youth SKILLS

# Report on Interviews with Experts on Digital Skills in Schools and on the Labour Market

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# Report on Interviews with Experts on Digital Skills in Schools and on the Labour Market

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## Executive Summary

The ySKILLS project seeks to better understand which skills 12-17-year-olds must obtain to knowingly, and critically use Information and Communication Technology (ICT) for their wellbeing, education and social life, and to improve existing knowledge as regards how children and youth can build resilience against negative impacts. As part of *Work Package 3 Digital Skills: Actors and Factors* of the ySKILLS project, this report aims to contribute a deeper knowledge on (1) the (digital) skills that youth need in the 21st century and (2) the role of digital skills education in formal (e.g., the school), informal (e.g., an extracurricular coding course) and non-formal (e.g., home) learning settings. Against this background, 34 interviews with experts from the educational sector and the labour market were carried out in six European countries: Estonia, Finland, Germany, Italy, Poland and Portugal.

As a result of their professional and personal experiences, these experts were able to provide deep insights into the impact of digital technologies in the lives of young people. Their views are, thus, a valuable resource to provide evidence-based recommendations and strategies for key stakeholder groups to promote digital skills and wellbeing. In addition, experts' insights provide knowledge that can help improve the measurement of digital skills.

Many experts interviewed highlighted that digital skills have increasingly become an integral part of people's lives. Mastering digital skills is perceived as vital for being able to take advantage of the opportunities ICTs provide and minimising potential risks. As the interviews were carried out in April and May 2020, amidst the COVID-19 pandemic in Europe, many of the interviewees reflected on how this crisis and the consequent 'social distancing' had impacted the labour market and education, when, all of a sudden, learning and working had become essentially digital. Several experts noted, however, that access to the necessary tools, resources and education in this field varies greatly, not only across but also within countries. The quality and effectiveness of initiatives meant to build digital skills are, according to the respondents, often deficient and inconsistent.

Although our interviews concentrated on the role of digital skills for the lives of children and adolescents, many experts also observed a deficiency of adequate programmes to develop the digital skills of adults, especially the elderly. In the light of an advancing digital transformation of the economy and society in which digital skills are needed for a growing number of daily activities as well as civic participation, this was regarded as highly problematic. Experts emphasised that it is crucial to develop strategies to reduce existing inequalities which are only reinforced by digitisation.

Consequently, it is an important challenge for governments nowadays to ensure that all citizens have access to effective and meaningful training and education in the field of digital literacy. The provision of access to digital technologies and the Internet can only be seen as a starting point. Systematic approaches and effective collaboration and coordination of various stakeholders, policy makers, academics, the private economic sector, educational stakeholders, practitioners, and civil society are needed to support the development of digital skills and, thereby, equip people with the skills needed for the 21st century.

## The ySKILLS project

Youth Skills (ySKILLS) is a large international research project whose aim is to understand what kinds of skills are needed among children and youth so that the long-term positive impact of the digital environment can be maximised.

ySKILLS starts from the observation that digitisation is changing society and requires a new set of digital skills, which many children and adolescents in Europe currently do not master. This can negatively affect their educational, informational, and social inclusion and wellbeing. Longitudinal and robust academic research on children's and adolescents' digital uses, the context of use and its impact is lacking on both national and European levels. Against this background, and considering children as active agents in their own development, ySKILLS examines both risks and opportunities related to children's and adolescents' (aged 12 to 17) ICT uses as well as their digital skills to understand how to purposefully use ICTs towards greater cognitive, physical, psychological and social wellbeing of children and adolescents. The project will provide recommendations for strategies that can be used by children, parents, schools, and people working with and for children to develop skills that will maximise positive opportunities and minimise the risk of harm.

ySKILLS aims to identify the factors that increase the risks of negative impacts and factors that protect from these negative impacts as well as to understand the potential of digital skills as a strategy to boost the resilience of children, and the link between digital skills and children's wellbeing.

***The Overarching Aim of ySKILLS***

*To enhance and maximise long-term positive impact of the ICT environment on multiple aspects of wellbeing for all children by stimulating resilience through the enhancement of digital skills*

In order to reach its overarching aim, ySKILLS addresses four research objectives:

***Objective 1:*** *To acquire extensive knowledge and better measurement of digital skills.*

***Objective 2:*** *To develop and test an innovative, evidence-based explanatory and foresight model predicting the complex impacts of ICT use and digital skills on children's cognitive, psychological, physical and social wellbeing.*

***Objective 3:*** *To explain the ways in which at-risk children (in terms of mental health, ethnic or cultural origin, SES and gender) can benefit from online opportunities despite their risk factors (material, social, psychological).*

***Objective 4:*** *To generate insightful evidence-based recommendations and strategies for key stakeholder groups to promote digital skills and wellbeing.*

This report, part of *Work Package 3 Digital Skills: Actors and Factors*, helps achieve ySKILLS' Objectives 1 and 4. The experts' views are essential to provide insightful evidence-based recommendations and strategies for key stakeholder groups to promote digital skills and wellbeing. In addition, experts' insights provide knowledge that can help improve the measurement of digital skills.

## 1. The report

The ySKILLS project aims to better understand which skills 12-17-year-olds must obtain to knowingly, and critically use Information and Communication Technology (ICT) for their wellbeing, education and social life, and to improve existing knowledge as regards how children and youth can build resilience against negative impacts. Against this backdrop, the report in hand pursues the objective of contributing to a deeper knowledge on (1) the (digital) skills that youth need in the 21st century and 2) the role of digital skills education in formal (e.g., the school), informal (e.g., an extracurricular coding course) and non-formal (e.g., home) learning settings. For this purpose, 34 interviews with experts from the educational sector and the labour market were conducted in six European countries: Estonia, Finland, Germany, Italy, Poland and Portugal.

In this report, experts' views appear as an important source of information since, as a result of their professional experience and closeness to the field, they may observe tendencies and phenomena which otherwise might not always become evident in scientific research, particularly within a quantitative paradigm. As revealed in this report, many of the experts interviewed have witnessed at first hand the impact of digital technologies in the lives of young people either because of their professional or personal experiences (e.g., as teachers or even, in some cases, as parents themselves). Their views are, thus, valuable to help ySKILLS reach its overarching aims.

In the coming sections of this report, education and labour market experts share their views as regards digital skills and the importance for young people now and in the future. They also reflect on what needs to be done to ensure that efforts to develop digital skills and literacy effectively respond to their countries' needs.

The next section provides an introduction to key topics such as digital skills and digital literacy and we reflect on the conceptual diversity and definitional challenges present in the field. Then, we outline the methodology of the conducted study. Subsequently, we present the results of the expert interviews. The first part of this section focusses on the views of educational sector experts and the second part analyses interviews carried out with labour market experts. Based on the results of the analysis, we provide some final reflections and a list of recommendations for various stakeholders involved in the development of young people's digital skills.

# 2. Background

## 2.1 Understanding digital skills and digital literacy: Conceptual diversity and definitional challenges

Over the past decades, numerous efforts have been taken to better grasp and accurately define the wide range of concepts related to digital technologies, and the skills required to become competent and responsible users. Although many of these terms are closely interrelated, they have emerged from different disciplines and, therefore, they set their focus on different, although interrelated, aspects. For instance, information literacy, a term originating from library and information science, is frequently used to refer to aspects related to information access as well as the evaluation, creation and sharing of information and knowledge, using various tools, formats and channels. In contrast, terms such as ICT literacy are said to have been originated in computer science and informatics as terms usually employed to refer to the ability to use digital devices, software, and infrastructure (UNESCO, 2013).

As digital technologies evolve – demanding new skill sets from the population – new terms are being coined dominating academic, policy and popular media discussions. Not surprisingly, this conceptual diversity, plus the greater accessibility, convergence and distribution of information and media content, in various formats and via diverse digital tools, has motivated academics and organisations all over the world to continue refining existing theoretical models, concepts and definitions. For instance, in 2013 UNESCO introduced the concept of Media and Information Literacy (MIL) as a construct that brings together information literacy, media literacy, Information and Communication Technology (ICT) and digital literacy. UNESCO (2013, p.17) defines MIL as "a set of competencies that empowers citizens to access, retrieve, understand, evaluate and use, create, as well as share information and media content in all formats, using various tools, in a critical, ethical and effective way, in order to participate and engage in personal, professional and societal activities." Later on, in 2018, UNESCO introduced the concept of digital literacy as "the ability to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately through digital technologies for employment, decent jobs and entrepreneurship" (Law et al., 2018, p.6).

Alongside this, the concept of digital skills has also evolved through the years to include broader conceptualisations and a wider set of skills. For instance, ITU (2018, p.23) defines digital skills as "the ability to use ICTs in ways that help individuals to achieve beneficial, high-quality outcomes in everyday life for themselves and others" comprising of "the extent to which one is able to increase the benefits of ICT use and reduce potential harm associated with more negative aspects of digital engagement." According to this definition, digital skills refer to the ability to translate internet use into tangible educational, social, economic and identity-related opportunities (van Deursen & Helsper, 2015; van Deursen & van Dijck, 2014) – thus promoting cognitive, psychological and social wellbeing – *and* to the ability to minimise potentially problematic outcomes of digital media use.

Despite the great conceptual diversity, and as observed in this report, academics, educators, practitioners, policymakers and industry representatives alike agree that the new socially mediated, digital environments demand specific literacies from the population. Without these, citizens cannot fully grasp the consequences of their engagement with digital technologies, nor take full advantage of the opportunities that digital environments have to offer (e.g., Blum-Ross et al., 2018; Donoso &

Verdoodt, 2014). As these increasingly complex sets of skills cannot be acquired just by interacting with digital technologies, it is important that all citizens, particularly the youngest and most vulnerable ones, are provided with enough opportunities and support to fully develop these complex and ever evolving skill sets which will help them to actively participate in increasingly evolving, digitised societies.

### 2.2 The increasing importance of digital skills for everyday life

Digital technologies, particularly social media, have become an important part of the lives of children and young people providing avenues for personal development as well as access to a wide range of opportunities, such as information access, communication, entertainment, socialisation, creativity, citizenship, and civic participation. As is well documented, many of these opportunities also bring risks and potential harms (e.g., Livingstone, Haddon, Görzig & Ólafsson, 2011; O'Keeffe & Clarke-Pearson, 2011; Mascheroni & Ólafsson, 2014; Vandoninck, d'Haenens, De Cock & Donoso, 2011). Particularly, in the case of children and adolescents these risks can be augmented because, due to their evolving cognitive and emotional maturity, they may be less equipped than adults to recognise online threats and to cope with them in appropriate ways (Livingstone, 2014).

Not surprisingly, worldwide efforts are being made to create enough opportunities to nurture children's digital skills and literacy at school and beyond. But why is this important? On the one hand, digital skills have become, and are becoming, increasingly necessary to perform a wide range of everyday activities (e.g., for home-school communication, to make a doctor's appointment or to buy something online). Despite our increasing reliance on digital tools, many citizens, including children and young people, have not yet acquired the necessary (digital) skills to allow them to perform these activities effectively, responsibly, and safely. As a matter of fact, as stressed by UNESCO, millions of people worldwide continue not having access to digital technologies and many of those who do, are not yet fully capable of taking full advantage of the opportunities digital and social media have to offer. These inequalities are not merely digital. They usually stem from profound educational and social inequalities: "While digital skills education and training has evolved over the past 20 years, the quality and effectiveness of its provision remain inconsistent. Pronounced inequalities and disparities exist in terms of individuals' digital skills and competencies within communities, countries, and regions. Reconciling these gaps will require more than technology alone. Holistic approaches — encompassing policy, implementation, funding, and partnership — are needed to ensure that all learners have opportunities to cultivate relevant digital skills" (Atchoarena et al., 2017, p.5).

On the other hand, if we look at labour market trends worldwide, a major shift in the types of skills needed is taking and will continue to take place and children and young people need to be prepared to face these challenges. As a matter of fact, it is estimated that, in addition to basic literacy skills, technological, cognitive, and new creative and interpersonal skills will account for nearly half of work activities by 2030, compared with 37 percent in 2017 (Bughin et al., 2017). Education and training are key to support the future of work and the development of these new skills. This is particularly important in Europe because it is estimated that 45 percent of the population does not have basic digital skills (Kiss, 2017). According to Kiss (2017) the level of digital skills among the labour force is higher than that among the general EU population with only 13 percent of the EU labour force having no digital skills. Interestingly, although recent Eurostat data shows a slight increase in the

percentage of individuals who self-report possessing digital skills above a basic level (27% in 2015 compared to 31% in 2019), the same upward trend is observed among individuals with low overall digital skills (23% in 2015 compared to 29% in 2019) (Eurostat, 2020). Although more robust data would be necessary to draw proper conclusions, the current trend seems to suggest that the gap between people with low or no digital skills and those with higher digital skills is widening. In Europe, this trend is particularly pronounced in countries like Bulgaria and Romania, where a high percentage of the population are still digitally excluded (Kiss, 2017).

Considering that traditional forms of employment will continue being disrupted, making of the employment landscape a more complex and multifaceted environment which will require more digital skills from the working population (Bughin et al., 2017; World Economic Forum, 2016), we cannot but highlight the need for increased digital skills education. As Bughin et al. (2017, p.6) stress "Employers, employees and policy makers face challenges in managing the shift to a new economy, which requires significant reskilling and a socially responsible transition".

### 2.3 Growing momentum for digital literacy worldwide

Clearly, there is growing momentum to support the integration of digital literacy into education worldwide. As a matter of fact, preparing Europe for the increasing importance of digital technologies in the future remains a policy priority of the European Commission. In her political guidelines for the years 2019-2024, the current Commission President Ursula von der Leyen stressed the importance of keeping track with digital innovations which "changed our societies and our economies" (von der Leyen, 2019, p. 13) and sets the objective of fostering education and training opportunities in this field so that all citizens are equally well equipped to master those transformations. The Commission's strategy for the digital future of Europe pursues three key objectives: (1) technology that works for people, (2) a fair and competitive digital economy, (3) an open, democratic and sustainable society (European Commission, 2020b). In this context, digital skills play a crucial role both for the personal development of people and the economic future of Europe for which a digitally skilled workforce will be a decisive factor.

This notion has only been confirmed by the challenges the COVID-19 pandemic has caused. As the need for social distancing led to an upsurge in teleworking and home-schooling, digital technologies became a crucial part of daily routines. As part of its efforts to support Europe's recovery after the pandemic, the Commission published the *European Skills Agenda for Sustainable Competitiveness, Social Fairness and Resilience* introducing a package of actions meant to ensure that all European citizens have the opportunity to develop the skills they will require in the future. Digital skills are explicitly mentioned as a focus of this agenda since "it is only with the right skills that Europe can strengthen its position in global competition and have a sustained economic relaunch geared towards the green and digital transitions" (European Commission, 2020a, p.3). The actions proposed by the European Commission highlight that it is essential to provide citizens with access to high-quality education and training from a young age while simultaneously creating opportunities for continuous lifelong learning.

The importance of digital education in Europe was also highlighted in the Eurydice report on *Digital Education at Schools in Europe* (2019) which showed that in most European countries digital education is integrated at all levels of education. The majority of them has embedded a digital

competences strategy into the national educational system and investment in digital equipment of schools is on the rise. Despite this, the report concludes that concrete definitions of digital competences are often missing on a national level and teachers do not receive sufficient guidance on how to assess their students' digital competences. Similarly, the OECD's Teaching and Learning International Survey (TALIS) conducted in 2018 found that teachers continue to see a high need for training initiatives which focus on "ICT skills for teaching" (OECD, 2019) while 35 percent of teachers regard further investment into ICTs at schools as one of the most important fields requiring innovation.

Against this background, an important challenge for governments these days is to ensure that digital literacy reaches all citizens. Education and training are thought to be essential components of any efforts to achieve this. A clear example are the numerous initiatives to promote digital literacy and citizenship at schools all over the world. However, the quality and effectiveness of these initiatives remains inconsistent and, to a large extent, unassessed. In this report, the experts interviewed from the educational and labour market sectors reflect on these and on the numerous challenges related to improving the current provision of digital education in their countries and regions. Their reflections have been particularly important to reflect on ySKILLS' own conceptualising of digital skills and to elaborate insightful, evidence-based recommendations to continue promoting digital skills and wellbeing in Europe and beyond.

# 3. Methodology

## 3.1 Sample

In May 2020, 34 in-depth interviews with experts from the educational sector and the labour market were conducted in Estonia, Finland, Germany, Italy, Poland, and Portugal with the aim of getting a deeper understanding of (1) the (digital) skills that youth need in the 21st century, and (2) the role of digital skills education, both in formal (e.g., the school) and informal learning settings. Special attention was given to the technological transformations in the labour market.

