaptability**.
- **Learnability.** The competences should be learnable by formal, non-formal, in-formal learning activities.

In addition to these central criteria, we have considered the European and international perspective as well as the national perspectives represented in the project (see chapter 3).

We decided on a two-level model for structuring the digital competences. At level 1 (level1), a basic differentiation is to be made. We aim to define the central competences and to name complementary competences or competences that build on them.

Level 2 serves to differentiate the competences based on the evaluated sources. Based on the evaluated competency frameworks, we have tried to map them as completely as possible. Additional competences can be added to the model. In the guidance counselor, individual competences should be accentuated and concretized about a specific workplace or occupational field (case-related) in order to facilitate an individual adaptation of the competences to practice (e. g. further training).

4.2 Model at Level 1

The comparison of the different sources and models shows a large overlap of the differentiated digital skills. On the one hand, the categorization is carried out by differentiating the content; the categories should

encompass different competences with as little overlap as possible. The categories differ by assigning the following characteristics:

- Technology: The technical aspect includes hardware and software.
- Content: The content aspect focuses on information and meanings.
- Application: Application involves the use of existing devices and programs.
- Creation: Creation involves the development of digital products and new content.
- Individual: Refers to the consideration of the individual user.
- Social collaborative: Refers to interaction with other individuals, groups and communities.
- Reflection: Reflection focuses on how the individual sees him/herself in relation to technology

In principle, all aspects can play a role in each competence category, but individual aspects are dominant in each case.

Categories on level 1:

At Level 1, the result of the comparative analysis are the following five categories (see Diagram 1).

1. technical proficiency (technology, application, individual)
2. information, data, and media literacy (content, application, individual)
3. communication and collaboration (content, application, social collaborative)
4. digital content creation (creation, content)
5. transversal (i.e., digital learning, development, safety, identity, **resilience**) (reflection)

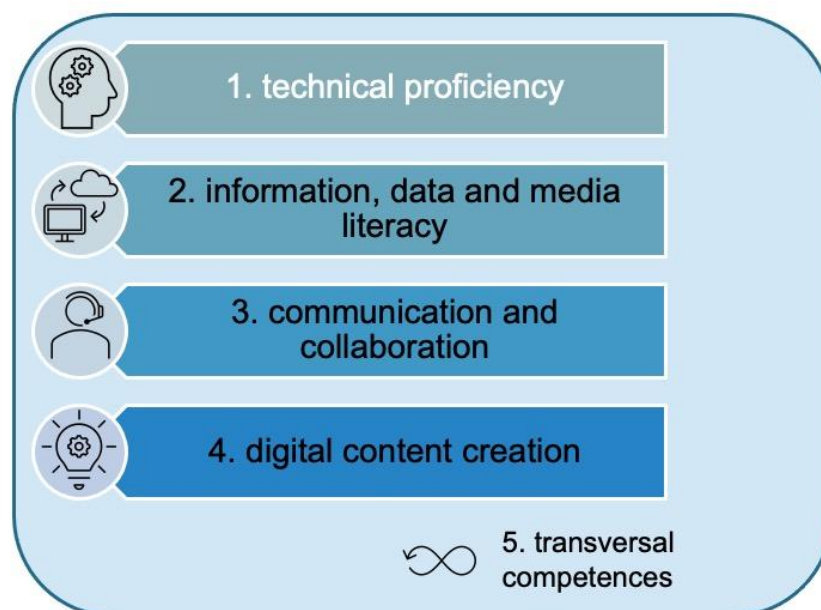


Diagram 1: Digital Competences, 5 categories on level 1 (own diagram)

Like other models (Cedefop, 2015; Stifterverband für die deutsche Wissenschaft e.V., 2021; Jisc, 2022), we see *technical proficiency* (1) as an important core of digital competences. It refers to both basic enablement to deal with hardware (e.g., a computer or smartphone) and software (programs, apps). Like the following competences, it can be expressed in many different ways, starting with "basic" competence and ending with "expertise". Typically, guidance practitioners apply technical competences to handle IT equipment like computers, tablets, printers, presenters etc. and they often need to apply specific software for documentation, **assessment** etc.

We assume that each of the competence categories must be further elaborated (see chapter 4.3). In the process, we also name sub-competences that should be differentiated into 'basic' and 'advanced', since in the context of our project the focus is primarily on basic competences. We have assigned some competences that in many models belong to the technical category to the 'transversal competences', for example 'problem solving'. It stands to reason that when using technology, smaller and larger problems often arise, which should first be solved by the user's own experiments. Nevertheless, in our understanding, a problem-solving attitude is a higher-level competence that is also necessary for all other categories and is therefore defined as transversal.

The *second category* is "information, data and media literacy" (2). In an information and knowledge society, dealing with data and information is essential. Digital data and media permeate all areas of life. People must be able to access data, reduce the amount of information and organize data. In order to extract information from data, people must be able to analyze, evaluate and interpret data based on criteria and in a way that is appropriate to the situation. These activities are also available in a wide variance of complexity and requirements. Even simpler occupational activities rely on basic competences in this area. In guidance and individual professional development, mastering such personal "information management" is essential, e.g. to information research and case documentation.

"Communication and collaboration" (3) is a relevant category in almost all models (cf. Jisc, 2022; NHS, 2018; Vuorikari, Kluzer & Punie, 2022). It includes, for example, communication using digital media and apps. Skills for collaborating with others also fall into this competence area. The topicality and relevance of these topics is obvious. It can also be assumed that people can learn and practice this area of competence in many cases in their private lives and that the competences for application in a professional field or in a job can build on these basic competences. Guidance counselors apply these competences for communication via video counselling, e-mails or collaboration in repositories for teamwork.

"Digital content creation" (4) represents the fourth category. Basically, this includes the creation of documents with various software products. In a broader sense, it also includes the development of Web content, social-media content, and the like. This can extend to the creation or adaptation of complex programs or media. Creation covers thereby apart from the technical skill is also the creative aspect. In relation to the target groups of the project it is e.g., about the ability of self-marketing but also about basic competences of content creation for professional activities. For **CGC professionals** there is also the ability to independently create content that can be used for guidance, marketing services and to use it in different media (e.g., presentations, videos, blogposts, etc.).

The fifth category is described as "transversal competences" (5). Transversal competences such as reflection, problem solving, creativity, future thinking, or continuing learning are described as relevant to develop and adjust constantly to the development of digital competences.

We assume that these transversal competencies are of central importance for people to be able to adapt to changes and to learn continuously. Therefore, such competences should be addressed in further education. Learning arrangements can achieve this, for example, through practical experimentation, problem-based learning, and the like. People who enlarged these competences will more easily develop also digital competences in formal and informal learning context.

It should also be considered that such competencies are closely linked to attitudes (cf. Vasilescu et al. 2020). Whether people are open to digital transformation depends on such attitudes, experiences, and personality traits. The acquisition of digital competences can also be hampered by negative experiences and negative attitudes. This must also be considered and addressed in learning opportunities.