According to the Grant Agreement in every country, at least one policymaker, two NGO experts and two scientists had to be interviewed (See Annexes I and II for a breakdown of experts per country and area of expertise). However, considering that the main aim of this report was to get a better understanding of what educational and labour market experts considered as essential skills for children and young people to strive for in the 21st century, it was agreed among the partners involved in this task that the views of practitioners and especially of educators could not remain absent from this report. For this reason we opted for extending the category 'NGO experts' to 'NGO experts and practitioners'. In parallel, we further specified the profile of the experts to be interviewed (See Table 1). In defining these profiles, special attention was given to including representatives of education and of the labour market sectors. Additionally, we defined the term 'expert' in a broad sense and looked for potential interviewees who could represent the scientific sector (e.g. a professor or researcher at an academic institute) as well as practitioners with demonstrated experience in their field (e.g. reflected in the amount of years working in a certain sector, professional affiliation, etc.) and policymakers. As experience is gained cumulatively and is not only related to one's current occupation, we were flexible in allowing the recruitment of interviewees who had previously occupied relevant policymaking positions to be interviewed. This was, for example, the case of a former Minister of Economy and Labour in Portugal and of an Italian educational expert who was responsible for the national plan for digital education.

**Table 1 Expert Profiles**

| Expert Profile | Description |
|---|---|
| **Educational expert 1** | Someone with **ten or more years of experience** working in/for the formal educational sector. This expert is **currently working in the educational sector or has recently worked there** (no more than two years ago), i.e. he or she is a practitioner. This expert has plenty of knowledge about the use of digital technologies in schools, among children aged 12 and older. |
| **Educational expert 2** | A person with **profound knowledge of educational policy and/or curriculum development** with a special focus on ICT and digital technologies, such as a ministry representative, an educational policymaker, a researcher, an expert working at an educational agency with a government mandate. The expert has **a minimum of five years of experience** in the field, not necessarily working in the same organisation. |
| **Educational expert 3** | A **representative of an organisation, public or private, developing programmes/training/educational materials for formal or informal education** around topics related to digital skills, media literacy, digital citizenship, online safety, etc. for students, parents and/or educators. This |

| | |
|---|---|
| | person has a **minimum of five years of experience** in the field, not necessarily working in the same organisation. |
| **Labour market expert 1** | A person **well acquainted with tech/innovation, ideally someone currently/recently engaged in the industry, services or innovation sector and/or active in a sector** where digital technologies are widely used (e.g., online-banking, e-marketing, health industry/sector, etc.). The person has a good overview of current and future technological trends and of the labour skills required in the sector, but also a broader understanding of the societal impact of digital technologies. |
| **Labour market expert 2** | An expert with a **good understanding of broad, more general labour market trends and developments**. As opposed to the labour market expert 1, this expert does not need to be a person with mainly technical knowledge, but rather **someone knowledgeable about the labour market in their country**. This person has a broader understanding of (general) skills needed across the labour market (in their country) as a whole, and not just of digital skills. |

Finally, it t was also agreed that in every pilot country at least three educational experts and two labour market experts would be interviewed. In Poland and Portugal four educational experts were interviewed, in Germany and Finland three experts from the labour market took part in the interviews. In accordance with the aims of our study, a purposive type of sampling was chosen (Denzin & Lincoln, 1994). By means of this sampling strategy we were able to identify and select the experts that best fit the profiles defined in Table 1. The importance of identifying information-rich cases is that it allows us to study the cases in more depth. However, it also requires knowledgeable researchers able to identify the individuals who best meet the specified research criteria. In our research, every ySKILLS pilot country team was in charge of identifying and recruiting national experts who met the criteria established. The identified experts were invited for an interview via e-mail. In most cases, the experts accepted the invitation. In the few cases where no response was obtained or when the invitation was not accepted, a replacement was sought.

### 3.2 The interviews

The interviews were conducted in April and May 2020 by 12 researchers. All interviewers were staff members of the ySKILLS consortium partners. While the original plan was to carry out the interviews face-to-face in the six European countries participating in the study, the outbreak of the COVID-19 pandemic in Europe rendered a change of strategy necessary. Therefore, the experts were instead interviewed remotely via online conferencing systems. The researchers used the online platform for which their institution had a data processing agreement (DPA) in place. Hence, the following video conferencing tools were used for the purpose of the interviews: MS Teams, Zoom, Jitsi Meet and Lifesize. In one case, parts of the interviews were carried out via WhatsApp audio call and the Voice Memos app by Apple because of technical problems with the standard communication tool.

All researchers conducted the fieldwork on the basis of interview protocols (Appendices III; IV) developed in advance. The protocols distinguished between five overarching themes for the interviews: (1) Conceptualising digital skills, (2) Core skills needed in the digital age, (3) The development of digitals skills, (4) The importance of digital skills as compared to non-digital skills, (5) The strengths, weaknesses, opportunities and threats related to digital skills education/training in these six countries. Following these themes, a set of questions were formulated.The interviews were designed in a semi-structured fashion to provide space for individual, detailed responses and to allow for the emergence of unanticipated themes. Therefore, the researchers were free to inquire into any

issue relevant for the research aim raised by the interviewees. Consequently, the length of interviews varied greatly between 30 and 150 minutes.

The interview started by asking experts to describe what, in their view, would make a person "digitally skilled". This question was followed by an interactive exercise in which both educational and labour market experts had to reflect on the top-5 digital skills that adolescents should possess these days. During this exercise, experts were provided with 21 cards, each of them specifying a digital skill or competence. These skills were taken from the European Commission's Digital Competence Framework for Citizens (DigComp) in its revised 2017 version (Carretero, Vuorikari & Punie, 2017). The interviewed experts were asked to select the five, in their view, most important digital skills and rank them in order of importance. Afterwards, they were requested to comment on their choices. The interviewees were given the possibility to include additional skills, not included in the DigComp, if they wished. As explained later in the report, only a few experts added additional skills.

It is important to clarify that the exercise was not intended to serve as an evaluation of the DigComp model. Instead, the framework was used as a source of inspiration for the experts to express their view on digital skills in more detail.

### 3.3 Collection and storage of data

Ethical approval was granted by the Social and Societal Ethics Committee (SMEC) of KU Leuven to carry out the interviews before the recruitment of particpants started. Once participants were recruited and before any data was collected, the interviewees were informed on how the collected data would be stored and processed, and their informed consent was obtained (Appendix V). The interviews were video-recorded. Most interviewees gave us their explicit permission to share their name and affiliation in ySKILLS publications and/or to be cited in selected quotes from the interview. When this was not the case, the interviews have been anonymised. Research data obtained by the project partners was collected and stored by each partner in secure databases at their institution for the purpose of elaborations to be carried out in the project. In addition, primary research data was also centralised by KU Leuven.

### 3.4 Transcription and analysis

The interviews were transcribed afterwards. In cases in which the interviews were carried out in a language other than English, the transcripts were translated. In Estonia and Finland all interviews were carried out in English. In Italy the interviews with educational experts were carried out in English as well. In one case (Poland) the translation was produced by a professional translator and in Portugal the interviewers translated the two interviews given in mother language. In two cases (Italy and Germany) DeepL/DeepL Pro automated translation programme was employed. In all cases, translations were subsequently reviewed by the researchers who carried out the interviews to ensure that the resulting translation was correct. Finally, we lightly edited the transcripts for clarity and readability throughout, for example removing incomplete short phrases or repeated words, or smoothing translations when necessary.

Subsequently, the transcripts were hand-coded by multiple researchers according to emergent themes, and then grouped together focusing on the guiding themes and research questions that led this report and which are summarised below in Table 2:

| Table 2 | Themes and Questions |
|---|---|
| **Overarching themes** | **Research questions** |
| **Conceptualising digital skills** | • How do educational and labour market experts conceptualise digital skills? |
| **Core skills needed in the digital age** | • What digital skills do educational and labour market experts consider as essential for children and young people to acquire? |
| **Fostering digital skills** | • How are digital skills fostered in the pilot countries studied?<br>• Which actors/stakeholders are in charge of fostering and promoting digital skills in the countries studied? |
| **The importance of digital skills as compared to non-digital skills** | • How important are digital skills as compared to more traditional or non-digital skills (e.g., literacy, numeracy or other types of non-digital skills)? |
| **Digital skills education/training provision** | • Considering the current provision of digital skills education available in the countries studied, what are the main strengths and gaps identified? |

## 4. Main Results

In this part of the report we present the views expressed by the 34 experts interviewed from six European countries: Germany, Estonia, Finland, Italy, Poland, and Portugal. The main results are divided into two sections, each representing the main reflections about digital skills from the perspective of the Education Experts and the labour Market Experts, respectively. In both sections, experts elaborate on their views concerning digital skills and their importance for the lives of young people now and in the future. Based on the experts' views, common enablers and obstacles to the development of digital skills are identified. The report concludes with a series of recommendations concerning how the development of digital skills can be fostered within different sectors and by different stakeholders.

### 4.1 What makes a person 'digitally skilled'?

The first question all experts interviewed were asked was 'what makes a person 'digitally skilled'? The aim of this question was to explore how the interviewees conceptualised digital skills and to gain a deeper understanding of what they considered as key skills for (young) people to acquire. Although experts were explicitly asked about skills, many referred to digital competences, digital literacy, digital citizenship, or other related concepts. It soon became apparent that terms like skills and competences, although distinctive in the scientific literature (e.g., Cortesi et al., 2020), are often used interchangeably in practice. Additionally, it was interesting to observe how non-technical dimensions such as cognitive or ethical aspects (e.g., values) were also incorporated into the experts' discourse. The quotes below by Finnish, Italian and Polish experts illustrate this:

> First, you need to have access to be able to gain the skills and knowledge to use digital devices and products. Then, you need to be able to analyse and evaluate in order to understand the digital offerings and their values, how they operate, what their limitations are, and their meaningfulness in society in general, and in one's own life (Finland, Education expert 2).

> Typically, you would think that [digitally skilled persons] should be technologically advanced, but I think this is only a part of the picture. Obviously, you need technological skills, but mostly you need curiosity […] because anybody can learn (Finland, Labour market expert 2).

> I think that we can put our mind to our possibility to shift their [children's] competencies from the level of skilfulness to the one of wisdom (Italy, Education expert 2).

> Many competencies permeate here and cannot be considered as separate skills (Poland, Education expert 2).

Experts also noted that the definition of digital skills is subject to change depending on the development of technical innovations:

> Well, digital skills are changing very rapidly. Many years ago, digital skills were interpreted as using a set of tools, and in knowing how to use the internet. Right now, especially in this decade, digital skills are much more sophisticated (Portugal, Labour market expert 1).

Such diverse conceptualisations of digital skills illustrate some of the many existing challenges to build a common, comprehensive framework for the development of young people's digital skills since these skills are perceived by the experts from different angles and at different levels (e.g., macro societal level, and microlevels of a classroom, an enterprise or personal life). The latter may be caused by many factors, including cultural differences, different theoretical traditions, lack of a common terminology and different understanding of fundamental terms (e.g., digital skills, competences, literacy, etc.). It is clear that further reflections and interdisciplinary discussions are required to continue improving our understanding of digital skills and how they should be mesarured, as well as to propose systems that effectively help to promote digital skills in children, adolescents and citizens in general.

### 4.2 Digital Skills – The Views of Education Experts

In this section of our report we reflect on the views of the twenty education experts consulted during our research. These experts, individually interviewed in May 2020, reflected on the importance of digital skills for young people, on how these skills are currently being promoted among youth and on what needs to be done to ensure that digital literacy continues being boosted in the educational sector in in their country.

#### *The importance of non-technical skills*

The term operational skills describes the technical skills needed to operate computers and the Internet (e.g., knowing how to bookmark websites or download files) (van Deursen, Helsper & Eynon, 2014). Such skills, sometimes referred to as *technical skills* by our respondents, often served as a starting point of the definitions provided by the experts (e.g., "ability and knowledge to use standard and advanced applications, websites" – Poland, Education expert 4; "first of all, technical knowledge" – Germany, Education expert 1). Although, most experts considered such skills as an indispensable basis for the further development of digital skills, many respondents highlighted that the possession of operational skills alone is insufficient to consider a person digitally skilled.

> ***At first, when you say digitally skilled, you think about using tools, about using devices, about using applications, webtools, and using the internet, using emails, and so on. (…) although young people are bored with the devices in their hands… They have been using devices since the day they were born (…) we understood that being digitally competent is something else.***
>
> ***Italy, Education expert 3***

In addition, whereas some experts expressed that acquiring a basic level of operational skills would be relatively easy for young people, other experts warned that the kind of "natural, intuitive use" children might demonstrate as regards digital technologies is not in itself a sufficient indicator of being digitally skilled: "It is not true that our students or younger generations are digital natives because they know how to spontaneously use tools and devices" (Italy, Education expert 3).

Some experts also pointed out discrepancies between young people's perception of their skill level and what they are actually able to do:

> When we do group work via the computer, children will say, "OK, I can chat and do videoconferencing via WhatsApp" but when it comes to specific teaching matters, they don't know. They can chat with each other, but none of them knows how to create a file available on the Internet so that everybody can work on it at the same time (Germany, Education expert 1).

This is in line with existing research which suggests that self-assessment alone is a poor predictor of actual performance. These gaps between the perception of and the actual skills level are present worldwide, including in digitally developed countries in Europe (e.g., ECDL Foundation, 2016).

In general, the experts agreed that digital skills are not merely a synonym of operational skills but a more complex skill set involving functional, strategic and critical skills. As illustrated by the Estonian educational expert below, digital skills go far beyond technical abilities and operating certain hardware or software.

> It's not only about producing some document, but it's about trying to solve different types of problems, critically evaluating the things that you're getting from different sources, the way you are presenting yourself in the digital world, and all of that, which is not only about skills, about how you can do things, but also the way you think, what you do, and what the consequences are (Estonia, Education expert 2).

Other experts emphasised the importance of social and interaction skills, as expressed by education expert 3 from Portugal: "Digital skills, for me, are not only the skills that people have, such as searching on the Internet, how to use social media, more and more digital skills are also social skills".

Other experts highlighted active citizenship and creativity as important aspects of digital skills:

> Maybe we could think rather about being prepared to learn to use digital tools to be an active and at times creative participant of culture, society, education rather than create a checklist of skills (Poland, Education expert 1).

In sum, although operational skills are indispensable to achieve higher levels of digital skills, many respondents highlighted that the possession of operational skills alone is insufficient to consider a person digitally skilled.

### *Digital skills versus non-digital skills*

The interviewees were asked to evaluate the relative importance of digital as compared to non-digital skills understood as part of traditional literacy concepts covering reading and writing abilities. Many experts conluded that both skill sets are complementary and that it is difficult to position any set of skills above the other:

> I cannot say that I consider one set of skills as more important than the other. I'm not undervaluing any of them, now digital competence is not the most important, but it is as important as the other competencies (Estonia, Education expert 2).

> We used to have a gym teacher who said, "A good football player can use his left foot just as well as his right foot." So, I want to draw that comparison with skills. These are skills that complement each other, not fight each other, not neglect each other, but complement each other. It has to be seen that way (Germany, Education expert 1).

In many cases the experts also observed that a positive correlation between achieving a certain level of digital and non-digital skills: “Those who have non-digital skills have also acquired digital skills well. It's just the same as when I know a foreign language, I can learn a second foreign language more easily” (Germany, Education expert 1).

This position could be extended by quoting the expert from Portugal who perceived digital skills as a wide set of skills that are adapted to the online environment. The expert further suggested that these two types of skills often co-exist:

> When you are using digital skills on social media, when you are talking to someone on Instagram, or sharing your content, you are using social skills, you are engaging in personal relationships with people, you are creating a digital channel instead of creating a face-to-face channel. The difference is not the content. The difference is the format. People should know that they don’t need to learn something extra to have digital skills, they do need to know how to adjust the skills they already have to the digital environment (Portugal, Education expert 3).

A few experts questioned the notion of distinguishing digital skills from other skills as they considered digital skills to be so extensively embedded in modern life and intertwined with everyday activities that it appeared almost impossible to set them apart from other skill sets:

> I am always bothered by this term "digitally skilled" or "digital education". Education in the digital world or competences for digital anything, but this "digitally skilled" is actually a contradiction in terms for me. I wouldn't take it out as something completely new, but it is now part of everyday life and therefore I always find it difficult to see it as an extra (Germany, Education expert 1).

One of the experts even proposed replacing the term digital skills by more comprehensive terms that would cover digital and non-digital skills, both crucial for young people nowadays:

> Digital skills are as important as non-digital skills. I think we are living in some kind of media augmented reality where we no longer have the possibility of not using digital skills. Maybe we should call it “competences of the future” or “competences of continuous learning” rather than digital skills (Poland, Education expert 1).

*Problem-solving and critical skills*

Some education experts conceived being digital skilled as being able to use digital technologies to solve problems or to perform tasks more efficiently:

> I think the skill in this case means that you use it on a daily basis. When you are thinking about how to deal with a task, then you think about how to do it. If you are digitally skilled, you will think about how to use ICT to solve a problem (Finland, Education expert 1).

Not surprisingly, the majority of experts interviewed often mentioned information processing skills (incl. searching, critically analysing and using data) as a key aspect of digital skills. In this context, the interviewees frequently referred to the manifold sources of information available on the internet nowadays and the importance of being able to assess the quality and trustworthiness of such information. Particularly, some experts referred to the increasingly prominent phenomenon of 'fake news' and how important it is for young people to acquire the necessary abilities to search and assess information critically: "When talking about a huge amount of data and texts or documents, you must have some idea about how to assess that content. Is that the data you really need? Which are relevant? And then, you have to have a skill to search the right way. And of course, you have to evaluate the data accuracy" (Finland, Education expert 1).