The attentive, thoughtful, and careful handling of data security ("digital safety") or one's own digital identity is also part of this broad field of competences. Transversal competences are closely related to characteristics and resources of individuals, such as adaptability, i.e., the ability to fit oneself to occurring changes, or **resilience**, i.e., an inner resistance and resources to cope well with changes and to react appropriately. This also relates to the ability to maintain one's own well-being through and despite digital technologies. In this model, transversal competences also include personal development through informal, non-formal or formal learning. People should recognize their learning needs ('recognizing'), set learning goals, and know or be able to identify ways and tools to achieve them. Digital tools (e.g., learning platforms), in turn, are important means to learn and to organize one's learning path. Für CGC practitioners und other professionals (e.g., trainer, HR experts) transversal competences are an important link to support clients in their personal career and developmental process.

As a result, we see this competence model as systematic and comprehensive. Individual additions and, if necessary, revisions remain possible and are also desired through the involvement of practitioners from guidance, education, and employment in the sense of the project goal. Together, the competences can describe the necessary digital capability and **digital capacity** for the world of work as well as for private life and life as a citizen of a country. For this reason, it makes no sense in our view, for example, to designate a separate category for "digital citizenship". Rather, it is necessary to consider in each context how the competences need to be further differentiated. In the context of this project, differentiations make sense, for example, for the job search, the management of basic digital tasks in the company context, and digital empowerment for CGC practitioners. For the latter, the competences described here are of multiple importance (see chap. 2). For these target groups, we will make further specifics within the framework of the project.

4.3 Differentiation of the competences at Level 2

To make the competences transferable for the named areas of application and to develop suitable learning offers, for example, further differentiation (level 2) is necessary. The basis for this is the comparison of the models (see chapter 3) and the evaluation tables (see appendix). As a result, Table 2 shows the (sub) competences assigned to the five categories of digital competence (Level 1). **Competences that go beyond basic competences are marked in color.**

Table 1. Digital Competences on level 1 and differentiation on level 2

Category (level 1)	Differentiation (level 2)
Technical proficiency	<ul style="list-style-type: none"> • Operating technical hardware (PC, tablet, mobile device, robots) in personal and workplace context • Operating technical digital software, AI, technology, and applications in personal and workplace context • Maintenance and technical troubleshooting, engineering design, programming by using syntax • Translating real problems into models or algorithms
Information, data and media literacy	<ul style="list-style-type: none"> • Getting access to data, information, and digital content by browsing, searching and filtering them • Managing, storing, and organizing data, information, and digital content. Deriving information from data • Navigating through, analyzing, evaluating, and interpreting data, information, digital content and their sources critically • Managing, curating, citing data, information, and digital content. Fostering data quality. • Generating statistically robust insights.
Communication and collaboration	<ul style="list-style-type: none"> • Communicating and interacting with other people through digital technologies (e. g. e-mails, social media, videocalls) • Collaborating with other people in groups and digital networks through digital technologies and tools to produce shared outcomes to meet shared goals • Sharing information and content through digital technologies • Complying with netiquette to use ethical, positive, sensitive, and appropriate attitudes and behaviors
Digital content creation	<ul style="list-style-type: none"> • Developing digital content and digital resources by using word processors, creating spreadsheets, software for production, design, calculation, and simulation • Integrating and re-elaborating digital content • Publishing and presenting personalized content • Understanding and adhering to digital copyright, licenses, intellectual property and privacy rules and regulation
Transversal competences	<ul style="list-style-type: none"> • Creative, critical, and future thinking • Problem solving • Reflection • Digital safety • Digital citizenship • Digital teaching and learning • Digital identity and wellbeing

For the transversal competences, a further differentiation and concretization is useful. Table 2 shows the seven competences identified and the individual aspects assigned to each.

Table 2. Detailed description of transversal competences

Creative, critical, and future thinking	<ul style="list-style-type: none"> • Creativity • Critical thinking • Future orientation and future thinking
Problem solving	<ul style="list-style-type: none"> • Solving problems, making decisions and achieving successful outcomes by using data, information and digital content • Identifying technological needs and responses
Reflection	<ul style="list-style-type: none"> • Understanding of the nature of technology, its systems and how it changed interaction and operations
Digital safety	<ul style="list-style-type: none"> • Protecting devices, personal and professional data, and privacy • Protecting health, digital footprint, reputation, and wellbeing • Protecting environment • Meeting security rules
Digital citizenship	<ul style="list-style-type: none"> • Defining digital citizenship • Engaging citizenship through digital technologies
Digital teaching and learning	<ul style="list-style-type: none"> • Recognizing what is not known • Setting personal learning goals, identifying learning needs and knowing learning interfaces/tools • Using digital technologies and tools for personal use by being aware of one's own digital learning style • Validating and managing/monitoring one's own learning pathway and development by using digital devices • Mastering changing technologies, keeping up to date with technologies and being willing to try new practices • Supporting and developing others in digital settings. Using digital technologies and tools in teaching, coaching and mentoring others. Leading on the use of digital technologies
Digital identity and wellbeing	<ul style="list-style-type: none"> • Supporting digital wellbeing • Developing, projecting, and managing digital identities, digital reputation, self-image, and social relationships.

4.4 Discussion of competences for learning contexts

Digital competence can be learned and developed in **informal, non-formal and formal learning** arrangements. Most people might build up digital competence in their daily lives, when using digital devices and media. The younger generation in particular brings a wide range of contacts with digital technology and media to the table. Digital competences are also supported in the workplace, for example through the introduction and use of digital tools, and many employees have acquired basic competences in recent years. Other employees whose workplace has not yet experienced digitization lack such **informal training** ("**digital divide**").

Digital competences are taught and acquired at school and in comparable **formal learning** arrangements, but here, too, a wide variance in learning opportunities must be expected in relation to people's age, their level of education, or various local circumstances. For target groups that have not yet been able to learn many digital competences, non-formal learning opportunities can be helpful in increasing their individual connectivity. Companies and public institutions promote such training. Nevertheless, the educational opportunities offered are not always a perfect fit, do not focus on all the competences that are relevant (e.g., for a specific job), or are not tailored to people's learning habits or learning opportunities. Especially for people who do not yet have formal qualifications, such learning opportunities should be made more accessible that combine a vocational qualification and the learning of digital competences.

5 Summary and further research and development needs

In the project presented here, this form of continuing education is central to promoting digital competences, especially for people who have had little opportunity to train digital competences. CGC practitioners, who are responsible for advising this target group, will work together with companies and training providers to develop tailored advisory and training services (see chapter 2). The taxonomy developed in chapter 4 provides the basis for this.

How the taxonomy will be used, e.g.:

- The competency model can enable stakeholders to exchange information about digital competences and competency needs
- The competency model can be used when guiding people (implicitly or by means of an instrument) or consulting with stakeholders to address their level of competency or competency needs
- The model can be used to collect, classify, and compare further education offers regionally.
- In counselling, the model can be used to search for suitable continuing education courses.
- In consultancy with employers, the model can be used to assess current and future competence requirements of jobs and to search for suitable personnel on this basis.

In the CGC-Digi-Trans project, these approaches are integrated and tested in the development of a consulting methodology (“**Roundabout for digital transformation**”). We believe that better alignment between individuals, counselors, training providers and employers can narrow the gap between demand for digital learning and supply, and thus better develop skills in demand in the labor market.

The work on the project will also open new research and development questions. These will also be collected and pursued as part of the project. The present model cannot be considered as complete. Questions may pursue the following directions, including:

- How can the competences described be further concretized and described in a job-specific and practical way?
- What is the role of the described transversal competences and how can they be supported in further education and in consulting?
- What could a systematic competency **assessment and needs analysis** look like and which, if any, existing instruments can be used?
- What does the specific competence model look like for CGC practitioners who offer guidance on digital continuing education?
- How can the existing competences be taught in a practical and action-oriented way in continuing education?

The project CGC-DigiTrans will focus these questions and discuss them with the partners and the networks of experts. The products of the project will be tested and evaluated in practice and integrated into training programs for CGC practitioners (See work-program and results <https://digitransformation.net/>).

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Zinke, G. (2018). Digitale Transformation - Hype um digitale Kompetenzen in der Berufsbildung?. In F. Schröder (Ed.), Auf dem Weg zur digitalen Aus- und Weiterbildung von morgen. Ergebnisse des Berliner Modells "Zusatzqualifikationen für digitale Kompetenzen" (S. 49-58). Bielefeld: wbv Media.

II. Glossary for digital transformation

The glossary defines relevant terms for the project context “digital transformation” The terms are sorted in four areas:

- Transformation
- Digitalization
- Vocational Education and Training, Career Guidance and Counselling and
- Methodology.

Transformation

Digital transformation

Digital transformation describes a process in which new digital technologies (e. g. computers, the internet, artificial intelligence, and digital platforms) create new or change existing processes, products, and services. Digital transformation also has an influence on the labor market by upcoming new skills needs and the automation of routine-based tasks.

“In reality, digital transformation requires the organization to deal better with change overall, essentially making change a core competency as the enterprise becomes customer-driven end-to-end. Such agility will facilitate ongoing digitalization initiatives but should not be confused with them” (Bloomberg, 2018, p. 5).

Source:

European Commission, Directorate-General for Economic and Financial Affairs, Morandini, M., Thum-Thyssen, A., Vandeplass, A. (2020). Facing the digital transformation: are digital skills enough?, Publications Office. <https://data.europa.eu/doi/10.2765/846577>

Bloomberg, J. (2018). Digitization, digitalization, and digital transformation: confuse them at your peril. Forbes. Retrieved on August, 28, 2019.

Pfeiffer, S. (2021). The Greater Transformation: Digitalization and the Transformative Power of Distributive Forces in Digital Capitalism. *International Critical Thought*, 11(4), 535-552.

Emerging skills

The world of work is developing all the time, driven by social, organizational and technological innovations. Occupations and jobs are following these changes in terms of the required skills. In this understanding emerging skills can be defined as “Abilities for which demand is increasing in existing or new occupations”. “Identification of new/emerging skills needs is crucial to prevent skill gaps and shortages, foster employability of citizens and meet needs of the economy” (CEDEFOP, 2014). It should be noticed that in this definition individuals are forced to adapt to a change driven by the system. In turn it should be reflected how the system is supporting individuals to cope with the changing demands.

Source:

European Centre for the Development of Vocational Training [Cedefop] (2014). Terminology of European education and training policy (2nd Ed.). Luxembourg: Publication Office of the European Union.

Innovation

Innovation refers to the process of introducing something new or improved into the marketplace. This can be a new product, service, or process that addresses a specific need or solves a problem in a unique way. Innovation often involves creativity, experimentation, and risk-taking. It can also involve the use of technology and data, as well as the application of new business models or approaches to existing industries. Innovation can happen at any level of an organization, from the individual level to the corporate level and can be a driver of economic and social progress. Innovation can also be incremental or disruptive and can come from internal or external sources.

Innovation is about the “core renewal processes” e. g. in organizations but also more broadly in societies (Bessant et al. 2005, p. 1366). The change is not just focusing on products or offerings, innovation also affects the way of creation and delivery of goods. Innovation is seen as crucial for the survival and growth of organizations (ibid.). It is pointed out that innovation is about change in a wide range of elements, i.e., products, services, processes, paradigms (mental models) and positions (context) (Rowley et al. 2011, p. 80-83). The “EU Innovation Scoreboard” measures innovation in societies with 32 Indicators including human resources, intellectual assets, use of information technologies, employment impacts or environmental sustainability (EU 2022, p. 6).

Source:

EU Commission (2022). EU Innovation Scoreboard, methodological report https://research-and-innovation.ec.europa.eu/system/files/2022-09/ec_rtd_eis-2022-methodology-report.pdf (2023-01-04).

Bessant, J., Lamming, R., Noke, H., & Phillips, W. (2005). Managing innovation beyond the steady state. *Technovation*, 25(12), 1366-1376.

Rowley, J., Baregheh, A., & Sambrook, S. (2011). Towards an innovation-type mapping tool. *Management Decision*.

Digitalization

Digitalization

Digitalization, according to Gartner, Inc., is the process of employing digital technologies and information to transform business operations (Muro et al. 2017, p. 5). “The progress of digitalization is crucial to track, because major economic and labor-market impacts that flow from it are redefining work and transforming the structure of the entire economy” (ibid., p.6.)

“Digitalization is an often discussed but vaguely defined concept that has long since evolved beyond its original technical meaning - the conversion of analog information to a digital format. In current debates it is most often used to address two separate subjects: first, information technology artefacts and innovations (everything from artificial intelligence, machine learning, and the “internet of things” to new approaches in robotics), and second, the economic and social changes that are expected to accompany their use” (Pfeiffer, 2021, p. 535).

The world of work is affected by digitalization and digital skills are needed for success on individual, regional or industry level. These technical processes are directly linked to aspects of qualification and competence: “Digitisation is leading to a higher demand of human workers because humans have a comparative advantage over computers when it comes to ‘cognitive tasks’ which require thinking, improvising creative solutions and solving unexpected problems, and to also be better than machines with tasks requiring flexibility to adapt and interpersonal interactions. These human cognitive and interactive

abilities are complementary to the work of computers” (Bloomberg, 2018). The terms Digitalization and Digitization are both used, and, in this report, we understand them as synonyms.

Source:

Bloomberg, J. (2018). Digitization, digitalization, and digital transformation: confuse them at your peril. *Forbes*. Retrieved on August, 28, 2019.

Curtarelli, M., Gualtieri, V., Shater Jannati, M. and Donlevy, V. (2016), *ICT for Work: Digital Skills in the Workplace*, European Commission, Brussels.