This observation and awareness are crucial since according to some studies a vast proportion of information concerning vital aspects of life, e.g., medical information concerning serious diseases may be false (Waszak, Kasprzycka-Waszak & Kubanek, 2018).

*The ethical dimension*

Several education experts highlighted the importance of using digital technologies in responsible and ethical ways and indicated that these aspects are also necessary for considering someone as digitally skilled. Protecting personal data and privacy, as well as being able to manage one's digital identity were also aspects that experts considered relevant, as expressed by the German expert below:

> Skills are not just about copying and distributing certain things… or taking pictures of classmates and sending them across the country. Children must learn early on that this is not allowed. For example, data protection and the like, personal rights. Also certain responsibilities, e.g., identifying certain sources (Germany, Education expert 1).

As expressed by the Polish Education expert 3, a digitally skilled person uses ICT effectively and responsibly, and is aware of the consequences of his or her actions. Here some experts went even further expressing the opinion that behaving unethically while using digital technologies may in some way diminish the value of the digital skills possessed: "I can be skilled, but if I am skilled […] I can use my skilfulness to do stupid things in the web (Italy, Education expert 2).

Some experts also reflected on the ethical dilemmas resulting from new technological developments, some of which were particularly boosted during the COVID-19 pandemic, as stated by the Portuguese expert below:

***In Europe today there are sensitive questions, such as Covid-19's digital screening apps that put pressure on individuals, as the data they collect are only reliable if a significant number of citizens use it. Today we already have to choose between security or privacy.***

***Portugal , Education expert 1***

Clearly, as expressed by the experts interviewed, a heightened awareness of the potential consequences of one's online actions as well as using online technologies in ethical and responsible ways are increasingly important dimensions that should also be given enough attention in digital skills education.

*Awareness of the underlying mechanisms regulating Internet and online communication*

Since Social media platforms routinely apply personalisation algorithms to ensure that the content presented to users is relevant and engaging (Koene et al., 2017), some experts suggested that being aware of how those mechanisms operate should be considered as an important aspect of digital skills.

Some of the experts interviewed put forward the idea of a "meta-skill" or rather a "meta-competence" that makes children and young people more flexible, more aware and more proactive users of ICT:

> Children need to be able to learn themselves to use different interfaces. They have to understand that a hard algorithm telling how to use every application does not exist. So it is very important that children learn to use many apps, to look by themselves for the applications' functions and to use them in an active way (Poland, Education expert 1).

For other experts, it is also important to possess a deeper understanding of how computer-mediated communication works and be aware that these underlying mechanisms can affect the quality of interactions among people online, as reflected in the following quote:

> Young people need to understand that in the digital world you don't hear the tone of voice, you don't know what is behind, or you don't see whether someone has just had a bad day when posting something. When you are face to face, you do understand these things. So, you need to tell them that the digital environment has its own rules and mechanisms that are decided by someone else (Italy, Education expert 1).

Summarising, the definitions of a digitally-skilled person brought forward by the educational experts interviewed were multidimensional and reflected upon many aspects which are in the focus of current research in this field (e.g., Cortesi, et al., 2020; Haggitai, 2009; van Deursen, at al., 2014). However, despite differences among experts, they share the perception that operational skills are not sufficient to define a person as digitally-skilled. Besides technical skills, experts attached great importance to non-technical skills such as critical-thinking and information processing skills, ethical use of digital technologies, protecting personal data and privacy and managing one's digital identity. They also highlighted the need to integrate the concept of digital skills and perceive them as a more holistic concept that includes also traditional (non-digital) skills or reference to them.

Despite this comprehensive approach of digital skills, some experts indicated that the ICT curriculum in formal education continues being narrow and highly technocratic:

> You had a lot of courses, a lot of subjects, a lot of hours either in the morning or in extracurricular hours related to how to proficiently use or produce slides, documents, specific software… even robotics now… But in general, this is all connected to a specific technological tool to use (Italy, Education expert 1).

The problem with this type of curricula is that educational approaches focusing solely on technical aspects of ICT use seem insufficient to support the adequate development of digital skills.

### *4.2.2 The importance of digital skills in the lives of children and young people*

Not surprisingly, the experts confirmed the value and importance of digital skills now and in the future. However, the rationales that the experts provided to explain that importance differ. The most common argument was that technology is inevitably present in all spheres of youth life, with a great emphasis on the school environment, as illustrated in the following quote:

> I think that it's not the digital skills as such that our young people need, but it's also this creative mindset and this problem-based learning. In the future what is needed is that they are able to solve problems by using different tools. And some of these tools are technologies. So, I wouldn't emphasise this digital skills part so much, but more so STEM and problem-based learning (Estonia, Education expert 2).

#### *Risk of digital inequalities*

A group of experts pointed out that a lack of digital skills in young people may lead to digital exclusion or digital inequalities. This may endanger the overall quality of life and equity in society:

> I believe that this is also where society splits, so to speak. Not in the sense of what is of use to young people. But the key question is: how do they use it? And all studies show that those who use it not only to play but also to study are now making a huge leap forward, while the others fall by the sideway (Germany, Education expert 2).

It is underlined by the experts that digital inequalities emerge despite possession of hardware and access to the Internet and that they also stem from lack of abilities to use ICT to achieve important developmental and life goals.

Explanations provided by the research participants are in many cases in line with existing literature that attributes digital inequalities to numerous factors far beyond traditional ones as technological access or socio-economic status of the family (e.g., Helsper, 2017).

### *4.2.3 Looking ahead: The role of digital skills in the future*

It is noteworthy that a significant proportion of experts found it difficult to predict the changing roles of digital skills over a period of 10 to 15 years, as this is a very long time when it comes to the development of technology and the social and economic changes it brings along.

When discussing the importance of digital skills for the future, many experts reflected on the trends and technological changes that could affect the qualitative aspects of digital skills needed in the future (e.g., augmented reality, artificial intelligence, etc.).

They also referred to the widespread use of big data analysis and the heightened need for critical information processing skills which, on its turns, requires raising awareness about the ways in which data is processed, stored and used:

> Another problem that will affect us is aggregation and data processing (big data). Each of us is already generating a lot of data, calculated in terabytes. We will need to be conscious that such things happen and have consequences. It is and will be relevant to consent to the processing of this data. The pros of collecting such amounts of data are obvious. Fast access to data allows us to forecast and use them in a different way, e.g., medical diagnoses (Poland, Education expert 2).

Secondly, experts remarked that the need for digital skills will be increasing in the future due to a transforming labour market. The experts often linked digital skills to the future of the labour market. "Research has shown that in the past few years many jobs have disappeared and many others have emerged. No one could have known ten years ago that being a YouTuber or being an influencer would be a job" *(*Portugal, Education expert 2). While participants mostly mentioned the emergence of new professions, often exclusively connected to online activities (for instance social media influencers), a few experts addressed the issue of automatisation which could lead to the disappearance of entire professional branches.

Thirdly, the respondents pointed out that digital skills could furthermore enrich the personal life of young people by creating new options of leisure activities. For instance, children might be able to establish connections with people sharing mutual interestes to exchange ideas and share content.

Last but not least, digital skills will be necessary for active citizenship and public engagement in later adulthood*: "*e.g., online elections, electronic signatures, e-prescriptions, e-ID cards with many additional functions, e.g., public transport tickets, discount cards" (Poland, Education expert 3). Interestingly digital citizenship was regarded as a vital aspect for the future, (Cortesi et al., 2020) seldom mentioned by the experts as an aspect of relevance for the present.

All in all, it is worth underscoring that most of the experts mentioned more than one rationale while explaining the role of digital skills in the future. Experts put different emphasis on particular areas of life. While some experts focused on the occupational sphere, others elaborated on the impact of digital skills on private life.

#### *4.2.4 The digital competences that educational experts consider as key for young people to acquire*

In our study, experts were asked to choose the top five competences that adolescents should develop at school. As explained in the Methodology section, the DigComp 2.0 framework was used as a reference to guide the conversation and to provide a common framework for all respondents. Experts were also encouraged to include additional competences that were not listed in DigComp 2.0, if they thought it necessary. The experts were asked to justify and explain their choices. Table 3 below summarises the choices made by the education experts.

| Table 3 | The Views of Education Experts: Digital Skills (DigComp) Ranking | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Competence areas** | **Competences** | **Estonia** | **Finland** | **Germany** | **Italy** | **Poland** | **Portugal** | **Total** |
| 1. Information and data literacy | 1.1 Browsing, searching and filtering data, information and digital content | | 1 | 2 | 2 | 3 | | 8 |
| | 1.2 Evaluating data, information and digital content | 3 | 3 | 3 | 1 | 1 | 2 | 13 |
| | 1.3 Managing data, information and digital content | 3 | | 1 | 1 | | | 5 |
| 2. Communication and collaboration | 2.1 Interacting through digital technologies | | 2 | 1 | 1 | 2 | 1 | 7 |
| | 2.2 Sharing through digital technologies and know about attribution practices. | | 1 | 1 | 1 | | | 3 |
| | 2.3 Engaging in citizenship through digital technologies. | | 1 | | 2 | 1 | 3 | 7 |
| | 2.4 Collaborating through digital technologies | 1 | 1 | 1 | 1 | 2 | | 6 |
| | 2.5 Netiquette | 2 | | 1 | | | 2 | 5 |
| | 2.6 Managing digital identity | 1 | 1 | 1 | 1 | 1 | 2 | 7 |
| 3. Digital content creation | 3.1 Developing digital content<br>Create and edit digital content, express oneself. | 1 | 1 | | 1 | 1 | | 4 |
| | 3.2 Integrating and re-elaborating digital content | 1 | | | 1 | 2 | | 4 |
| | 3.3 Copyright and licences | 1 | | 2 | 1 | | | 4 |
| | 3. 4 Programming | | | | 2 | 1 | | 3 |
| 4. Safety | 4.1 Protecting devices | | | | | | | |
| | 4.2 Protecting personal data and privacy | 3 | 1 | 1 | 1 | 2 | | 8 |
| | 4.3 Protecting health and well-being | | 2 | 2 | 1 | 1 | 1 | 7 |
| | 4.4 Protecting the environment | | | | | | | |
| 5. Problem-solving | 5.1 Solving technical problems | | | | | | | |
| | 5.2 Identifying needs and technological responses | | 1 | | 1 | | | 2 |
| | 5.3 Creatively using digital technologies | | 2 | | 1 | 1 | 1 | 5 |
| | 5.4 Identifying digital competence gaps | 1 | | | | | 1 | 2 |

| Table 4 | Skills Individually Added by Experts |
|---|---|
| **Country** | **Skill(s) added** |
| Poland | Creative problem solving |
| Portugal | Resilience, literacy for the future, digital human rights |

Numerous experts expressed difficulties in choosing the top five competences since they perceived most of the competences as interconnected and overlapping: "Many competencies are overlapping and cannot be considered as separate skills. It is challenging to make a ranking, it is also hard to select the top 5" (Poland, Education expert 2). Additionally, some respondents experienced difficulties to generalise since the requirement of certain competences may depend on the specific context or social environment of an individual:

> For example, some of the digital game or photo editing skills can be essential for some kids' social lives, even for their future professions, and at the same time they can be totally useless for others (Finland, Education expert 2).

Furthermore, the experts stressed that the speed at which technologies evolve and the ways in which these are appropriated requires a constant "upgrade" of these as well as one's understanding of what a digitally skilled person is: "You may have good digital skills now, but in five years those skills will be hopelessly outdated" (Finland, Education expert 3).

Nevertheless, a general tendency was notable in the choices made by the educational experts. Most respondents prioritised two competence areas, namely Communication and collaboration (35 votes) and Information and data literacy (26 responses). Both Digital content creation and Safety received 15 votes. Surprisingly, the Problem-solving competences only received 9 votes. It was also interesting to observe that the assessment and processing of data and social digital competences were preferred over more technical skills. The latter were chosen less frequently or even not chosen at all. For example, solving technical problems and protecting devices were not indicated by any of the 20 educational experts as their top-5 skills. Some experts expressed clearly why they decided to adopt such an approach:

> I don't think that everyone has to be able to solve technical problems. That is the old debate between computer science and media education that is opened up (Germany, Education expert 2).

Not surprisingly, evaluating data, information and digital content was the competence most often chosen by educational experts. According to them, the ability to critically assess data is fundamental given the huge amount of information available on the internet these days and the necessity to deal with that: "I think everyone can find something by now. But the question is always how to evaluate it. Well, that's a very important step, to sort, analyse, evaluate, what to do with this information" (Germany, Education expert 2).

> I think that children need a critical judgment. That's why I say that digital skills are like life skills. Kids know how to use Google, etc. They have to learn how to have critical judgement in the digital world. They need to know how to search the sources to choose. They must understand and be conscious that what they do online has an impact on the real world (Portugal, Education expert 3).

While explaining their choices, the respondents often commented on competence gaps observed in younger generations such as insufficient knowledge about how to protect personal data and privacy, which was the second most frequently indicated competence. "Privacy questions are another problem, as they [young people] generally don't mind publishing photos or videos with personal data that require consent" (Portugal, Education expert 1). Protecting health and wellbeing when using digital technologies was also considered to be of high relevance by some respondents. Well-being was often associated with lack of control to limit screen time which could interfere with other activities, such as time for social interactions: "If you are conscious that some technology is bad for you, you can choose when to use it, and how long to use it" (Portugal, Education expert 3).

This could also be understood from the perspective of Problematic Internet Use concept:

> Young people don't use devices in a proper way. They are addicted. Not only young people. We are all addicted. So, it is important to teach them how to manage these devices, to choose priorities, to make decisions. When they have to study, they need to dedicate themselves to concentrate and to study, and not to use mobiles to talk to friends. Because, you know, our sleep can be affected by bad use of these devices, for example (Italy, Education expert 3).

Those aspects concerning Problematic Internet Use and FOMO are justified by the newest research data concerning prevalence and consequences of those phenomena. However, it is important to remember that deep problems of this kind refer to the minority of the population (e.g., Tomczyk & Sołecki, 2019).

Experts from Poland and Portugal defined additional competences complementing the provided model:

> Resilience was proposed as an extension to the competence of digital wellbeing. It was defined as the "ability to respond to the challenges of the Internet. It implies dynamism, flexibility, attention, and permanent and holistic adaptation to risks" (Portugal, Education expert 1).

Based on this definition, resilience is connected to digital wellbeing and internal factors that make young people resistant to digital risks, even when those are widely present. This is in line with existing studies showing that only a small percentage of young people engage actively in the seriously risky behaviour online or is victimised by them (e.g., Smahel et al., 2020).

Another idea of this expert was literacy for the future based on anticipating and predicting future scenarios for the digital society. This expert also underlined digital human rights, referring to the "power to participate and influence in public life through social networks and other media" (Portugal, Education expert 1).

An experienced IT teacher and school headmaster proposed creative problem solving as an additional digital competence. He justified his choice as follows: "Creative problem-solving means using computational thinking enhanced by programming skills and algorithmic methods. It is associated with the ability to organise, create innovative systematic solutions" (Poland, Education expert 2). The proposed competence could be understood as a meta-competence that requires in practice the use of many other competences that are already included in the DigComp model.

To sum up, the data on experts' competence choices shows that, despite different sociocultural factors, educational experts have similar views on the relative importance of specific digital

competences. Skills connected to effective data retrieval, processing and its critical assessment, protecting personal data and privacy, managing digital identity, engaging in citizenship through digital technologies and maintaining digital wellbeing ranked high in the experts' assessment. Similarly, the respondents prioritised competences needed for building digital citizenship and interactions. Simultaneously, the experts across countries ascribed less importance to more technical competences.

#### *4.2.5 How do children and young people acquire digital skills? The role of formal, informal, and non-formal education in the development of children's digital skills*

*Developing children's digital skills at school*

> ***The level of skill achievement relies in fact on the children themselves, whether they engage with all this digital stuff in their private lives and whether they are interested in it.***
>
> ***Finland, Education expert 3***

Although, according to the experts interviewed, schools play an important role in supporting the development of children's digital skills, some interviewees claimed that the school provided children only with a digital basis, while further progress will depend on how the children (can) take this forward in their lives outside school.

> Formal education can give a good basis for developing digital skills in terms of competencies and attitudes. The level of skill achievement relies in fact on the children themselves, whether they engage with all this digital stuff in their private lives and whether they are interested in it. So I think that formal education should be the one to spark the interest, but then it should be up to the non-formal sector or the formal and non-formal education sector together to support that personal development of digital skills (Finland, Education expert 3).

The experts also pointed out that, currently, the emphasis at school is mainly on technical skills instead of social, critical, and creative skills (see also Helsper & Eynon, 2010).

> Because the current school focuses on mastering the basics of Office Suite, children rarely learn practical things. We should invest more in the student-teacher relationship instead of overwhelming students with a pile of materials and tasks. However, this requires broad digital competencies from the teachers, and not everyone has them. But children do not only learn at school (Poland, Education expert 1).

The interviewees considered the development of digital skills in children as necessary and they pointed out the crucial role that schools play and can play here. Some interviewees argued that digital skills' education should be mandatory and be included in the school curricula.