Muro, M., Liu, S., Whiton, J., & Kulkarni, S. (2017). *Digitalization and the American workforce*. Brookings Institute. <https://www.brookings.edu/research/digitalization-and-the-american-workforce/> (2023-01-12).

Pfeiffer, S. (2021). The Greater Transformation: Digitalization and the Transformative Power of Distributive Forces in Digital Capitalism. *International Critical Thought*, 11(4), 535-552.

Digital literacy and digital competence

The terms “digital literacy“, „digital competence“, „digital skills“ and “ICT skills” often are used as synonym. One of the aims is to elaborate and categorize the digital competences people need in the labor market and workplaces. In this context the terms will be discussed more in detail. While the project is allocated in the CVET context, the terms “digital competence” and “digital competences” will be used to define what people can or should develop to be able to find and maintain sustainable work.

Jones and Flanningan (2006) suggest, “Digital literacy represent a person’s ability to perform tasks effectively in a digital environment; digital means information represented in numeric form and primarily use by a computer, and literacy includes the ability to read and interpret media, to reproduce data and images through digital manipulation and to evaluate and apply new knowledge gained from digital environments”. (Jones and Flanningan zitiert nach Bejaković, P., & Mrnjavac, 2020, p. 925)

“Ilomaki et al. (2011) explain that digital literacy or digital competence is the most recent concept describing technology-related skills. Over time various terms have been applied with a more or less broad scope to determine skills linked to the application and understanding of ICT and digital technologies. Such terms are ICT skills, information technology skills, technology skills, 21st century skills, digital and/or information literacy and digital skills. These terms are almost regularly used as synonyms; for example, digital competence and digital literacy” (Bejaković, P., & Mrnjavac, 2020, p. 924).

Digital Skills are transversal skills itself: “In other words, although digital competence is a part of the skills of the 21st-century, its role is central and transversal because it allows the acquisition of other key skills.” (Martínez-Bravo et al., 2021, p. 83)

“On the one hand, the proposals emphasize that digital literacy is necessary to have a job (obtain a job or develop an enterprise), be functional in a digital environment, and be successful in the 21st-century; on the other, they speak of empowerment both at a personal and social level, as well as a vision of effective and active citizens and the construction of social and intellectual capital. Both visions complement each other and, above all, go beyond the instrumental approach of technology, aligning with social objectives focused on access and quality of education, eradication of poverty, reduction of inequities, decent work and economic growth, health and well-being, among others” (Martínez-Bravo et al., 2021, p. 83).

“Digital literacy is a convergent concept of various literacies, which implies, more than a technical approach, a techno-social and critical vision. It makes it easier to work, live, and participate in the digital

age, which drives human and economic development. This analysis leads us to understand digital literacy as a set of competencies, knowledge, skills, and attitudes that allow the safe and critical use of ICT to consume, produce, and participate in the digital ecosystem. Thus, digital literacy includes the same fundamental skills as traditional literacy, that is, it implies the ability to read, interpret, give meaning, and communicate, but through different codes, formats, and digital contexts” (Martínez-Bravo et al., 2021, p. 85).

Source:

Bejaković, P., & Mrnjavac, Ž. (2020). The importance of digital literacy on the labour market. *Employee Relations: The International Journal*.

Curtarelli, M., Gualtieri, V., Shater Jannati, M. and Donlevy, V. (2016), *ICT for Work: Digital Skills in the Workplace*, European Commission, Brussels.

Martínez-Bravo, M.C.; Sádaba Chalezquer, C.; Serrano-Puche, J. (2021). Meta-framework of digital literacy: comparative analysis of 21st-century skills frameworks. *Revista Latina de Comunicación Social*, 79,76-110.

Transversal Competences

On the one hand digital competences are described as transversal, so these competences support the development of other competences and help to master various tasks in work and life. On the other hand, transversal competences such as adaptability, reflexivity, problem solving, resilience, or continuing learning are described as relevant to develop and adjust constantly to the development of digital competences.

In a broader sense digital skills are embedded in a set of complementary skills needed to make us of ICT. “(...) the use of ICT affects skill requirements as regards digital skills as well as other complementary skills. Advanced digital skills to apply specific software are often required, but frequently the employee needs only basic digital skills to use general software and applications that are not specific to the profession. Complementary skills in communication, service and documentation skills in relation to colleagues and customers become more important” (Curtarelli et al, 2016a, p. 5).

“Direct and transversal skills interact with each other. As an example, to understand both typologies, when a user decides to use a tool (direct skill: technical), they evaluate the security of their data in the tool (transversal skill: critical thinking) and make effective management of their digital identity in the said tool (transversal skill: interpersonal). That is, they put into practice direct and transversal skills, which go beyond the technical approach, in each experience. All this leads us to consider a multidimensional approach to digital literacy to not “reduce digital skill to its most technological and instrumental dimension” (Gutiérrez & Tyner, 2012).

Source:

Martínez-Bravo, M.C.; Sádaba Chalezquer, C.; Serrano-Puche, J. (2021). Meta-framework of digital literacy: comparative analysis of 21st-century skills frameworks. *Revista Latina de Comunicación Social*, 79, 76-110.

Curtarelli, M., Gualtieri, V., Shater Jannati, M. and Donlevy, V. (2016), *ICT for Work: Digital Skills in the Workplace*, European Commission, Brussels.

Gutiérrez, A., & Tyner, K. (2012). Educación para los medios, alfabetización mediática y competencia digital. *Comunicar*, 38(19), 31-39.

OECD 2019;

Bejaković, P., & Mrnjavac, 2020

Adaptability

“Adaptability (Latin: adaptō "fit to, adjust") is a feature of a system or of a process. This word has been put to use as a specialised term in different disciplines and in business operations. Word definitions of adaptability as a specialised term differ little from dictionary definitions. According to Andresen and Gronau (2005) adaptability in the field of organizational management can in general be seen as an ability to change something or oneself to fit to occurring changes. In ecology, adaptability has been described as the ability to cope with unexpected disturbances in the environment” (WikiPedia).

In the context of CGC the concept is specified as “career adaptability”. “Career adaptability, according to career construction theory, comprises psychosocial resources and transactional competences that help workers to manage successfully both their current daily work demands and to deal effectively with career-related changes and challenges (Savickas, 2013). The theory suggests that the four dimensions of career adaptability (concern, control, curiosity and confidence) should contribute positively to individuals’ work outcomes and career development, as the relevant resources and competencies accumulate over time as they are developed in a variety of education, training and work contexts (Savickas & Porfeli, 2012)” (Brown, 2016, p. 222)

Source:

Andresen, K., Gronau, N.: An Approach to Increase Adaptability in ERP Systems. In: Managing Modern Organizations with Information Technology: Proceedings of the 2005 Information Resources Management Association International Conference, 2005.

WikiPedia (o.J.) Adaptability. https://en.wikipedia.org/wiki/Adaptability#cite_note-1 (2023-05-01).