Regarding the age at which children should start receiving formal digital education, there were some discrepancies among experts. For instance, some argued that digital education should start as early as possible, during pre-school; while others considered older ages as more appropriate, for example at the beginning of primary school (i.e., at the age of 6) or when they are given their first smartphone.

> If we think about formal education, children start developing their digital skills from early childhood education already, so basically since they are toddlers. Multiliteracies together with media literacy and ICT are included also in the early childhood education curriculum. So, as

> soon as they enter kindergarten, they should be catered also with media education and ICT pedagogies (Finland, Education expert 2).

The majority of experts considered the development of digital skills in children as necessary and indicated that such subjects should be compulsory, and be clearly included in the teaching curricula.

*Digital skills in the school curriculum*

Digital skills are developed at school in various ways. According to the educational experts we interviewed, in some countries this development is mainly achieved in form of a single, dedicated subject (compulsory or optional) focused on ICT, or the content is interwoven in a natural way with other subjects, intentionally or not. In several countries, digital education usually concerns the development of technical skills and is an optional, non-compulsory subject.

> For many years, our Ministry [of education] has been focusing on informatics and on technical aspects. So far, they have never considered the cultural and ethical aspects of media education (Italy, Education expert 2).

> There is a curriculum for informatics. I know that three years ago there was a version which gave more opportunities to deal with digital competencies, for example, coding, 3D-printing, robotics, and so on. And I think that at the primary level, very basic skills are taught. For older students – critical thinking – is taught, I think, in junior high school (Estonia, Education expert 1).

For instance, in Estonia, digital competence is one of the eight competences that are mentioned in the Estonian national curriculum. Because informatics is not a compulsory subject in Estonia, it is often taught in the form of a separate optional course. In practice, as the experts from Estonia told us, digital skills are frequently dealt with during non-specific ICT classes: "Quite a lot of Estonian teachers are using technologies in their history, biology or language classes" (Estonia, Education expert 2). In other countries, a similar situation was observed:

> Well, because I'm also a math teacher and I do a lot of math with the PC. We have software, a CD to accompany the math book and there are interactive exercises. We often practice that as well. But I also create tests by myself via the e-learning platform. But some other colleagues work less with it. It depends (Germany, Education expert 1).

It is also the case for Poland, where digital education is taught within a dedicated, compulsory subject subject concerning ICT, but focused mainly on the technical aspects of using digital tools. Additionally, in the early integrated education, there is a special module called "IT education" where an introduction to coding appears in the curriculum" (Poland, Education expert 1).

The experts interviewed also indicated that even if digital skills are, sometimes, included in the curriculum, there are no clear guidelines on what should be taught and learned nor how this should be accomplished. This is the case, for example, in Poland and in Finland where experts indicated that the way in which ICTs are used is entirely decided by the teachers: "Although a new curriculum emphasises using digital technologies in education even at an early stage, there are no specific recommendations regarding which technologies we should use" (Poland, Education expert 1).

Some experts pointed out that the lack of clear guidelines may diminish the quality of the educational process or cause a situation in which nobody feels responsible for teaching *about* and *with* ICT.

Conversely, the lack of clear framework may also have some unintended, positive effects. For instance, by providing teachers with enough freedom to choose the digital technologies and teaching approaches that better cater for their students' needs.

> There should be more detailed requirements concerning ICT in our curriculum. They are very brief now. Teachers can decide quite a lot about how and what they teach, for example in primary school. It is up to them to decide what kinds of digital skills they teach and how they are used as a tool (Finland, Education expert 1).

*Flexible education: ICT as a transversal competence*

Based on the opinion of nearly all the experts, the role of schools in developing digital skills is substantial and efforts should be made to include guidelines in that respect for the teaching curricula. It is equally important to include these items into specific subjects, as well as to be flexible and use digital media platforms across the curriculum. In Finland, the experts interviewed called it "a gap in flexible education" and a lack of teachers' preparedness who continue to use outdated educational methods with new media tools, without keeping up with changes in communication modes among young people. For example, many teachers continue using plain email to communicate with their students, rather than expanding their mode of communication tools like, for example, the use of social media, webinars or other educational platforms. It is also questionable to what extent it is advisable for teachers to use (usually commercial) social media platforms to communicate with their students. GDPR and the minimum age of consent to access these platforms adds even more challenges: in some countries the platforms can/should only be accessed at age 16, in others at age 13, for example. In Portugal, school activities are geared towards a common framework of ten competences and skills that students must develop as part of the so-called Profile of Students Leaving Compulsory Education. Digital competences belong to one of those ten areas (i.e. Scientific and technological knowledge). This common framework offers the advantage that teachers will work together. In the interviews, mention was also made of the INCoDe national policy initiative launching ICT as a compulsory subject in primary education. The Portuguese educational experts interviewed praised this initiative and saw it as a first step in the right direction, as it formalises ICT as part of the curriculum:

> (…) however, I do not think that teachers are ready for it. But I'm not blaming the teachers, because there is this whole context surrounding schools, teachers, the continuous professional development programmes in Portugal, which has been hindering the goal of having digital competencies developed throughout primary and secondary levels (Portugal, Education expert 2).

The role of teachers in digital education was mentioned several times by the experts. Many experts emphasised the necessity to support teachers' professional development, provide them with a financial gratification adequate to the effort, and with sufficient IT equipment (for both teachers and pupils). "Although there are Teacher Training Centres, teachers do not have a system of support" (Poland, Education expert 1) or IT teachers are asked to solve the technical problems in the school. "This makes technology impossible to deal with*"* (Italy, Education expert 1). Only in Finland, the expert said that they have well-trained teachers and a good system to support their development.

A clear digital education policy is also important. The lack of coherent and stable education policies results in chaotic implementation of the respective educational programmes and the deficiency of standards in educating teachers in that respect. Moreover, the issue of policy is closely linked to financing, including the infrastructure investments, availability of grants, educational projects and teacher trainings. If these are missing, the self-motivated teachers would become the only chance for children to get some form of digital education at school.

The experts noted that many teachers still do not use appropriate teaching and learning methods, and therefore may not support the development of children's digital skills adequately. Providing the digital tools in school is not enough for children to know what to do and how to use them in the future. Adequate teaching and learning methods are also required:

> We must change our learning methods to be able to really develop students' digital skills, or else we will not be doing that, we are just giving tools they will not use. It should be directed towards developing their digital tools (Portugal, Education expert 3).

As mentioned before, although teachers may be well trained (e.g., in Finland), they tend to remain conservative in their approaches to ICT implementation. Being confronted with new challenges caused by the COVID-19 pandemic, was seen by the respondents as an accelerator and an opportunity to push for better quality of digital education in the educational system:

> ***Teachers found out that, of course, they have had the opportunity to learn how to use ICT in teaching for several years already. But now they have to do it. It's a huge step forward from a non-digitised school to an online school.***
>
> ***Finland, Education expert 1***

The experts interviewed pointed out the discrepancies associated with the use of digital tools in accordance with adequate pedagogical methods: "It is connected with the gaps in the education of future teachers, with the lack of curricular and methodological support. Large inequalities also occur between what local governments offer in different regions" (Poland, Education expert 2).

The experts also mentioned the school autonomy as a great facilitator for the implementation of digital education. However, this can also create problems:

> Our teachers have pedagogical freedom to choose the methods and practical examples that they find the most relevant for the course. And I think it is a very important principle and I wouldn't change it. However, in practice, this means that those teachers who for some reason have decided not to comply with the curricular ICT content, may have managed to do so. And this is a problem for those students who happen to be in their classes (Finland, Education expert 2).

The opinions of the experts are consistent with the research of Foulger, who indicates that the following competences are important in the work of teachers: aligning content with pedagogical approaches and technologies, modeling the use of online and blended learning methods and strategies, guiding the ethical and responsible use of technologies and engaging in leadership for using technology (Foulger et al., 2013, p. 432).

*Developing children's digital skills outside the school*

Although the interviewers touched upon the issue of acquiring digital skills outside the school setting, the majority of our experts emphasised the role of formal education (including the curriculum, the governmental regulatory framework, and the schools and teachers). Relatively less responses referred directly to informal and non-formal education.

We asked the experts who were responsible in their countries for supporting the development of children's digital skills, most experts agreed that, at least nowadays, the greatest responsibility in this matter in their countries lies with the schools and the teachers. However, they also mentioned the government and their ministries setting out the regulatory framework. "I think that at the latest the ministries of education are responsible for setting the framework and also for creating the conditions for its implementation" (Germany, Education expert 2). It was emphasised that "the formal sector should lay the groundwork and there should be an overarching plan from the government's level or maybe even the EU level" (Finland, Education expert 3).

Whereas existing research shows that peers also play a substantial role in the development of digital competences, our experts rarely mentioned them. They stressed instead the role of the family and the parents. Other agents referred to as important were university departments and private companies dealing with digital media, providing workshops and offering traineeships, NGOs, parents and families, and a combination of various agents who share the responsibility.

> ***I do believe that the responsibility should be shared between formal and non-formal education sectors. In a perfect world, the formal education would lay the groundwork and then the non-formal sides would support young people in their own learning.***
>
> ***Finland, Education expert 3***

| **Table 5** | **Supporting the development of children's digital skills by actors** |
|---|---|
| **Stakeholders** | |
| Schools and teachers | |
| Governments (The Ministry of Education and Research in Estonia; The Ministry of Education and Culture and The National Agency for Education in Finland) | |
| Public units and initiatives (Estonian HITSA, Information Technology Foundation for Education; INCoDe.2030 - an integrated public policy initiative to enhance digital competences) in Portugal; NASK: a National Research Institute in Poland) | |
| Universities (e.g., competitions, workshops, grants) | |
| School library | |
| Companies who are dealing with digital media or related topics, they provide workshops and offer places for trainees | |
| NGOs | |
| Parents and families | |
| Peers: informal learning | |
| Private sector: in conjunction with family and schools. | |
| Regulatory framework | |

The experts interviewed pointed towards the present disconnection between the standards set in formal education and the activities organised in a non-formal context: "The youth field, for example, is just trying to have fun with technology and enrich their activities with technology. But there is no link between the two. And if there was, I think young people's learning could really be enhanced" (Finland, Education expert 3).

> NGOs have many excellent concepts and thanks to them a lot is happening. They have great potential, but there are also some problematic issues related to their actions. Firstly, they depend on public funding, and in the absence of it, their activities cease. Secondly, instead of working together in alliances, various NGOs compete with each other. They should cooperate to do something really valuable instead of doing the same thing separately (Poland, Education expert 1).

It is notable that the role of non-governmental organisations in digital education was rarely mentioned by the experts, although various research studies, e.g., the 2013 ANR TRANSLIT transliteracy programme, showed their significance in this area (Frau-Meigs, Velez & Michel, 2017). Meanwhile, in many cases there are the non-governmental organisations that deal with the digital education of children and youth. They cooperate with schools, conduct workshops and trainings both for students and teachers.

The expert from Finland pointed out that real dialogue among all stakeholders in this field is important.

> We would need the people, even on a government level, to coordinate things. But we would also need the practitioners themselves talking to each other on a local level in several places, trying to figure out where the similarities are, where the common points are, with those approaches, what could be learned from them (Finland, Education expert 3).

In summary, the experts recognised the need to connect the formal and non-formal education sectors because only such joint actions can really support young people in the development of their digital competences:

> I do believe that the responsibility should be shared between the formal and non-formal education sectors [...]. In a perfect world, formal education would lay the groundwork, and then the non-formal sides would support young people in their own learning. Of course, there would need to be common goals and common ways of having this link between the two. It would require the development of policies, which would probably be developed at governmental level. Yes, otherwise this will not happen. What we are seeing in the formal field is that it usually depends a lot on single practitioners, as there is not always an overarching strategy in place. And then it is only about the motivation of the single youth worker or teacher (Finland, Education expert 3).

*Children as self-learners*

For many experts the children's natural and autonomous learning, outside school, was seen as an added value to develop some types of digital skill, such as problem-solving or collaborations:

> I have a son who plays Fortnite, and when I'm just listening to him and thinking about the DigComp competence framework, I can see all this communication- and problem-solving and choosing strategies, and that part is happening quite efficiently among them [young people] (Estonia, Education expert 2).

Children can learn directly from media platforms too: "Most kids develop their digital skills autonomously, by watching tutorials on YouTube, going to forums on the Internet" (Portugal, Education expert 3).

> We have libraries that enable children to practice their digital skills. Also, our national TV broadcaster YLE provides teaching and learning materials suitable for children and young people. Many hobby groups also contribute to the development of digital skills, you can have e-sports as your hobby, you might have WhatsApp groups or discussion forums, for people who are practicing the same hobby (Finland, Education expert 2).

It seems that it is vital for digital skills development, that adults see active ICT use by young people not only as a threat – as is commonly the case these days – but also as an opportunity. In practice, this requires mediating young people's digital engagement in age appropriate ways according to their maturity level, providing enough opportunities for safe exploration and creativity, and providing sufficient adult guidance when required, guidance and interest in the children's independent use.

***So most kids are very active gaming, socialising and watching videos with their personal smart phones, even though these are not usually considered as learning opportunities by adults. But, of course, they are practicing their digital skills when they do that.***

***Finland, Education expert 2***

*The role of parents*

The opinions of the experts on the role of parents were quite diverse. Some experts felt parents' ability to support the development of their children's digital skills was sometimes limited due to their own difficulties understanding of digital technologies (Lorenz & Kapella, 2020; Livingstone & Byrne, 2018). The latter may be related to the socioeconomic status of the family and parents lacking time and opportunities to develop their own digital skills and the skills of their children. It may well be connected also to motivational factors when the parents consider digital skills as something that is not necessary for their own occupational and private life and their children's future. "If the parents

***I think that most parents are motivated to support their children's learning, they help with homework, buy digital devices for home, and pay for the Internet connections. And they are also the primary source when it comes to teaching their children digital skills in everyday life from a very young age. But of course, the parents' capabilities of contributing to a child's learning are very much dependent on the general circumstances of the family.***

***Finland, Education expert 2***

themselves don`t know how to deal with digital problems or how to behave on the Internet, then they can't teach their own children" (Portugal, Education expert 1). However, other experts had different, and even opposing views:

Parental modelling was perceived as a valid method for developing proper digital skills in children. This approach was nuanced by the experts by naming factors that modify the quality of parental influence in this respect. According to some experts, parents set an example for their children to properly use digital media. However, in many cases parents' digital behaviour, for example excessive use of smartphones, could be perceived as contradictory if parents, at the same time, attempted forbidding their children from spending too much time in front of screens. Sometimes, the experts noted that the parents' fear of the problematic use of ICT by children led them to focus more on controlling, supervising, and banning ICT use, rather than focusing on digital education. This ambiguous parents' approach is reflected below:

> I think that parents in Poland are not truly open to digital technologies used by their children. They think about media as necessary tools for the future but at the same time, they are very suspicious of them. They think about screen time, parental control, inappropriate content, etc. At the same time, parents often ignore such important aspects as being with their children, learning with them, trying to use apps practically, for instance, to better organise their family life or their children's education. Therefore, when teachers are trying to use new methods based on using apps and are preparing Internet learning events, parents are often astonished (Poland, Education expert 1).

In conclusion, the role of parents in supporting the acquisition of digital skills by the children seems to vary considerably among experts. Some experts pointed out parents' low competences, limited education and interest in digitally educating their children, while others indicated the supportive role of parents.

> For families who invest in their children's education, this is not a problem. They find ways and possibilities to always bring their children forward, also with regard to developing their digital skills. But educationally disadvantaged families are often not at all interested in finding ways of somehow enabling them to acquire digital skills. This is difficult because they themselves are not able to do this (Germany, Education expert 1).

This chapter focused on how children and young people acquire digital skills and the role of formal, informal and non-formal education in the development of children's digital skills. Schools play an important role in supporting children to develop their digital skills, although this mainly concerns operational rather than the social or creative skills. The importance of teachers and their professional development by improving their digital skills was also highlighted. According to the experts, although several other agents play a role in the non-formal and informal digital education of children, it is the formal education that is the most important. The experts further recognised the need to create more synergies between the formal and non-formal education to really support young people in developing their digital skills.

Finally, it was noted that although children can learn to engage with several aspects of digital technologies autonomoulsly, even without the direct support of adults, age-appropriate parental mediation, and other forms of adult guidance and supervision remain important.