Brown (2016) Career adaptability and attitudes to low-skilled work by individuals with few qualifications: ‘getting by’, ‘getting on’ or ‘going nowhere’, *British Journal of Guidance & Counselling*, 44:2, 221-232, DOI: 10.1080/03069885.2016.1145196

Digital capacity

Digital capacity refers to the ability of individuals, organizations, and societies to use digital technologies effectively and efficiently. It encompasses a range of skills, knowledge, and resources that are needed to participate in the digital economy and society. In some context the term “digital capability” is used (Jisc data analytics, 2022).

Digital capacity is becoming increasingly important as more aspects of our lives and economy are digitized and it is a key for organizations, businesses, and individuals to remain competitive and sustainable in the digital era.

On an organizational level, digital capacity refers to the ability of an organization to use digital technologies effectively and efficiently to achieve its goals and objectives. This includes having the necessary skills, knowledge, and resources to participate in the digital economy, as well as the ability to adapt and innovate in a rapidly changing digital landscape. This includes supporting the digital skills development of employees. Providing training and development opportunities for employees to develop and maintain the necessary digital skills

Source:

Killen, C, Beetham, H, & Knight, S. (2017). Developing organisational approaches to digital capability. JISC.

<https://www.jisc.ac.uk/full-guide/developing-organisational-approaches-to-digital-capability> (2023-01-18)

G20 Toolkit for Measuring Digital Skills and Digital Literacy: Framework and Approach

<https://csis.or.id/publication/g20-toolkit-for-measuring-digital-skills-and-digital-literacy-framework-and-approach/> (2023-01-18).

Jisc data analytics. (2022). Building digital capabilities framework: The six elements defined. Bristol: Jisc data analytics. Retrieved from: https://repository.jisc.ac.uk/8846/1/2022_Jisc_BDC_Individual_Framework.pdf (2023-01-18).

Digital divide

As result of the polarising trend that higher skilled workplaces require also higher digital skills and low-skilled occupations do not require or develop digital skills, there is a risk of a widened "digital divide" and the risk of digital exclusion (Curtarelli et al. 2016a, p. 8). Workers who are "lagging behind" (...) would (..) benefit from specific attention" (ibid.). In turn we can assume that the digital divide at the workplace corresponds with exclusion from participation in other fields of life.

In an environment of fast-increasing digitalisation, this digital skills gap implies serious risks of exclusion and long-term unemployment as digital skills become a prerequisite, not only for entry into many jobs, but increasingly for the job search itself" (Guitert, et al. 2020, p. 3).

Source:

Curtarelli, M., Gualtieri, V., Shater Jannati, M. and Donlevy, V. (2016), ICT for Work: Digital Skills in the Workplace, European Commission, Brussels.

EU Commission (Eurostat) 2016, Europe https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Digital_divide (20223-01-12)

Guitert, M., Romeu, T & Colas, J.F. | (2020) Basic digital competences for unemployed citizens: conceptual framework and training model, Cogent Education, 7:1, 1748469, DOI: 10.1080/2331186X.2020.1748469

Van Dijk, J.A.G.M. (2017). Digital Divide: Impact of Access. In The International Encyclopedia of Media Effects (eds P. Rössler, C.A. Hoffner and L. Zoonen). <https://doi.org/10.1002/9781118783764.wbieme0043>

Digital skills challenge: skills shortages and skills gap

"Given the recognised importance of digital skills for an effective implementation of ICT in the workplace, the main challenge for employers is to make sure that the supply of digital skills within the workforce matches its demand at the labour market and enterprise level, in terms of both required type and level of skills. In other terms, the digital skill challenge for businesses is twofold. It can refer either to the lack of workers with the needed skills in the labour market (skills shortages), and/or to the presence of overskilled or underskilled workers at company level (skills mismatches and skills gaps). Challenges can therefore be external to the firm (as in the case of shortages) or internal (as in the case of mismatches or gaps)" (Curtarelli et al, 2016a, p 4).

Source:

Curtarelli, M., Gualtieri, V., Shater Jannati, M. and Donlevy, V. (2016), ICT for Work: Digital Skills in the Workplace, European Commission, Brussels.

Digital resilience

Digital resilience refers to the ability of individuals, organizations, and societies to withstand, adapt, and recover from digital transformation or disruptions. This can include disruptions caused by data violations, technological failures, or changes in the digital landscape. It should be noted that the term "resilience" is used in literature and research on individuals (and thus as psychological factor) as well as to organizations (organizational or managerial digital resilience).

“Resilience refers to the positive psychological capacity to bounce back from adversity and uncertainty and adjust to disruptions (...). It is an established concept in numerous disciplines including psychology, ecology, social studies and engineering” (Kohn 2020, p. 1). Thus, digitally resilient employees are better able to deal with uncertainty and change using IS and digital channels (ibid.)

On an individual level, “digital resilience is a dynamic personality asset that grows from digital activation i.e. through engaging with appropriate opportunities and challenges online (...)” (Manning 2021, p. 1). Four elements can support the development of digital resilience: “understanding when you are at risk, knowing what to do to seek help, learning from experiences, and having appropriate support to recover” (ibid.).

In a wider sense, digital resilience might also mean “responsible, safe and active participation in online communities” that for certain skills are required, as Critical thinking, media literacy, social behaviours online or peer safeguarding (Reynolds and Parker, 2018). Digital resilience is sometimes also understood on an organizational level as “institution’s ability to adapt to digital challenges” (Weller and Anderson, 2013).

Digital resilience encompasses a range of strategies, practices, and technologies that can help organizations and individuals to prepare for, respond to, and recover from digital disruptions. It includes having robust security measures in place to protect against cyber threats, having a plan in place to respond to digital emergencies, and having the ability to quickly recover and restore systems and data in the event of a disruption.

Digital resilience also includes developing the ability to adapt to changes in the digital landscape, such as the adoption of new technologies or changes in regulations. This can involve investing in training and development to stay current with digital trends and best practices and being open to experimentation and innovation.

Source:

Kohn, V. (2020). [How the Coronavirus Pandemic Affects the Digital Resilience of Employees.](#)

Manning, C. (2021). [A framework for digital resilience: supporting children through an enabling environment. Parenting for a Digital Future.](#)

Reynolds, L., & Parker, L. (2018). [Digital resilience: Stronger citizens online. Institute for Strategic Dialogue: London, UK.](#)

Weller, M., & Anderson, T. (2013). [Digital resilience in higher education. European Journal of Open, Distance and E-Learning, 16\(1\), 53.](#)

Southwick, S. M., Bonanno, G. A., Masten, A. S., Panter-Brick, C., & Yehuda, R. (2014). [Resilience definitions, theory, and challenges: interdisciplinary perspectives. European journal of psychotraumatology, 5\(1\), 25338.](#)

Mehedintu, A., & Soava, G. (2022). [A Structural Framework for Assessing the Digital Resilience of Enterprises in the Context of the Technological Revolution 4.0. Electronics, 11\(15\), 2439.](#)

Rodin, J. (2014). [The resilience dividend: being strong in a world where things go wrong. Public Affairs.](#)

Digital exclusion

Digital exclusion refers to the lack of access, skills, or interest in using digital technologies and the internet. This can affect individuals, communities, or entire populations, and can have a significant impact on their ability to participate fully in the digital economy, access information, and communicate with others.