### *4.2.6 Enablers and Obstacles to Digital Skills Education*

The educational experts interviewed noted both multiple enablers and obstacles to digital skills education in their respective countries. Many of these apply to specific local or national contexts and cannot be generalised nor easily extrapolated to other contexts. These include more or less flexible national or local regulation, available budget, national or local policies supporting the development of digital skills or even the (lack of) efficiency of procedures to apply for funding opportunities for schools. In spite of the specificity of the local contexts, different experts identified several key aspects which they considered as enablers or blockers to digital education in their countries. These common aspects are summarised in the table below:

**Table 6 The View of Educational Experts: Enablers and Obstacles to Digital Skills Education**

| Enablers | Obstacles |
|---|---|
| • Motivation, openness, and interest of teachers in raising digital competences<br>• Highly educated and qualified teachers<br>• Digital skills included in the core curriculum<br>• Investment in digital infrastructure<br>• Good quality teacher training<br>• Advanced digital skills of students<br>• Multi-stakeholder collaboration<br>• Autonomy of the school to adopt digital skills education to their needs | • Lack of clear guidelines regarding how to teach, learn and develop digital skills at schools<br>• Insufficient collaboration between the formal and non-formal sectors<br>• Lack of adequate digital infrastructure<br>• Insufficient budget or unstable funding opportunities<br>• Lack of financial, human or technical resources to keep up with rapic technical evolutions (e.g., not investing in the equipment or permamnet teacher training)<br>• Focusing on tools instead of developing digital competences<br>• Low digital skills of teachers and students<br>• Deficient cooperation between schools and families |

According to many of the educational experts interviewed, the most important asset in respect to digital skills education, are highly motivated teachers: "(…) teachers and schools are extremely receptive and proactive*"* (Italy, Education expert 1). The role of the wider educational community was also brought to the attention: "the educational community is motivated to develop these skills and there are a number of institutions and projects prepared to make their contribution" (Portugal, Education expert 1). The experts stressed the importance of teachers' general interest in new technology and their active participation in training initiatives: "We are very focused on solving problems when we are motivated. Portugal has a lot of people that love technology, are curious about it, are passionate about doing and experimenting with new stuff, and very interested" (Portugal, Education expert 3). Even in a specific situation such as the COVID-19 pandemic:

> We have an attitude that we want to learn and we are learning new stuff quite easily. And that means that if something happens, for example, this corona situation, then our teachers have

> coped with change quite fast, so that they could arrange the teaching and learning opportunities in a new situation. And so, I think it's a strength (Finland, Education expert 1).

For the experts, a very important issue is also the teachers' curiosity towards and motivation to learn new things – despite their age: "Our teachers are curious, and it doesn't matter how old the teacher is" (Estonia, Education expert 2). Apart from motivation, high quality of teacher training was also deemed as indispensable to warrant good quality digital education: "I think that the overall situation in Finland benefits from our teacher education. Our teachers are Masters of Education. They have the background to be Master of Education in primary schools as well as secondary schools" (Finland, Education expert 1). Thus, it is essential that teachers are provided with solid initial teacher training as well as with enough opportunities throughout their carrrers to continue developing their own pedagogical and digital skills. This is especially important since several experts voiced the concern that many teachers are still insufficiently digitally skilled.

Several experts (e.g., especially in Estonia and Finland) regarded the autonomy of schools and teachers as another advantage for digital skills education: "Thanks to the autonomy of the schools basically every school and every teacher can make a decision on what kind of digital innovation they would like to use. Fortunately, it is not decided nationally that everyone has to start using Google Classroom. It is not possible in Estonia. This would never work. And I think this system where autonomy of schools is respected, is one of the main strengths*"* (Estonia, Education expert 2). The experts thus generally appreciated flexibility and autonomy of schools but thought it crucial to prevent a too stark fragmentation of the educational system. Therefore, some experts criticised that there are no government-level recommendations regarding how to teach digital skills:

> (…) We need digital education skills for our country, for our further education, for our vocational training. And we have to regulate it, and we really have to implement and introduce it in a conceptually sensible way, otherwise, it will be useless. So, then the equipment will be put there. By the time they have learned how to use it, it will be obsolete again" (Germany, Education expert 3).

As regards deficiencies and potential obstacles to digital skills education, these became even more apparent during the COVID-19 pandemic because, according to experts, schools all over the world had no option but to migrate to online environments to be able to continue teaching. Despite the challenge this posed, several experts agreed that schools were responsive to these emerging needs and teachers were willing to quickly learn new skills and upgrade existing ones, as expressed by a Finnish expert: "I assume we have more to do in relation to attitudes than actual operation skills, but many of them learned quickly when they had to because of the corona virus lock down" (Finland, Education expert 2). Thereby, the COVID-19 crisis was also seen as an opportunity to raise awareness that more investment, not only economic but also in terms of human capital, in digital skills education is required.

Furthermore, some experts also pointed that the often insufficient use of existing equipment, incorrect ways of using digital media and the inadequate awareness about potential associated online risks, could translate into insufficient capacity and lack of awareness about how, when and why to use specific digital resources (e.g., educational platforms or social media) at schools.

One expert from Italy noted that there is no dialogue between the government and the educational sector: “The main weakness is our political system. There is no partnership between educational research and the government. And usually, people who are drawing our educational policies are not researchers” (Italy, Education expert 3).

Several educational experts pointed towards the importance of nation-wide digital education support programmes, such as a core curriculum and a teacher training system:

> Our strength is that we have the HITSA foundation, which is taking care of the teachers and educational institutions in a wider sense to help shape an educational community helping us to keep up with trends in training and different infrastructural developments” (Estonia, Education expert 1).

HITSA is the Information Technology Foundation for Education in Estonia. This foundation established by the Republic of Estonia, the University of Tartu, Tallinn University of Technology, Eesto Telekom and the Estonian Association of Information Technology and Telecommunication is a good example of transversal multi-sector, interdisciplinary collaboration. In particular, the experts from Estonia stressed the role of implementing a digital competence framework, like the one created by HITSA or included in DigComp 2.0. The role of the HITSA (Information Technology Foundation for Education) is to ensure that the graduates at all levels of education have obtained digital skills to the benefit of economy and society so that the possibilities offered by ICT are skillfully used in teaching and learning, which helps improve the quality of learning and teaching at all levels of education. As an educational expert from Finland noted:

> As a media educator, I hope that in Finland, in five or ten years, we can say that one of our strengths is also in practice that every time a teacher is doing digital skill education, they also remember to include the critical and participatory and creative aspects of media literacy into their teaching (Finland, Education expert 2).

However, the experts indicated that currently, curricula and frameworks remain too general and lack concrete, actionable guidelines, as expressed by one Finnish educational expert while referring to the Finnish curriculum: “If the curriculum were a little bit more exact, more concrete, it would help. For example, we don't have mandatory ICT courses in our secondary schools” (Finland, Education expert 1). One of the German educational experts pointed that new technologies are implemented in schools without giving enough consideration to the pedagogical aspects. “Every school is doing its own thing and everyone is trying to come up with a different concept” (German, Education expert 1).

One of the Estonian education experts put it clearly: “If we want to have digital citizens in the future, we should provide more digital education in school” (Estonia, Education expert 1). This is an important problem, which is often emphasised in digital education frameworks (e.g., European Commision, 2018; Redecker, 2017). The experts from almost every country in this area emphasised the role of teachers. Investing in teacher development is a great opportunity to develop pupils' digital skills. In Germany, The Standing Conference of the Ministers of Education and Cultural Affairs of the Länder, the consortium of ministers or senators of the federal states responsible for education and schooling, institutes of higher education and research and cultural affairs, are examples of standards for teacher training.

Many experts furthermore indicated the importance of availability of financial resources for the development of digital skills: investing in infrastructure, devices, e-learning content, teacher training, digital skills of students. This was considered as both a strength, opportunity, and a weakness in most of the countries. The experts see a chance in using funds for educational projects from the EU or other programs (e.g., on a national level). "I consider the Digital Pact for Schools [in Germany] to be very, very useful because with it the schools are now provided with a lot of money for the infrastructure within a very short time" (Germany, Education expert 2). "When we think about the future, it also means that there should be enough money to keep going on buying new equipment" (Finland, Education expert 1). Equipment should be mainly financed from the public funds, but sponsors and private funds could complement and support them. Therefore, it is unsurprising that many experts deemed the lack of adequate funds or unstable funding as a crucial obstacle for the fostering of digital skills education. This applies to investments in equipment (computers, robots), which remains a problem for some schools in Europe, as well as the development of digital competences of teachers.

> First and fore most the teaching staff must be well prepared, then follows the equipment. Not the other way around (Germany, Education expert 1). Although the curriculum considers the development of digital skills, formal education is still focusing on buying interactive whiteboards instead of focusing on developing teachers' digital or future competencies (Poland, Education expert 1).

Underpaid teachers are still a problem in Europe. Therefore, a system is needed which rewards teachers properly for what they do and encourages teachers to invest their time and energy to develop their skills, remain motivated and do a better job.

Experts regarded collaboration with educational agents, other than school-related agents, such as industry partners, as essential. Promoting collaboration and sharing experiences among teachers was referred to as an opportunity for digital skills development. "The key is to put together the smartest people and to build up policies from the ground. Not top-down. Hence the importance of building an educational community" (Italy, Education expert 2). Moreover, the potential for cooperation between students and teachers presents an equally big opportunity. For that to happen, teachers and pupils must learn to communicate with each other as equals, and the gap between the formal and non-formal education sectors should be bridged.

> I think our biggest opportunity is that the overall attitude of society is very supportive, and we get a lot of interest from the private sector. The ICT sector is a very demanding customer. So, they have to keep an eye on the developments and intervene when things seem to go really bad (Estonia, Education expert 3).

Other experts also noted that cooperation between the formal and non-formal sectors is still insufficient. All experts argued in favour of a dialogue between the formal and informal education sectors. It's worth mentioning here that formal education is an organised education model which is structured and systematic (e.g., learning at schools). Informal education deals with people everyday life (learning during individual and personal research on a subject or interests for themselves by using books, libraries, informal trainers, the internet, or other resources). In non-formal education, the educative progress has a more flexible curricula and methodology. The non-formal education activities or lessons take place outside institutions or schools.

> I think the kids would be best supported if the non-formal and formal sector work together in this in the sense that, I think I've kind of broached before that, the formal sector could give the basis for kids on learning. And if there would be a clear continuum to the non-formal sector, for example, youth sector or NGOs or whoever could support that same learning of skills, kind of formed the same timeline of learning. Because I think there is a disconnect now between the formal education is trying to teach a standard set of skills and then youth field, for example, is just trying to have fun with technology and enrich their own activities with technology (Finland, Education expert 3).

A disconnect is noticed in the activities organised in the informal education and youth sectors when it comes to the so-called maker activities that blend science, technology, history, art and hands-on learning to keep children and young people tinkering and developing their creativity.

Moreover, unwillingness to change or attachment to traditional forms of education form yet another tenacious threat. “Traditionalism is a major force against change at this moment in Italy because there are some parts of our society who fear change” (Italy, Education expert 2).

One of the central obstacles to digital skills education identified by the experts is the existing inequality in digital literacy education. The teaching of digital skills is diversified across the EU (Redecker, 2017; Digital Education Action Plan, 2018). The experts in this area remarked that even if teachers integrate digital education in their teaching, it is not made visible in the curriculum.

Participants, additionally, voiced concern about an existing gender gap. According to the experts, the interest in ICT school subjects such as programming or robotics varies across genders. There still is a gender gap in this area. Gender inequalities in developing digital skills may also be due to the fact that science-related subjects (such as mathematics or computer science) are mostly taught by men. Research shows (e.g., Smahel et al., 2020) that patterns of usage of digital media by girls and boys are different. For example, girls often communicate indirectly and tend to be more creative. This fact has been particularly emphasised by the expert from Germany.

> And we also have a big performance gap between boys and girls, especially in literacy, according to studies, girls are much more competent in literacy and multiliteracies, that includes media literacy (Finland, Education expert 2).

In conclusion, what some experts considered an enabler or an opportunity, was viewed by others as an obstacle to digital skills education. For instance, in the case of teachers, their own digital skills were sometimes perceived as an opportunity (e.g., when teachers are able to transfer their digital skills into meaningful educational experiences) and sometimes as a potential obstacle (e.g., in the case of teachers with insufficient digital skills). Furthermore, it was noticed that teachers’ lacking opportunities to further develop their digital skills and innovative pedagogical skills and lacking motivation and commitment are also obstacles to digital skills education at school.

As regards the presence of digital education content in the national school curriculum, some experts indicated that digital education is well integrated into the curriculum, while others criticised that digital education, even when present in the curriculum, remains insufficient. Last, most experts agreed on what facilitates digital education opportunities: good infrastructure, well-educated teachers, better financial support, cooperation between educational agents, and reducing inequalities between the formal, non-formal and informal sectors. The experts also had similar opinions as regards the threats

to digital skills education. They considered insufficient equipment in schools, conservative, non-innovative pedagogical approaches, and finally, the resistance to change to constitute threats to children's and young people's development of digital skills.

### 4.3 The Importance of Digital Skills – The Views of Labour Market Experts

In this section of our report we reflect on the views of fourteen labour market experts from six European countries: Germany, Estonia, Finland, Italy, Poland, and Portugal. These experts, individually interviewed in May 2020, reflected on the importance of digital skills for young people, on how these skills are currently being promoted among youth in their countries and on what needs to be done to ensure that digital literacy continues being boosted in their sectors and regions.

#### *4.3.1 The importance of digital skills in the lives of children and young people*

The interviewed labour market experts agreed that digital skills have become fundamental for a successful integration into the job market. This is true for the current workforce but might become even more relevant for children and youths as the employees and entrepreneurs of tomorrow. Most experts, however, pointed out that digitisation had not only transformed the labour market but had impacted society in multifold ways. Therefore, young people will need digital skills as part of their daily lives in general.

> ***Digital tools are imperative, they are not a matter of choice.***
>
> ***Portugal, Labour market expert 2***

Digital skills are a key requirement in the labour market. A participant from Italy, stated that "today knowing digital is perhaps even more relevant than knowing English" (Italy, Labour market expert 1). While some experts thought that low-skilled work could still be carried out without knowledge of digital technologies, many of them deemed the possession of basic digital skills a prerequisite for all occupations. In addition to this rudimentary expertise, according to the labour market experts, employers increasingly asked for more advanced, more specialised skills. "It is taken for granted that everybody knows how to use MS Word, PowerPoint and those kinds of things, but also increasingly different technical skills and ability to acquire technical skills" (Finland, Labour market expert 1), as an interviewee from Finland put it. An expert from Poland, on the other hand, questioned whether these criteria for a successful application always corresponded with the actual requirements for the job profile. "Digital skills somehow have a quite similar status to the English language on a labour market - often unnecessary, but everyone asked for it" (Poland, Labour market expert 1). Nonetheless, the participants all agreed that those competences increased employability and heightened the chances for success. Although requirements differed strongly across professions, access to higher-level positions was usually barred for those who lack adequate levels of digital literacy, according to the experts. An Estonian respondent observed: "if you want to get a good job, you must have [digital skills]. There is no other way" (Estonia, Labour market expert 2). This is in line with existing evidence which found that in almost all professional branches digital skills are required for management positions. (e.g., European Commission, 2016).

What does this imply for children and young people? The interviewed experts stressed the importance of preparing the youth for their entry into the job market. "Digital skills increase people's employability. It would be anachronistic to think that we should not invest in such skills" (Italy, Labour market expert 1). Additionally, experts agreed across countries that children should be provided access to the "digital cosmos" (Germany, Labour market expert 1) because "otherwise we might not be able to encourage a kind of professional vocation in girls and boys who don't know they

have that kind of talent" (Italy, Labour market expert 2). In other words, it is important to include digital technologies in young peoples' education, so they can discover and unfold their potential and talents connected to these technologies. Already, a high demand for a skilled workforce can be observed in the ICT sector which offers plentiful opportunities for young people (e.g., World Economic Forum, 2018). On a national level a digitally high-skilled workforce will be vital to foster technological innovation and compete globally (ITU, 2020).

*The increasing importance of collaboration and communication*

Some of the interviewees noted a trend towards growing internationalisation or transnationalisation of workplaces and workforce meaning that online communication and collaboration tools rise in their importance for the daily processes of businesses. As a respondent from Germany remarked,

> I think you should be able to handle all possible means of communication that exist nowadays […]. Nowadays, it is of course the case that many people all over the world try to work together. And it doesn't work via fax or anything else, but via Microsoft Teams or […] via Jitsi for example (Germany, Labour market expert 1.1).

In view of the COVID-19 pandemic in Europe, amidst which the interviews were conducted, the experts also commented that this situation and the consequential need for social distancing added to the trend. Not only were more people working remotely, but also many organisations were starting to re-evaluate their own internal policies in respect to teleworking, creating more flexibility for employees by allowing them to work from home. The importance of digital communication and collaboration systems has thereby recently increased even further.

> Now we are working from home, using digital tools and applications to communicate, to have meetings. I think in a way it has opened the eyes to people that working from distance is possible […] it really will affect the labour market in the long run so that more and more people will continue working from home (Finland, Labour market expert 2).

> An old, urban legend says that you are not productive in the home office, but I must honestly say that this is complete nonsense. We've been in the home office for six weeks now and I think we're much more productive than we've ever been […] From my six or eight weeks in the home office, we have three different chat tools. We have various collaboration possibilities (Germany, Labour market expert 1.1.).

These systems are growing in their complexity and require more operational skills than needed for more basic tools like the sending and receiving of emails for example. Nonetheless, most of the experts, who have mentioned this issue, highlighted that solely technical know-how on how to operate digital communication systems was not sufficient. The work in virtual teams, whose members are regularly separated from each other by a significant geographic distance, introduced new challenges to the working life in terms of coordination of work processes, team management and exchange of ideas and information. What was therefore required, in the opinion of the experts, were social skills on how to communicate and interact with people from remote, possibly from various cultural backgrounds. In this context of virtual communication and teamwork, an Estonian expert commented that "empathy is very important" (Estonia, Labour market expert 2) for sustaining interpersonal relationships of any kind via digital systems.

*The importance of critical thinking skills to search, analyse and maximise the use of data*

Digital advances also offer great opportunities to young people. Experts particularly stressed easy access to information and research resources. Most frequently the value of data literacy was mentioned since, independent from profession, the efficiency of decisions would increase if information was used strategically beforehand. Hence, young people needed to be able "to search and aggregate information because it might become a foundation in the decision-making process" (Poland, Labour market expert 2).

Nonetheless, the research participants also agreed that young people were exposed to certain risks because of digital technologies. Particularly social media and the spread of disinformation, 'fake news', was deemed a potential threat which children should be equipped against. As an interviewee from Italy stated:

> The social network is built to be immediate, but it has a series of more dangers within it, from the most trivial things like giving one's consent for one's own profiling, to the use of Twitter to offend someone (Italy, Labour market expert 2).

An Estonian expert remarked that "false information is increasing and you must really be capable to filter what is right and what is research-based, what is science-based, and what is fake" (Estonia, Labour market expert 1). As digital technologies have become a part of every sphere of their lives, there was consensus among the research participants that young people should be educated correspondingly as early as possible. Not only to provide them with a basic understanding of the tools they are using and to alert them of the possible risks they could encounter, but also to ensure that they possess the means to orientate themselves in a world that is perpetually changing due to continuous technological advancements.

*The importance of enabling creativity*

It has been also noted how digital skills could enable new forms of creativity. "You can also create a lot with the devices whether you make music, cut or shoot films or draw" (Germany, Labour market expert 2). There are indeed many ways in which young people express themselves creatively online, from video blogging to the production of music for video games and animation movies. Young people also engage in creative collaborations with each other online. Through these activities, which predominantly take place outside of formal educational settings, children both express themselves artistically and gain experience which can be of benefit for them in the future when they enter the labour market (Lombana-Bermudez et al., 2020).

*The increasing importance of education and life-long learning opportunities*

Many of the interviewed experts emphasised the importance of ensuring universal access to education in the field of digital technologies because otherwise children could be prevented from having equal opportunities to develop their digital literacy. Moreover, some of the participants feared that existing social inequalities could be replicated in the digital environment and, thus, children from more socioeconomically challenged backgrounds would not receive enough opportunities to learn to engage with digital technologies as compared to children who grow up in more privileged environments.

> Let's say that my parents are not working in digital areas. One is a truck driver, the other one is a cashier, for example. Because in those areas, I think, there aren't many digital skills required. So, if I grow up in this environment, how would they know what I need to know? What will help me to have a better or easier life in the future? So yeah, I think that the educational institutions, but also the home environment should be responsible" (Estonia, Labour market expert 1).

According to the experts, these types of inequalities could also have long-term consequences, one of the most important ones being that children from more disadvantaged backgrounds could also be left behind in the labour market. It is noteworthy that this kind of social divide does not so much refer to inequality in access to digital technologies themselves as to a disparate access to education on how to use digital technologies in a meaningful and safe way. Concerns about the emergence of digital inequalities have been voiced frequently by academics in the past. Socioeconomic status is just one aspect of this. Gender, race, geographical position and age can also play a role (Helsper, 2017; Lombana-Bermudez et al., 2020; UNESCO, 2017).

Such a divide can lead to several forms of exclusion and inequality (Helsper, 2017; van Deursen, Helsper, Eynon & van Dijk, 2017). Firstly, young people who are not introduced to digital technologies will be at a disadvantage in competition for jobs. Moreover, not having access to digital technologies or not having the skills to use them in a truly constructive and positive way, would mean to be excluded from significant parts of social life and have less opportunities for personal growth and development. The interviewees also referred to these aspects and highlighted that children who are not schooled accordingly, but also other citizens who lack opportunities to develop in this area, could be left behind in several areas of their lives, including active citizenship. Hereby, the experts addressed the concept of digital citizenship which has gained growing attention from academics and policymakers alike. While the definition of this term remains a point of discussion, it has clearly been observed that, without digital skills, young people could be excluded from forms of social interaction, e.g., via social media but also through collaboration and content creation platforms such as Scratch, Twitch or SoundCloud (Lombana-Bermudez et al., 2020). Furthermore, researchers emphasise that digital skills have become important for the political life of citizens. In a modern democracy, it is essential that citizens have access to information so they can partake in political processes. The citizens' ability to find and critically assess information and media content becomes thereby crucial for the functioning of democratic societies (Cortesi et al., 2020; UNESCO 2013; 2017) while "digital literacy has also been positioned as an enabler of rights" (UNESCO, 2017, p. 20). The Finnish labour market expert below also refers to the importance of active citizenship and how digital skills can contribute to it:

> ***All young people need digital skills so that they can be active citizens. It means that you really know how to use the systems, how to work with officials and government. But you should also be able to participate in society. Be able to write things or use social media or use other media elements.***
>
> ***Finland, Labour market expert 2***

Several of the interviewed experts spoke in addition about the enhancement of public digital services such as e-health or e-government. In this context, people who lack the necessary skills will face difficulties in making use of services they are entitled to. Thus, it appeared vital to build digital citizenship and to ensure that no one is excluded from these forms of social and civic participation.

Apart from the potential inequalities based on socioeconomic aspects, the experts most frequently noticed digital inequalities as related to age. According to some respondents, youth, growing up in a time of rapid technological advances and familiar with various devices and social media, might be better equipped to succeed in a digitised society than older generations. An expert from Poland stated: "the older part of the population, which demographically dominates, misses digital skills" (Poland, Labour market expert 1). Children and youths developed digital skills valuable for the labour market outside of educational settings through their daily interactions with various technologies:

> I used to make fun of the guys who are playing a lot of video games. But, well, because it just felt like a waste of time. But now, looking into the future, I believe the skills acquired during the games and just playing all the games, getting familiar with the movements and how you interact with the characters, I think it will be beneficial. For example, you can do the remote operating of heavy vehicles or machinery (Estonia, Labour market expert 1).

While a generational divide as regards the use of digital technologies has been identified by researchers as well, some of the interviewees linked this phenomenon to a far more disputed concept. One group of experts expressed the notion that the younger generation was 'digital native' and thereby "acquiring [digital competences] through just growing up" (Estonia, Labour market expert 1).

Another group of experts presented themselves critical of this concept and echoed thereby concerns voiced by scholars in the past. One representative of this group stated:

> ***We have an illusion – it seems that young people are born with a mobile phone in hands these days and that they automatically possess all skills needed to handle it, but it is like you are giving a Ferrari to a 5-year-old and saying: "Go ahead and drive"***
>
> ***Finland, Labour market expert 1***

According to this, young people might acquire some useful skills through their daily use of devices and engagement with social media. However, the experts viewed these skills as mainly superficial. The concept of 'digital natives' which had previously been advocated by authors such as Prensky (2001a; b), is today viewed critically among academics (e.g., Buckingham, 2009; Helsper & Eynon, 2010; Bennet, Maton & Kervin, 2008). Buckingham argued that this idea pays too much attention to differences between generations while overlooking their inner diversity (Buckingham, 2009). Helsper and Eynon (2010) agree with that, showing that although young people appear to have a higher level of confidence regarding their digitals skills and are more likely to use digital technologies than older people, other factors such as socioeconomic status or gender play an important role as well. Kennedy, Judd, Churchward and Gray (2008) found significant disparities concerning access to and usage of digital technologies within a cohort of young people. Against this background, scholars have been concerned that the assumption of a 'digital native' younger generation will have a negative impact on their education. The idea that children develop digital skills almost naturally could lead decision-makers to perceive formal and informal education in this field to be of lower priority. If educators

base their teaching on this notion of a generation-wide high level of digital expertise, more disadvantaged students could be at risk of being left behind and their needs overlooked (Buckingham, 2009; Helsper & Eynon, 2010; Livingstone, 2009).

### *4.3.2 Looking ahead: The role of digital skills in the future*

In respect to children's future, the interviewed labour market experts were certain that young people will have to navigate through a digitally transformed job market. Digital skills will become even more significant: "I think that the world in the future will be loaded with digital devices and services. Working with them, also programming them or building solutions out of them – it will be an important part of everyday life" (Poland, Labour market expert 1). Digital skills will be taken for granted in the professional world "like reading and writing" (Finland, Labour market expert 1).

#### *Transformation of the Labour Market*

Several experts spoke about how advancing digitisation and, thus, developments such as automatisation and the usage of Artificial Intelligence could impact future working life. This is predicted to lead to the disappearance of entire professions, especially of labour which has relatively low skill set requirements:

> The history of the working world always has to do with the fact that we do higher-value work. That means we have handed over the work in the field to machines. In the future we will give the work at cash registers, in cars, etc. to machines and that will be completely normal […] (Germany, Labour market expert 1.2).

This assumption has been echoed by economists and politicians. The World Economic Forum (2018) found that 50% of all companies expected a reduction of their labour force as a consequence of automatisation by 2022. Having said this, this change will potentially also create new jobs. "We will need highly skilled employees to build and maintain all the tools that will replace them" (Poland, Labour market expert 1). While manual work could be substituted through automatisation, jobs that focus on interpersonal and social interaction are predicted to gain in importance. A respondent from Germany stated: "then new jobs will be created and we know that these jobs have to do with more luxury, that is, with personal interaction, that is, people with people" (Germany, Labour market expert 1.2), or as a Polish expert phrased it: "Robots and artificial intelligence will develop, but they will not dominate the world. Humans are social beings and need relationships and interactions" (Poland, Labour market expert 2). Preparing the youth for such a transformed work life was mentioned as a challenge. An expert from Germany noted that the children of today have to be prepared for professions of whose existence we do not know yet. Thus, young people need to be taught to adapt, to continuously use the resources available to them to further educate themselves and learn new skills. They have to be able to change their occupation and familiarise themselves with new job profiles. "Adaptational skills are absolute key because jobs are not here to stay. They change, they shift all the time and when your job is gone you have to adapt to something else" (Finland, Labour market expert 1).

> ***It means that the […] the importance of transferrable skills is increasing. Transferrable skills are skills that you can transfer from one occupation to another. And digitals skills, or most of them, are transferrable skills, you can use them in different occupations***
>
> ***Estonia, Labour market expert 2***

There are other transformations that will affect the labour market. Several experts remarked that offices were going to become increasingly detached from an actual location and progressively virtual which will require new communication, but above all, strong collaboration skills from employees. An Estonian respondent remarked that "even more important in the future probably, will be how to use virtual skills in virtual teams – when people are in different locations and they are working with one purpose" (Estonia, Labour market expert 2). Innovative technologies such as Augmented Reality or 3D technologies are also envisioned to have a profound impact on some professions, such as engineering.

*Transformation of Everyday Life*

Once again, it was of importance to the interviewees that these developments will not be restricted to the working world but go beyond. Digital technologies will be integrated in every aspect of life. Thus, even if digital skills will not be necessary for some jobs, "[they] will be essential in carrying out daily life, e.g., online shopping, banking, meeting people" (Poland, Labour market expert 1). Another interviewed expert from Poland expressed the opinion that the standard of digital skills might even decrease as a consequence: "digital reality will probably be simplified. It will become more intuitive and user-friendly" (Poland, Labour market expert 2). By the same token, advanced competences remained desirable for those who wish to reach high positions in their career.

*Transformation of Society*

Considering the potential of enhancing e-government, some research participants, moreover, underlined that in the future digital skills might be key to be able to fully assert one's rights and responsibilities as an active citizen. What is more, various experts from different countries expressed hope that digital technologies will help to solve larger social and political problems which, in particular, "the next generation" (Germany, Labour market expert 1.2) is currently facing.

> ***Important problems we have in society have a great deal to do with digital technologies. So, it is no longer just [about] digital media […], which is often brought to the fore, but think of health, security, think of education. These are all issues […] where digital technologies will make a massive difference.***
>
> ***Germany, Labour market expert 1.2***

The health sector was most frequently mentioned as an area in which digital technologies might have a positive impact. Other fields were transport, social equality and the environment. Generally, furthering technical innovations was viewed as beneficial for the society as a whole. “We keep developing, we keep innovating, we keep finding solutions to the existing problems or we even might find new problems” (Estonia, Labour market expert 1). In the future, digitisation might also solve social problems connected to the work life, e.g., help to ensure reconcilability of family and working life:

> […] I believe that digitalisation is really a great way to improve a lot and that you might have the possibility to work less with the same effect, have a little more time for families, more time for us, which we all somehow wish for (Germany, Labour market expert 2).

Although digital technologies offer great opportunities, there are also potential risks which should be considered. Particularly cybercrime was referred to by the interviewed experts as a significant potential threat in the future. Even though the overall look towards the future remained optimistic, the interviews made it clear that the future holds both chances and risks for children and young people, on the labour market and beyond, and that digital skills will play a large role in ensuring that positive impacts outweigh the dangers.

### *4.3.3 The digital competences that labour market experts consider as key for young people to acquire*

As explained in the methodology section, during the interviews, the interviewed experts were asked to select the digital skills that they considered as most important for children and young people to acquire these days and rank them in order of importance. The table below ranks the digital skills in order of the frequency of being selected by the experts as one of their top-5 skills.

| Table 7 | The View of Labour Market Experts: Digital Skills (DigComp) Ranking | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Competence areas** | **Competences** | **Estonia** | **Finland** | **Germany** | **Italy** | **Poland** | **Portugal** | **Total** |
| 1. Information and data literacy | 1.2 Evaluating data, information and digital content | 2 | 2 | 2 | 2 | 1 | | 9 |
| | 1.1 Browsing, searching and filtering data, information and digital content | 1 | 1 | 1 | 1 | 2 | 1 | 7 |
| | 1.3 Managing data, information and digital content | | | 1 | 1 | | | 2 |
| 2. Communication and collaboration | 2.1 Interacting through digital technologies | 1 | 1 | 1 | 1 | 1 | | 5 |
| | 2.2 Sharing through digital technologies. | | | | | | | |
| | 2.3 Engaging in citizenship through digital technologies | 1 | 2 | | 1 | | 1 | 5 |
| | 2.4 Collaborating through digital technologies | 1 | 1 | 1 | 1 | 2 | | 6 |
| | 2.5 Netiquette | 2 | | | | | | 2 |
| | 2.6 Managing digital identity | | 1 | 1 | 2 | 1 | | 5 |
| 3. Digital content creation | 3.1 Developing digital content | | 2 | | | | | 2 |
| | 3.2 Integrating and re-elaborating digital content | | 2 | 1 | 1 | | | 4 |
| | 3.3 Copyright and licences | | | | | | | |
| | 3. 4 Programming | | | 1 | | 1 | 1 | 3 |
| 4. Safety | 4.1 Protecting devices | | | | 1 | | | 1 |
| | 4.2 Protecting personal data and privacy | | 1 | | | | 1 | 2 |
| | 4.3 Protecting health and well-being | | | 1 | | | 2 | 3 |
| | 4.4 Protecting the environment | | | | | | 2 | 2 |
| 5. Problem-solving | 5.1 Solving technical problems | | 1 | | | | | 1 |
| | 5.2 Identifying needs and technological responses | | | 2 | | 1 | | 3 |
| | 5.3 Creatively using digital technologies | | 1 | | | | | 1 |
| | 5.4 Identifying digital competence gaps | 1 | 1 | | | | | 2 |

| Table 8 | Skills Individually Added by Experts |
|---|---|
| **Country** | **Skill** |
| Poland | Continuous Learning |
| Portugal | Re-Skilling |
| Germany | Self-Management |
| Germany | Methodological Skills |
| Finland | Online-Communication |
| Portugal | Creating media using Augmented Reality and 3D technologies |

As observed in Table 7 and similarly to educational experts, labour market experts also seem to find Communication and collaboration (23 votes) and Information and data literacy (18 votes) as the two most relevant competence areas. Within Communication and collaboration, the interviewed labour market experts predominantly regarded the collaborating and interacting through digital technologies as well as engaging in digital citizenship through digital technologies as the most important competences for young people to acquire. In terms of Information and data literacy, the experts stressed the importance of evaluating data, information and digital content as well as browsing, searching and filtering data, information and digital content. As a matter of fact, the digital spread of disinformation was conceived as an essential risk. "The whole digitalism gives so much information that one key thing is for individuals being able to split what is true [and] what is not true*"*(Finland, Labour market expert 1). An expert from Poland noted "Verifying and analysing the data sources is essential in order to come to decisions – they need to be based on solid data. Also, it's a way to eliminate fake news" (Poland, Labour market expert 1). The experts also saw the need to raise more awareness to the issue that data is not entirely neutral and to help people understand and detect potential biases. "The background of the information or input data is not neutral. We can talk about gender issues, we can put social aspect on that, or maybe nationalities and political systems and whatever, but it is not neutral" (Finland, Labour market expert 3).