“Digital exclusion is the lack of technology resources and access for poor or marginalised people. It is largely related to a lack of digital literacy and competence, rather than access to technology and services.

Risks of digital exclusion reinforce social exclusion, which is itself often an important cause of digital exclusion” (Bejaković, P., & Mrnjavac, 2020, p. 923).

Individuals who are digitally excluded may not have access to the necessary equipment or infrastructure to use digital technologies, such as a computer or internet connection. They may also lack the skills or knowledge to use digital technologies effectively, such as basic digital literacy skills.

Source:

Bejaković, P., & Mrnjavac, Ž. (2020). The importance of digital literacy on the labour market. *Employee Relations: The International Journal*.

Career Guidance and Counselling (CGC)

Career Counselling

Career Counselling describes the core competence of CGC professionals to support their clients in understanding their situations, in working towards solutions and in making decisions using ideographic and reflective methods.

Source:

NICE (2012). *NICE Handbook for the Academic Training of Career Guidance and Counselling Professionals*. Edited by C. Schiersmann, B.-J. Ertelt, J. Katsarov, R. Mulvey, H. Reid & P. Weber. Heidelberg: Heidelberg University.

Career Counsellor

The Career Counsellor supports individuals in understanding their situations, so as to work through issues towards solutions.

Source:

NICE (2012). *NICE Handbook for the Academic Training of Career Guidance and Counselling Professionals*. Edited by C. Schiersmann, B.-J. Ertelt, J. Katsarov, R. Mulvey, H. Reid & P. Weber. Heidelberg: Heidelberg University.

Career Guidance

A range of activities that enable citizens of any age, and at any point in their lives, to identify their capacities, competences and interests; to make meaningful educational, training and occupational decisions; and to manage their individual life paths in learning, work and other settings in which these capacities and competences are learned and/or used.

Source:

Council of the European Union, (2008). *Council Resolution on better integrating lifelong guidance into lifelong learning strategies*.

CGC Professional

The Career Guidance and Counselling Professional adopts professional values and ethical standards in practice, develops and regulates relationships appropriately, engages in continuous learning and critical thinking, and advocates for the profession.

Source:

NICE (2012). *NICE Handbook for the Academic Training of Career Guidance and Counselling Professionals*. Edited by C. Schiersmann, B.-J. Ertelt, J. Katsarov, R. Mulvey, H. Reid & P. Weber. Heidelberg: Heidelberg University

Multi actor career guidance

Networking and “multi actor approaches” have been developing in guidance since recent years (ELGPN, 2013; Schiersmann and Weber 2013). That for guidance is recognized increasingly as a network activity. In this context, networks are part of (career) guidance on different levels. (1) In a specific local area, different actors are involved in offering and coordinating guidance and support structures. Guidance is “structurally integrated” (Rämer and Scheffelt, 2016). (2) No single actor can provide qualitatively appropriate guidance alone; cooperation and collaboration are necessary to define and offer the desired quality. However, at its core, “multi-actor career guidance processes” are about direct, case-based collaboration involving actors with different backgrounds. In this sense, standards for guidance have been defined: “Working and interacting with the social context: Guidance practitioners are willing and able to use and further develop their personal professional network as well as the societal environment in relation to proper and target-group specific information, cooperation and networks” (nfb, 2012, p 12).

Source:

European Lifelong Guidance Policy Network: Entwicklung einer Strategie zur Lebensbegleitenden Beratung. Eine Europäische Handreichung. - Berlin: Bartos (2013), 115 S., URL: http://www.forum-beratung.de/cms/upload/ELGPN/DE_Resource_Kit_web.pdf - ELGPN tools. 01

nfb (2012) Quality and Professionalism in Career Guidance and Counselling The Open Process of Coordination for Quality Development in Career Guidance in Germany - English Short Version of Main Results. Berlin: Nationales Forum für Beratung www.beratungsqualitaet.net/upload/ServiceNavigation/bersetzung_BQ_Druckfreigabe.pdf (2023-01-04).

Rämer, S.; Scheffelt, E.: Gut vernetzt in die Zukunft. Drei Bildungsberatungseinrichtungen und ihre strukturelle Einbindung. In Magazin Erwachsenenbildung.at, (2016) 29, 10 S., URL: <http://nbn-resolving.de/urn:nbn:de:0111-pedocs-125713> (2023-01-04).

Education and Training

C-VET, continuing education, and training

Education or training after initial education or entry into working life aimed at helping individuals to improve or update their knowledge and/or skills, acquire new skills for a career move or retraining, or continue their personal and professional development (NCVER, 2013).

Vocational training should open the possibility for people to maintain their professional capacity in their current position/occupation (further training) or to expand their professional capacity for professional advancement (advanced training).

There are thus two forms of continuing vocational training: further continuing training (receiving and adapting) and advanced continuing training (expanding and career advancement) (BIBB).

Source:

Source: NCVER (2013), Glossary of VET. Australia, <https://www.voced.edu.au/vet-knowledge-bank-glossary-vet> (2023-01-12).

BIBB (o.J.). Terms of the German VET system, <https://www.bibb.de/en/80996.php> (2022-11-07).

(2023-01-12)

T-VET, technical and vocational education and training

‘Technical and vocational education and training’ (TVET) is understood as comprising education, training and skills development relating to a wide range of occupational fields, production, services, and livelihoods.

TVET, as part of lifelong learning, can take place at secondary, post-secondary and tertiary levels and includes work-based learning and continuing training and professional development which may lead to qualifications. TVET also includes a wide range of skills development opportunities attuned to national and local contexts. Learning to learn, the development of literacy and numeracy skills, transversal skills and citizenship skills are integral components of TVET.

Source:

[UNESCO \(GC\) 2015, UN \(2023-01-12\)](#)

Upskilling

“Short-term targeted training typically provided following initial education or training, and aimed at supplementing, improving or updating knowledge, skills and/or competences acquired during previous training”.

Source:

CEDEFOP (2014). Terminology of European education and training policy SECOND EDITION. A selection of 130 key terms, https://www.cedefop.europa.eu/files/4117_en.pdf (2023-01-04).

VET

Vocational education and training, abbreviated as VET, sometimes simply called vocational training, is the training in skills and teaching of knowledge related to a specific trade, occupation or vocation in which the student or employee wishes to participate.

Vocational education may be undertaken at an educational institution, as part of secondary or tertiary education, or may be part of initial training during employment, for example as an apprentice, or as a combination of formal education and workplace learning.