It is noteworthy, that, as a category, social digital skills are deemed highly important by the participants. In the light of internationalisation of work processes and a trend towards increased usage of virtual communication systems, the ability to digitally exchange ideas and work in virtual teams appeared to be a crucial skill for the labour market. "And in every labour related activity you need to have quite a good digital communication skill – using online tools and using social media and to know [the] ethics of digital communication and interaction with other people*"*, stated an expert from Finland (Finland, Labour market expert 2). Similarly, a German participant remarked:

> I think you should always remember that you are dealing with people. And in any case, communication is the be-all and end-all, so now it's all about the digital channels, but it doesn't matter what you do, you have to be able to communicate and you have to have a certain understanding of how people act. Because everyone is different, and everyone behaves differently (Germany, Labour market expert 1).

It needs to be noted that the interviews were carried out in the middle of the COVID-19 crisis in Europe when the issue of teleworking was highly relevant. Therefore, this could have had an influence on the choices made by participants.

The experts' thoughts on social digital skills were, however, not limited to communication. The management of digital identity was perceived as both a matter of individual security as well as a significant measure to heighten one's chances of employment:

> It is a fundamental issue that concerns the person and/or the organisation […]. Certainly, there is a theme of security and therefore protecting data, but also of how I build reputation. It is one thing to manage your social identity as an organisation and as a person (Avoid fake profiles, etc.). Besides the theme of protection, there is also the theme of promotion, which means that my digital presence is a mirror of my "real" presence. Or at least, I need to know how to manage things. If my LinkedIn profile was updated twenty years ago, then there is a lack of proactive capacity there (Italy, Labour market expert 1).

Being able to engage in citizenship and participate in society was equally understood as an important competence. The experts particularly spoke about public digital services and social media and how a citizen who is not trained to use these technologies in a positive way faced a certain from of social exclusion.

> One of the concerns I try to express is that the battle for an efficient and credible use of digitisation processes relies on [the skill to engage in citizenship through digital technologies]. It entails that each person as a citizen and worker has the capacity to be part of the digital society (Portugal, Labour market expert 2).

> Engaging in citizenship through digital technologies. Being as a citizen a part of society. To be able to get your voice heard. It is necessary (Finland, Labour market expert 2).

In contrast, more technical skills, even though they were not entirely dismissed as irrelevant by the experts, were underrepresented in the ranking. The interviewees valued critical thinking and social interaction skills more than technical know-how. In this field, there was additionally more variety in the selection of skills across countries.

Five experts added their own skills definitions to the ones provided (see Table 8). Among them, three skills were described in similar terms: *Self-management, Re-Skilling and Continuous Learning*. They all referred to the individual's own responsibility in managing and training their skills and their stance in an increasingly digitalised world. Accordingly, the individual needs to be able to use the resources available to them to continuously further educate themselves and adapt their skills if necessary. That corresponds with what many of the experts saw as the key for success in the future labour market: adaptability. This will become necessary because of the transformations of occupational structures and job profiles expected as result of accelerated technical innovations. The European Commission recently stressed the importance of the provision of opportunities "for upskilling (improving existing skills) and reskilling (training in new skills)" (European Commission, 2020a) in its *European Skills Agenda for sustainable competitiveness, social fairness and resilience* (European Commission, 2020b). In line with that, the World Economic Forum (2018) recommended that employees should personally take charge of their career development.

A Finnish expert additionally noted that the ethical dimension of digital skills did not receive sufficient attention:

> The ethics in both using information and providing information. […] that is a skill we are lacking as organisations and also as individuals. Understanding the whole ethical area, morals

– we have been given tools, but we don't have the morals yet […] to use them (Finland, Labour market expert 1).

#### *4.3.4 Is the workforce sufficiently digitally skilled to actively participate in the labour market and meet its demands?*

Although the experts interviewed came from different countries and across different sectors, they agreed that the workforce in their country was not sufficiently digitally skilled. As an Italian expert indicated: "I see it every day. These skills are missing. We need to develop them more strongly, we need to push for them, we need to manage them, and we need to find a way to apply them" (Italy, Labour market expert 1).

> ***I think that we are lacking a lot of skilled workforce, but this is not just the problem of Estonia, it is the problem of the global world in general because everything is so digitised.***
>
> ***Estonia, Labour market expert 1***

In spite of the acknowledgement that an important segment of the workforce is not sufficiently digitally skilled, there seemed to be agreement among the experts that people working in the digital industry had a higher level of digital skills than the rest of the population because, due to the nature of their jobs, they had access to up-to-date digital technologies and training. The experts also referred to strong differences even within their countries or regions and across different (economic) sectors. This is in line with existing evidence and with recent European trends (e.g., Kiss, 2017).

> If your work does not involve the use of digital applications or devices, there is no place you can practice. Part of the labour market force does not have access to digital applications or devices or education. There are difficulties to meet the need of the future. They don't have a base where to build unless there is huge awakening in their organisations (Finland, Labour market expert 3).

However, some experts also highlighted that not everybody requires the same level of knowledge or expertise as regards the use of digital technologies and, that it is natural that discrepancies exist among different occupations. As a labour expert from Estonia indicates:

> In IT, it is crucial, I think, to learn new things and to test new things, new ways of working, new methods, all that kind of things. In other areas, I don't know. If you are a carpenter, then I would probably prefer that you are a better carpenter in the future, rather than you know how to use digital solutions (Estonia, Labour market expert 1).

In general, however, the experts interviewed agreed that digital skills and digital literacy will occupy an increasingly important role in people's lives, but especially in working life. For this reason, they believed that is was important to continue promoting strategies to educate citizens of all ages from an early age, paying special attention to minimising the risk of creating new, or exacerbating already existing inequalities. As an Italian expert further suggested: "there is serious work to be done on the component of enriching and strengthening these kinds of skills in a very structured way. I do not think that we are ready to respond adequately to the demands of the market at the moment" (Italy, Labour market expert 1).

#### *4.3.5 What needs to be done so that labour market participants can develop adequate digital skills and keep them up-to-date?*

The experts interviewed referred to a wide range of possible measures and practical actions that are required to ensure that labour market participants, especially prospective ones, can develop adequate levels of digital literacy and keep their digital skills up-to-date. Some of the ideas proposed targeted the individual level such as developing critical thinking skills and 'soft' skills such as collaboration and communication skills, creativity, flexibility, adaptability, and the capacity to "learn how to learn": "I think that the area of personal development, the area of how to learn, these meta skills are a very decisive factor that has to be built into state systems because that is a huge competitive advantage" (Germany, Labour market expert 1.2).

Other suggestions, however, targeted the macro level of society and emphasised the importance of collaboration across multiple stakeholders such as national or local governments, the private sector, educational stakeholders, and civil society. As an Italian expert suggested when referring to existing initiatives to support the development of digital skills in his country, "[there are] small examples and small positive cases, but it is not a systemic thing. I would like it to be more system and more dialogue, more coordination between society, the wider world, institutions, and activities" (Italy, labour market expert 1).

*Developing digital literacy requires the development of a wide range of skills and knowledge and not just technical know-how*

From the analysis of the interviews, it became apparent that it is crucial that initiatives aimed at furthering the development of digital literacy pay special attention to the development of a wide range of knowledge and skills, including technical, critical, social as well as emotional aspects. "We need more tolerance, more understanding, and more interaction. And this involves everyone" (Finland, Labour market expert 3).

'Soft' skills and critical thinking where highlighted as key to achieve digital literacy. "This is the differentiating competence, the intentionality reflection and awareness of direction […] This "soft" competence (to use an obsolete term) is what can make the difference". (Italy, Labour market expert 1).

The importance of developing critical thinking skills was stressed by all experts interviewed. They all coincided that acquiring such skills has become especially relevant due to the increasing reliance on data. Data has become such an important "commodity" these days that developing the ability to search, retrieve, understand, critically assess, and ethically use data have acquired paramount importance. However, as pointed out by a Finnish respondent, the educational system does not seem, yet, to be up to this challenge:

> When we start to work with data, to extract it, or to filter them, we should know what happens. It is not so easy. And it is not easy nor simple nor clear, even for persons who have a technical background. I am a civil engineer. I know pretty much about how to build a house. But it is a totally different thing to go to a database and to understand the quality of the data. Is the data good or is it filtered? And if it has been [filtered], what should be done? How to select data? What to leave out? How will this affect results? It is not so easy. In previous years I did not

> need to think about this. But nowadays more and more we have to go where our studies don't prepare us (Finland, Labour market expert 3).

In particular, experts assigned great importance to understanding not only the meaning of the content conveyed through digital platforms, but also to understanding how these complex platforms are built and operate. As a Finnish expert puts it:

> The digital world requires that users are more aware of connections, relations and motives because [digital] platforms have some kind of agenda to the user. You have to be more aware. And that is the big question, not technical issues, but issues which relate more firmly to us as a part of society […] There are many influencers giving us information from some perspective. The digital world, the digital future, digital work life are not so much about technical questions, but about asking how we act [in these platforms], how aware we are of those background structures (Finland, Labour market expert 3).

Acquiring such a foundational knowledge would facilitate the adequate and critical use of digital technologies. Simply accessing and using the many available platforms out there was deemed as not enough to be a competent user of these technologies.

> In my opinion, digital skills translate into knowledge not only of the grammar of the tool, but also of how to use it […]. It is not enough to know Microsoft Teams to create a digital workshop. These different aspects are what makes a person digitally competent. Not only the grammar, but also the articulation of thought (Italy, labour market expert 1).

Other types of skills which were highlighted by interviewees, included having the capacity to learn on your own or "learn how to learn": "The information is out there. You don`t have to study best practices in the university or you don`t have to be mentored all the time, you just open Google and you just watch the videos that are describing the best practices that are being used and promoted to others." (Estonia, labour market expert 1).

You need a good basis, for instance, the one given at school, but then you can continue learning/perfecting your digital skills/literacy on your own.

*Coherent policies and coordinated approaches*

It was clear from the interviews that the efficient coordination across multiple stakeholders is a pre-requisite for all members of society to acquire the digital skills that they require to fully function in society. This is particularly important because digital skills are viewed as "transversal" and, therefore, as affecting different aspects of individuals' lives, but also of society in general.

> Thinking about digital skills compared to more traditional ones, digital is not a monolith that you deal with in a precise or coordinated way. It is something transversal to skills, industries, sectors. Many of the skills that are acted today can be enriched by digital or integrated with digital. Rather than seeing digital as a competence to be acquired, we need to reflect on the fact that within digital competence there is the issue of digital literacy, adoption, how to use tools, how to use digital as a learning context (Italy, Labour market expert 1).

Experts also stressed the importance of having a good understanding of the digital literacy needs of the population. In particular, they referred to the role of policy-makers and governments in identifying

these needs as a pre-requisite for the development of effective policies: “Politicians need to be trained in these issues, they have to understand what the implications are, so that they can put forward the right policies” (Germany, Labour market expert 1.2).

> To train someone you need to have digital knowledge, and right now, I don't think that even at a political level there can be a discussion of this kind if not everyone has the same understanding. I have also worked a lot with the public sector and I realise that the possibility of making a system is often thought in a tactical way, starting with start-ups, but there is not something as extensive and structured as there should be (Italy, Labour market expert 1).

A high level of coordination among governments and other relevant agents, as well as coherence between a country’s specific needs and the policies implemented to satisfy those needs were viewed as particularly important as stressed by this Portuguese expert: “It is fundamental to involve the economic sectors, the technological centres, the universities…There must be a strengthening of the articulation between the different agents” (Portugal, Labour market expert 2).

#### *4.3.6 How is the continuous development of digital skills fostered among employees and young people?*

Experts agreed that education, understood in a broad sense beyond formal education, is both instrumental and strategic to support children and young people develop digital literacy. Nonetheless, they were quite critical as regards existing educational and training initiatives in their countries. In particular, many experts regarded schools as non-innovative, too focused on the mastery of basic technical skills, which many children already possess, and too slow to respond to technological advances:

> There is no systematic approach to develop digital skills. Basic digital skills are being built by children mostly in practical ways, using digital devices and services. The school tries to teach the most sophisticated skills, but they usually fail. Either children know these things already, or they are irrelevant due to delays in shifting school programs versus technological advances (Poland, labour market expert 1).

This inconsistency between what is offered in formal education and the real digital needs of the population was perceived as a potential risk to fostering adequate digital skills and nurturing digital literacy.

> The current programmes offered at school and in university education are often not adequate. The digital world follows logics that are not those of classical education. In this sense I think that those who are still in training and looking for work should grasp the things that digital offers by getting their hands dirty. Digital competence in my opinion goes a long way from practicality […]. I often see it with some clients who have difficulties with basic functions of some tools (e.g., how do I turn on the webcam? how do I share a document?) (Italy Labour market expert 1).

As highlighted earlier in this report, experts also feared that children and young people from more disadvantaged backgrounds, whose opportunities to strengthen their digital skills and literacy rely almost exclusively on the digital curriculum offered at school, would end up having even less opportunities to succeed in the labour market, at least in those sectors where stronger digital skills are

required. On the other hand, they also expressed concerns that if the educational offer continues to be deficient, existing digital inequalities may be exacerbated. Better fine-tuning between the digital curricula offered by formal and informal educational sectors and the needs of the labour market, together with a better understanding of how children are actually engaging with digital technologies seem highly necessary to ensure meaningful and effective educational policies and practices that support and guide the development of digital literacy for all. As an Italian expert pointed out "we cannot just expect that people will learn about digital schools only at school. I can't think of specific initiatives in our country that go in this direction, but in my opinion, they should direct a transformation with respect to the applicability of competences."

Other interviewees pointed out that given the great availability of information, resources and tools, nowadays, there are plenty of opportunities to continue developing one's digital skills beyond formal and informal education possibilities. Nevertheless, access to such resources does not necessarily mean that every individual will have the capacity or even the self-discipline to take advantage of the existing resources out there. Therefore, even though such existing offer is, indeed, seen as an opportunity, more traditional ways of teaching and learning to develop digital literacy should continue being made available, ideally also beyond school. As this Finnish expert pointed out when asked who was responsible for the development of digital skills in their country:

> Everyone. […]. But it is not, of course, a question about individuals. Individuals can update their knowledge. But this needs structure. You can find information; you can find a person who teaches you and who helps you. There is a question about individual responsibility to develop [digital] skills, but we need a structure for that. Individuals should be able to find the right place for the education and the knowledge they need (Finland, Labour market expert 3).

#### *4.3.7 Enablers and obstacles to the development of digital skills*

The participants from the labour market identified various strengths and obstacles regarding the digital skills development in their respective country. This revealed several trends which are summarised below:

| Table 9 | The View of Labour Market Experts: Enablers and Obstacles to the Development of Digital Skills |
|---|---|

| Enablers | Obstacles |
|---|---|
| • Training opportunities and life-long learning<br>• Multi-stakeholder cooperation (of universities, other educational institutions, and private corporations)<br>• Good quality and accessible digital infrastructure and access to public digital services for all citizens<br>• High quality of educational system<br>• Committed and innovative political leadership<br>• Open mindset towards digitisation and enthusiasm for new technologies among the population | • Fragmented structures in the area of re-skilling and tertiary education<br>• Limited collaboration among different stakeholders, particularly among educational, political and economic spheres of society<br>• Uneven investment by the private sector in the further training of their employees (especially SMEs)<br>• Lack of systemic approach in teaching digital skills<br>• Uneven access to education and training opportunities (e.g., gender or age-based gaps)<br>• Fear of change or reluctance to embrace digital technologies among the population |

*Political Leadership and Public Services*

Based on the views of the interviewed experts, a political leadership which is committed to the development of digital skills and supports innovation and training is key for successfully building digital competences of citizens, including children and youth. Policy makers who support digital education by formulating long-term policies and invest in both digital infrastructure and training were a crucial advantage. Linked to this was the expansion of public digital services. E-government or e-health programmes were not just considered to be introducing new possibilities of social participation, but also to promote digital skills by bringing all groups of society into contact with digital technologies and the potential opportunities they offer. However, it needs to be taken into consideration that the use of these kinds of systems requires a minimum degree of digital expertise in the first place which could pose a significant obstacle particularly for more vulnerable citizens, such as the elderly or less socio-economically advantaged groups. Thus, the application of such services needs to be accompanied by measures which ensure life-long education for all citizens.

*Education and Lifelong Learning*

The participants stressed how beneficial a good educational system and the offer of training opportunities for all citizens were for the development of digital capacities. Furthermore, multi-stakeholder cooperation was seen as an asset for education in the field of digital skills. Private corporations, universities and schools could here exchange their expertise and experience as regards digital skills and, thus, benefit from each other's strengths.

> […] our education system […] is very broadly based. [It] is also very manageable in terms of costs, even for each individual, in contrast to what we have in the Anglo-Saxon world. That is a huge advantage. Cooperation between universities, educational institutions and companies is also a strength when it comes to teaching digital skills (Germany, Labour market expert 1.2).

> Generally, we have a high level of education for IT and cybersecurity specialists. A lot of people and organisations deal with digital skills in an educational context, including NGOs. Companies are doing well in the digital branch. Many global partnerships perceive Poland as an interesting market. Many firms have serious digitisation plans (Poland, Labour market expert 2).