Source:

EU Commission (Eurostat) 2016, Europe [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Vocational_education_and_training_\(VET\)](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Vocational_education_and_training_(VET)) (20223-01-12)

BIBB (o.J.). Terms of the German VET system, <https://www.bibb.de/en/80996.php> (2022-11-07).

Formal, nonformal and informal Learning

“Formal learning: learning that occurs in an organized and structured environment (such as in an education or training institution or on the job) and is explicitly designated as learning (in terms of objectives, time, or resources). Formal learning is intentional from the learner’s point of view. it typically leads to certification” (CEDEFOP 2014, p. 99)

“Nonformal learning: learning embedded in planned activities not explicitly designated as learning (in terms of learning objectives, learning time or learning support). Non-formal learning is intentional from the learner’s point of view” (Ibid. p. 183).

“Informal learning: learning resulting from daily activities related to work, family or leisure. it is not organised or structured in terms of objectives, time or learning support. informal learning is in most cases unintentional from the learner’s perspective” (Ibid. p. 111).

Source:

CEDEFOP (2014). Terminology of European education and training policy SECOND EDITION. A selection of 130 key terms, https://www.cedefop.europa.eu/files/4117_en.pdf (2023-01-04).

Methodology

Training needs analysis

“Systematic evaluation of present and future skills needs against the skills available to implement an efficient training strategy.

training needs analysis rests on:

- (a) identification of skills needs;
- (b) assessment of skills available in the workforce, and (c) appraisal of skills gaps and shortages;

training needs analysis can be conducted at individual, organisational, sectoral, national or international levels; it may focus on quantitative or qualitative aspects (such as level and type of training) and should ensure that training is delivered effectively and cost-efficiently”.

Source:

CEDEFOP (2014). Terminology of European education and training policy SECOND EDITION. A selection of 130 key terms, https://www.cedefop.europa.eu/files/4117_en.pdf (2023-01-04).

Roundabouts for Digital Transformation as Learning Helices

The CGC-DigiTrans project is proposing a participative process inspired on the one hand by successful innovative techniques in the educational context such as the “learning helix” (Lernspirale) and techniques of collaborative educational coordination on local and regional level such as the multi-level “round tables for digital education” (Runde Tische für digitale Bildung). We have chosen the metaphor of a “roundabout” to signify that multiple actors can enter, stay in the loop, and leave the conversation as required or needed. In various settings (virtual, hybrid or in-person; on “neutral ground” or “on site”) an initial conversation between (employed or unemployed) worker and CGC professional is followed by sequences of interactions between worker, CGC professional, VET providers and organisations’ HRM specialists. The exact order, frequency and participants is to be determined in the process with the CGC professional initially to act as a “coordinator”. The ultimate aim is to equip the client with the ability to act as their own network pilot.

The learning effects of such roundabouts constitute an upwards helix, which will also result in smoother and swifter process as local communities of knowledge and practice are forming and particularly CGC practitioners become ever more competent brokers of local expertise and managers of participatory procedures.

In addition to the primary aims of overcoming knowledge gaps regarding local needs and opportunities and facilitating contact and interaction between workers, HRM and VET to create better matches of individual needs and existing opportunities; this process is geared to create opportunities for innovation for both companies and providers of VET. VET may find ways of responding to training needs in a more tailored way. Companies may find ways of utilising enhanced digital literacies in workers for innovation in administration and production.

Source:

CGC-Digi-Trans Project <http://digitransformation.net/> (2023-01-25)

Skills

Skills refer to the abilities (in combination with knowledge) that a person possesses to perform a specific task or activity. These can be divided into two main categories: hard skills and soft skills.

Hard skills are specific, technical abilities that are often acquired through formal education or training, such as programming languages, data analysis, or welding. These skills are typically quantifiable and can be measured through testing and certification.

Soft skills, on the other hand, are personal attributes that enable a person to interact effectively with others. Examples of soft skills include communication, problem-solving, leadership, and time management. These skills are often developed through experience and practice, rather than formal education.

Skills are important for individuals to perform their jobs, and for organizations to achieve their goals. Having a diverse set of skills allows individuals to be more adaptable and versatile in the workforce, and organizations to be more efficient and effective in achieving their objectives.

Source:

Wikipedia (o.J.) Skills. <https://en.wikipedia.org/wiki/Skill> (2023-05-01).

BIBB (o.J.). Terms of the German VET system, <https://www.bibb.de/en/80996.php> (2022-11-07).

Competence

The proven or demonstrated individual capacity to use know-how, skills, qualifications or knowledge in order to meet the usual, and changing, occupational situations and requirements (Unesco, 1984).

“In the broader educational discussion, competence is generally understood to mean the combination of knowledge and skills in coping with demands for new occupational situations. The competent persons are those who, on the basis of knowledge, abilities and skills, are able to generate new action that is currently required. In particular, the competence concept emphasises coping with situations that require non-standard action and problem solving” (BIBB).

Competence in the singular form might refer to the overall competence of a person or a specific field of action (“Digital Competence”). Competences in plural often is used to differentiate a complex field of competence into sub-competences.

Source:

BIBB (o.J.) Definition und Kontextualisierung des Kompetenzbegriffes <https://www.bibb.de/de/8570.php> (2023-01-18).

UNESCO (1984) Terminology of technical and vocational education. UNESCO International Bureau of Education. <https://unesdoc.unesco.org/ark:/48223/pf0000029940> (2023-01-18).

Assessment

Assessment (educational assessment) refers to the process of evaluating or measuring a person's knowledge, skills, abilities, or performance. It can be used for a variety of purposes, such as measuring progress, identifying strengths and weaknesses, making decisions about hiring, promotion, or admission, and determining compliance with standards or regulations. Assessment can take many forms, such as written tests, oral exams, interviews, observations, or reviews of work products.

Source:

Wikipedia (o.J.) Skills. https://en.wikipedia.org/wiki/Educational_assessment (2023-05-01).

Recognition of skills and competences

Recognition of skills and competences or recognition of prior learning refers to the process of formally acknowledging and validating an individual's skills, knowledge and experience. This can be done through a variety of means, such as certifications, licenses, degrees, or other forms of credentialing. Recognition of skills can also be used to demonstrate an individual's qualifications for a specific job or profession, and to increase an individual's employability and earning potential.

Recognition of skills and competences can be provided by employers, professional organizations, educational institutions, or government agencies. It can be formal, such as a college degree, or informal, such as a letter of recommendation.

Source:

Wikipedia (o.J.) Skills. https://en.wikipedia.org/wiki/Recognition_of_prior_learning (2023-05-01).

III. Appendix

Table with sources used for comparison

Source name	Author	Year	Origin & background	Reason for inclusion in the comparison	Type of frame
DigComp 2.2	Vuorikari, Kluzer & Punie	2020	EU, for citizens other policy makers	Up-to-date, EU reference, well differentiated, will be further developed	Own competence framework for digital competences
OECD DeSeCo	OECD / Expert Group	2005	OECD panel of experts, decisive impetus for the discussion on competences as a whole (Weinert, 2001)	Basic model for key competences, widespread, broad recognition	Comprises digital competences in a larger competency framework, but these are still superficially differentiated (e.g. ability to use technology interactively)
OECD Learning Compass 2030	OECD	2019	The Education and Skills 2030 project	Update of the key competence research from 2005 Embedding digital competences in a broader concept of future skills	Digital competences are integrated into a larger competence framework
European skills and jobs (ESJ) survey	CEDEFOP	2015	Cedefop carried out the European skills and jobs (ESJ) survey	Empirical survey, labour market orientation, however, only three " levels " of skills are distinguished and very roughly associated with skills	Digital competences are integrated into a larger competence framework
Curatelli et al.	Curtarelli, Gualtieri, Shater Jannati & Donlevy	2016	Investigation for the EU Commission on the digital transformation of EU jobs and its penetration	Explicit focus on the labor market	Gathering of digital skills
Building digital capabilities frame	Jisc data analytics	2022	Review of almost 100 frameworks other resources in	Flexibly adaptable basis for other labor market-related	Own competence framework for digital competences

Source name	Author	Year	Origin & background	Reason for inclusion in the comparison	Type of frame
			use, interviews with keys organizational other stakeholders, engagement with professional bodies (Beetham, & Shri, 2020)	competence frameworks, eg DigiDex (digital dexterity for librarians), A Health and Care Digital Capabilities Framework of the NHS; Role profiles and application in practice	
Project Digital Skills Accelerator	Rózewski, Kieruzel, Lipczyński, Prys, Sicilia, García-Barriocanal, Sánchez-Alonso, Hamill, Royo & Uras	2019	On the basis of the DigComp, expansion to include additional competences; Findings from the Erasmus+ project Digital Skills Accelerator	Very differentiated extension of the DigComp with competence-oriented learning modules	Modules for learning digital competences, in a competence framework-like arrangement
Future Skills 2021	Stifterverband für die deutsche Wissenschaft e.V.	2021	Survey in 377 companies and authorities, July and August 2021, managers and HR managers were interviewed	Employer focus. Survey dates 2021, so it can be assumed that the latest pandemic-related developments have been included from the employer's point of view	Digital competences are integrated into a larger competence framework
A Health and Care Digital Capabilities Framework	NHS	2018	The digital skills of employees in the health and care sector (UK) are to be improved. The framework contributes by empowering staff to develop their own digital skills to improve care.	Reference to the world of work (here specifically in the care and health sector) is in the foreground. In addition to the description of the competences, the framework also provides 4 levels of proficiency for each competency	Own competence framework for digital competences
Dondi et al.	Dondi, Klier, Panier & Schubert	2021	Definition of the required digital skills so that curricula	emphasis that digital competences about the technical aspect go out,	Digital competences are integrated into a larger competence framework

Source name	Author	Year	Origin & background	Reason for inclusion in the comparison	Type of frame
			and learning strategies can be derived.	attention also on communication collaboration, self-management and the ability to innovate	
Martínez-Bravo et al.	Martínez-Bravo, Sádaba Chalezquer, & Serrano- Puche	2021	Secondary analysis, study, assumes that different competency frameworks nonetheless involve relationships that, taken together, can be mutually enriching	Integrated proposal of digital literacy through a comparison analysis of digital competence in eight frameworks of 21st-century skills (ATCS, enGauge, Naep, Nets, OECD, P21, UNESCO, European Union)	Own competence framework for digital competences

Resources:

Beetham, H. & Footring, Shri (2020, February 13). Talking about the Jisc digital capability framework – Part 2 [Power Point Slides].

<https://digitalcapability.jisc.ac.uk/documents/242/2-How-the-Jisc-digital-capabilities-framework-came-about-A.pptx>

Cedefop (2015), Skills, Qualifications and Jobs in the EU: The Making of a Perfect Match? Evidence from Cedefop's European Skills and Jobs Survey. Luxembourg: Publication Office of the European Union.

Curtarelli, M., Gualtieri, V., Shater Jannati, M. & Donlevy, V. (2016). ICT for Work: Digital Skills in the Workplace. Brussels: European Commission.

Dondi, M., Klier, J., Panier, F., & Schubert, J. (2021). Defining the skills citizens will need in the future world of work. McKinsey & Company.

Retrieved from <https://comskills.co.uk/wp-content/uploads/2021/11/defining-the-skills-citizens-will-need-in-the-future-world-of-work.pdf> (2023-01-19)

Jisc data analytics. (2022). Building digital capabilities framework: The six elements defined. Bristol: Jisc data analytics. Retrieved from:

https://repository.jisc.ac.uk/8846/1/2022_Jisc_BDC_Individual_Framework.pdf

- Martínez-Bravo, M.C., Sádaba Chalezquer, C., Serrano-Puche, J. (2021). Meta-framework of digital literacy: comparative analysis of 21st-century skills frameworks. *Revista Latina de Comunicación Social*, 79, 76-110. <https://www.doi.org/10.4185/RLCS-2021-1508>
- NHS. (2018). A Health and Care Digital Capabilities Framework. <https://www.hee.nhs.uk/sites/default/files/documents/Digital%20Literacy%20Capability%20Framework%202018.pdf> (2023-01-19)
- OECD. (2005). Defining and Selecting Key Competences (DESECO) <https://www.oecd.org/pisa/definition-selection-key-competencies-summary.pdf> (2022-12-01)
- OECD. (2019a). Core Foundations for 2030. OECD Future of Education and Skills 2030 Conceptual learning framework. https://www.oecd.org/education/2030-project/teaching-and-learning/learning/core-foundations/Core_Foundations_for_2030_concept_note.pdf (2022-12-01).
- OECD. (2019b) OECD Learning Compass. https://www.oecd.org/education/2030-project/teaching-and-learning/learning/learning-compass-2030/OECD_Learning_Compass_2030_Concept_Note_Series.pdf (2022-12-01).
- Różewski, P., Kieruzel, M., Lipczyński, T., Prys, M., Sicilia, M.-A., García-Barriocanal, E., Sánchez-Alonso, S., Hamill, C., Royo, C. & Uras, F. (2019). Concept of expert system for creation of personalized, digital skills learning pathway. *Procedia Computer Science*, (159), 2304-2312. <https://doi.org/10.1016/j.procs.2019.09.405>
- Stifterverband für die Deutsche Wissenschaft e.V. (Hrsg.) (2021). Future Skills 2021: 21 Kompetenzen für eine Welt im Wandel. Diskussionspapier Nr. 3. <https://www.stifterverband.org/download/file/fid/10547> (2023-01-19)
- Vuorikari, R., Kluzer, S. & Punie, Y. (2022). DigComp2.2: The Digital Competence Framework for Citizens. Luxembourg: Publications Office of the European Union.

IV. Additional resources

In this appendix the project will collect additional resources, e.g. from national contexts.