Nonetheless, these elements need to be integrated systemically through the whole education and life-long learning paths including formal, informal and non-formal education modalities, instead of being limited to local initiatives and experimental projects (WEF, 2018). Otherwise these positive dynamics will only reach a small fraction of the population. In some countries, the experts observed that deficient collaboration and coordination of the various stakeholders involved in the development of digital skills, resulted inevitably in a fragmented and inefficient approach to digital skills development and education:

> We have a ministry for this and a ministry for that. We have a quite independent educational system. Then we have the industry sectors. Small numbers of people can make their own association or their own staff. Our weakness is the lack of a bigger picture (Finland, Labour market expert 3).

Beyond this, multiple experts noted a general unevenness of access to education and training and varying levels of quality in their respective countries. Traditional structural inequalities, thereby, also impact the development of digital skills. Studies on this topic have identified multiple factors of influence, among others, age, socioeconomic status, and gender (Helsper, 2017; van Deursen, Helsper, Eynon & van Dijk, 2017). For instance, senior citizens and women seemed to have less access to enough opportunities to further develop their digital skills. Correspondingly, a Finnish participant said that "[…]we have to be sure that senior citizens have [the] skills and we need to help them to learn new things, tools and applications […]" (Finland, Labour market expert 2). An expert from Portugal remarked:

> The most important problem […] is a huge gender difference in professions in the areas of information communications sciences. […]. Academic levels are higher in women, even in scientific areas, but in the area of digitalisation the numbers are much lower than in other countries. This is a problem that must be recognised and answered. It's not just a matter of rights but of impoverishment of our offer in this area. This is an important topic (Portugal, Labour market expert 2).

Another criticism brought up against the formal educational system is the (s)low innovation capacity of schools. Experts felt that both the curricula and the methodologies used at schools to support pupils' development of digital skills were often outdated and not in congruence with the requirements of the labour market or simply the reality of young peoples' daily lives. The school curricula were also criticised for being too technocratic and paying little attention to the development of the increasingly necessary critical and "soft" skills. The respondents further had the impression that

changes were implemented only haltingly and that, thus, schools seemed to be too strongly rooted in the past. “One is stuck in the past. There are great persistent tendencies as far as education is concerned. […] here we have to make changes more quickly and put digitisation on a higher agenda”, explained a German expert (Germany, Labour Expert 1.2). Therefore, the interviewees voiced the opinion that it was important for educational systems to develop school curricula and teaching methods in line with the newest research, particularly in the field of digitisation which keeps advancing.

### *Economic Factors*

Identifying strengths, several experts saw a digitally well-positioned private economic sector as a positive factor for the development of digital skills. Their impression was that flexible and innovative corporations could serve as a catalyst for broader social advancement in this field, either by providing more incentives to train digital skills or by investing in the education of their employees themselves. Nevertheless, based on the experts’ experiences, in particular small and medium-sized companies seemed to struggle to offer adequate training for their employees, usually as a result of a deficit of financial and human resources or simply because of the lack of vision and incentives to invest more resources in building capacity in the area of digital literacy. As a Portuguese expert commented, “the resources associated with training are an investment and not an expense. This is not always noticeable to everyone or understood by everyone” (Portugal, Labour Expert 2). As a consequence, if digital skills development relies mainly on the private economic sector, digital inequalities could be reinforced as the opportunities for training an employee may receive would strongly depend on the company’s interest in investing in this specific area as well as on the company’s economic strength and size. An expert from Germany, therefore, stated that “there are a few great companies that do this, but we do not have an overall structure yet, not even a generally binding structure.” (German, Labour Expert 2)

It was considered to be of advantage when the country could look back at some sort of technological economic tradition. It was assumed that in this case there were already skills among the workforce that could easily be built on towards a more digitised industry. “All in all, we are very techno oriented, we are engineer nation, technology comes more naturally than in other places. There is a great legacy from the Nokia time”, stated a respondent from Finland (Finland, Labour market expert 1).

### *Society and Demographic factors*

Some participants noted that their country’s population is relatively young. This was experienced as a strength while, correspondingly, demographic change has been named as a potential threat for the fostering of digital skills. As has been indicated before, many of the experts shared the assumption of a generational gap. Accordingly, children and young people were perceived to be better equipped to use digital technologies than senior citizens. This resonates with prior empirical evidence (Hargittai, 2002; UNESCO, 2017). However, in correspondence with the previous elaborations on the concept of ‘digital natives’ (cf. Livingstone, 2009), the experts noticed a seemingly paradoxical problem arising out of this perceived generational gap. It was described that, based on the assumption that they are ‘digital natives’ who acquire these skills automatically, provision of digital training for young people, especially after the phase of secondary school, was often insufficient.

Beyond this, it became clear in the interviews that an open mindset towards digital technologies among the population was deemed a decisive factor for the development of digital skills. While some participants talked of a general enthusiasm for technical innovation within their countries, many experts thought that digitisation is accompanied by reluctance, fear or "technophobia" (Italy, Labour market expert 2) for many people. As an expert from Estonia described it:

> […] there are a bunch of us who are innovative […] and excited about the future. And then we have some who are closed to and […] who are afraid of change, and who think that the new ways maybe shouldn't be introduced into our society (Estonia, Labour market expert 1).

The respondents argued that if people remained reluctant to engage with technology, digital skills would not be improved and members of society would not be able to make use of the broad range of opportunities these technologies have to offer while minimalising the risks they could be exposed to. The level of trust in digital technologies is part of what scholars have described as 'digital readiness'. A person's digital readiness is composed of their digital skills as well as their beliefs about the trustworthiness of digital technologies and content. It has recently been increasingly used as explanatory factor in the discussion on people's adoption of technologies (Horrigan, 2016; UNESCO, 2013).

The participants felt, therefore, that it is important to raise more awareness of the importance of digital skills. In particular, it was mentioned that a balanced media coverage reporting on both the risks and the benefits of digitisation could help to create more enthusiasm for these technologies among citizens which could thereby present an opportunity for the issue at hand. A Finnish research participant commented: "I see that there is an opportunity related to mentality of Finnish people. We still need to encourage our people to be braver users of digital things. The media play a major role there" (Finland, Labour market expert 2).

### *Transnational Dynamics*

The COVID-19 pandemic was evaluated equally as an opportunity and a threat. On one hand, experts observed that the need for social distance and the consequent trend towards teleworking and home-schooling revealed shortcomings as regards access to digital technologies and people's usage of them. The experts expressed the hope that the crisis, thus, raised attention towards the importance of developing digital skills. On the other hand, COVID-19 crisis was experienced to unfold a destabilising effect on the national economic and political situation and on the basis of this considered a detrimental factor for further public and private investment into the development of digital skills. An expert from Poland stated: "[The COVID-19 pandemic] deprives people of jobs [and] causes an economic crisis" (Poland, Labour market expert 1).

Transnational cooperation was mentioned as a way to fostering digital skills and education by exchanging expertise. Experts also stressed that EU guidelines and measures create incentives for new initiatives for the building of digital capacities on the national level. EU funding for digitisation was mentioned as a valuable financial resource and, thus, as an important factor for the further development of digital skills for all segments of society.

Moreover, the experts regarded the influence of foreign private agents on the European labour market as a threat. In their opinion, European enterprises were often weakly positioned in the international

competition for highly skilled workforce, especially with big tech companies like Google (Alphabet), Amazon, Facebook, Apple or Microsoft (GAFAM). This is considered to cause a form of human capital flight which would slow down the further development of proficiency within the respective country. Therefore, the experts thought it necessary to increase the location factor of European countries and the attractiveness of the local labour market for highly skilled employees:

> That means attracting highly qualified people and, secondly, retaining highly qualified people. So, if today […] the AI experts […] all go to Amazon, because no German company is even remotely capable of paying the salaries, then we have a huge problem (Germany, Labour market expert 1.2).

In conclusion, the experts felt that the development of digital skills, particularly for young people, but also for all other citizens, should be a multi-stakeholder effort. The obstacles which were pointed out by the experts can be mainly traced back to deficient coordination and collaboration among stakeholders. This results in fragmented structures which could replicate and even deepen existing inequalities. In order to ensure an even access to skills development and training opportunities for all, a systemic approach and coordinated efforts are required.

## 5. Conclusions and final remarks

As stressed by many of the experts we interviewed during our research, digital skills have acquired an indispensable status in different aspects of people's lives, especially since a wider range of activities and services are being performed and accessed online. In such a context, mastering digital skills is seen as essential to take advantage of the opportunities ICTs offer and at the same time counteract potential risks and harms related to the use of these.

As expressed by several of the experts we interviewed, the provision of programmes, tools and resources to support the development of digital skills varies greatly across and within countries, and individuals' access to such offer differs greatly depending on a wide range of factors including individual (e.g., age or gender), socio-economic (e.g., having or lacking access to internet at home or to high quality (digital) education), political (e.g., local, or national policies to promote the development of digital skills) and even geographical factors (e.g., poor connectivity due to one's location).

Another interesting finding was the common idea that the development of digital skills and the promotion of digital literacy is not a task that only concerns the formal educational system. On the contrary, several educational and labour market experts stressed the importance of working collaboratively across different sectors to ensure coordinated and coherent policies and measures to promote the effective development of the increasingly needed digital skills. Experts warned us that fragmentation in the field would inevitably lead to the development of ineffective strategies unable to tackle the many challenges related to the development of digital skills and digital literacy for all. In this sense, life-long learning, upskilling and reskilling of existing competences were considered as key for a number of reasons: on the one hand, digital technologies evolve so quickly that individuals require to continuously upgrade their knowledge and skills. On the other hand, the risks to increasing existing and emerging digital inequalities can be exacerbated if certain sectors of society remain excluded from access to good quality of digital skills education and training.

Although digital education was seen as a shared responsibility, disproportionate attention was given to formal education. Although both experts from the educational and labour market sectors were critical about the current provision of digital skills education at school, labour market expersts tended to see formal education systems as non-innovative and slow to adapt to the requirements of increasing digitised societies. Conversely, education experts had a more nuanced view and, although they were vocal about the deficiencies of the sector, they also elaborated on the positive aspects of formal education in ther respective countries. These included, among others, motivation, openness, and interest of teachers in digital technologies and their incorporation in teaching-leanring experiences, highly educated and qualified teachers, schools autonomy to adopt digital skills education to their needs and the presence of digital skills education in the core curriculum.

Although the focus of our interviews was to reflect on the importance of digital skills for youth, many experts also highlighted the current lack of adequate programmes to continue developing the digital skills of adults, especially the elderly. This was considered as highly problematic particularly because of the assumption that in the near future, more digital technologies will be used for work, but also to perform a wider range of everyday activities (e.g., communication, online shopping, e-government, e-health, leisure, etc.).

Probably because the interviews were carried out in May 2020, just in the middle to the COVID-19 crisis which has impacted Europe and the whole world in unprecedented ways, many of the interviewees reflected on how this crisis, and especially the "social distancing" measures taken all over the world were affecting education and work practices, and how, all of a sudden, learning and working had become primarily digital. Many experts reflected on how this "forced" shift towards the digital had obliged many governments all over the world to re-think their existing digital strategies. Many, if not all our interviewees, came to realise that much more needs to be done to effectively educate and support all citizens to achieve adequate levels of digital literacy.

Although, most interviewees assessed their country's level of digital skills and digital skills 'development provision as deficient, they all agreed that the COVID-19 crisis could act as an unprecedented opportunity and as a "wake-up call" for governments to re-assess their digital needs and start investing more in digital education for all. As the recently launched European Skills Agenda for Sustainable Competitiveness, Social Fairness and Resilience (European Commission, 2020c, p. 4) highlights: "Education at a young age remains fundamental but is only the beginning of a life full of learning".

Another interesting finding from our report was the fact that although different experts used different terminology refer to digital skills (e.g., digital competences, ICT skills, digital literacy, etc.), most of them seemed to share a similar understanding and considered the same set of basic skills as particularly important for young people to acquire. This skill set would include a combination of digital and non-digital skills comprising aspects as varied as operational skills, critical literacy and even an ethical dimension. As expressed by some educational experts, using online technologies in ethical and responsible ways are increasingly important dimensions that should also be given enough attention in digital skills education.

During the interviews, experts were presented with a set of 21 digital competences based on the European Digital Competence Framework, also known as DigComp 2.0. They were asked to choose the five skills that they considered as most important for children and young people to possess these days and to rank these five in order of importance. It was interesting to observe that both the education and the labour market experts ascribed the greatest importance to the Communication and collaboration competence area followed by Information and data literacy. Digital content creation and Safety were given considerably less importance. Surprisingly, of the five competence areas that comprise the DigComp framework, the competence area that received less attention from both the education and labour market experts was Problem-solving. It is important to note, however, that several experts mentioned that it was difficult to select only five competences (as instructed during this task) because many of the competences described in the DigComp were interrelated. It was also surprising to observe that of the 32 experts interviewed from both the educational and labour market sectors, the great majority of interviewees, 22 experts in total, chose the capacity to *"evaluate data, information and digital content"* as the most important competence that children should possess, followed by *"browsing, searching and filtering data, information and digital content"* (15 experts). In both groups of experts *"collaborating" and "interacting"* through digital technologies, "*managing digital identity*" and "*engaging in citizenship through digital technologies*" were considered among the top-5 digital competences that children should acquire. Among educational experts, "*protecting personal data and privacy*" and "*protecting health and well-being*" were also mentioned as important skills for children to develop. Looking at the choices made by the interviewees, we see a clear

preference for those skills related to the effective retrieval and critical assessment of information. During the interviews, several experts emphasised the importance of critical thinking skills and the increasing importance of being able to comprehend, critically assess and ethically use data, especially in times of information overflow, disinformation and misinformation, especially through social media platforms. Interestingly, *"creatively using digital technologies*" was ranked as a top-5 skill by five educational experts as opposed to only one expert from the labour market. Also interesting to notice was the fact that technical aspects such as *"protecting devices"* or *"solving technical problems"* ranked the lowest among all experts' choices.

Although the experts interviewed came from different countries and across different sectors, they agreed that the workforce in their country was not sufficiently digitally skilled. The experts also referred to strong differences within their countries and across different (economic) sectors. Particularly, IT professionals were deemed as possessing advanced digital skills, compared to the rest of the population. In general, however, the experts interviewed agreed that digital skills and digital literacy will continue to occupy an increasingly important role in people's lives and especially in working life. For this reason, they believed that it is important to continue promoting strategies to educate citizens of all ages from an early age on, paying special attention to vulnerable groups and enhancing existing efforts to minimise the risks of creating new, or exacerbating already existing digital inequalities. This will require much more than the mere access to digital technologies and Internet connectivity. In particular, coordinated approaches, effective collaboration, and strategic partnerships among a wide range of stakeholders and sectors, including policy makers and regulators, governments, the private sector, educational stakeholders, practitioners, and civil society are needed. Consequently, an important challenge for governments these days is ensuring that digital literacy initiatives are meaningful, effective and that they reach all citizens.

The private sector could play an important role in these potential partnerships. Flexible and innovative corporations could serve as a catalyst for broader social advancement in this field, either by providing more incentives to train digital skills or by investing in the education of their employees themselves. We should keep in mind, however, that if the digital skills employment relies on the private economic sector, inequalities could be reinforced as the training that employees might receive would strongly depend on a company's willingness to provide such training as well as on its economic strength and size. Therefore, another challenge identified is creating adequate mechanisms and incentives so that small and medium size companies, but also organisations outside the IT sector, such as non-profit organisations, can offer adequate capacity building opportunities for their employees. Moreover, any involvement of private corporations in educational initiatives involving children and youths needs to be regulated and monitored paying special attention to ensuring that children's rights are fully respected and that children are not exposed to privacy nor commercial risks.

Finally , equally important, is providing opportunities to develop sufficient digital skills and digital literacy to all members of society and this implies thinking as well about those who, for diverse reasons, are not, cannot, or may wish not to be inserted in the labour market. Digital technologies continue to impact more aspects of our lives, including citizenship and participation. Therefore, when thinking about education and training, a big challenge ahead remains devising inclusive approaches to support the development of digital skills and literacy for all.

## 6. Recommendations

In this report, we presented and analysed the views of 34 experts on the role of digital skills of young people. Thereby, we identified positive aspects but also challenges for the development of digital skills in formal, informal and non-formal educational settings and on the labour market in the respective countries. One of the overarching objectives of the ySKILLS project is develop ideas and strategies which will help to further foster education in the area of digital skills and, thus, support children in navigating through a digitally transformed world. We, therefore, conclude this report with a list of recommendations organised by stakeholder group.

### 6.1 Policymakers and Regulators

- **Coherent educational policies in regard to digital skills are needed to ensure that everyone has access and gets the same opportunities to develop their skills.**
  While nearly all European countries already recognised the need for developing digital skills of young people on a national level, these political efforts sometimes remain fragmented and unsystematic. In consequence, the quality of digital education provision is often dependent on the capacities and initiatives of individual schools and teachers which in turn means that not every child receives the same opportunities. Therefore, it is important to create a cohesive, coordinated strategy for the development of digital skills ensuring an even access for all children.

- **Fine-tuning the national school curricula with the realities of young people's lives and the expectations for the future labour market.** The experts we interviewed felt that, in respect to the teaching of digital skills, school curricula often lag behind the developments in the private economic sector and society. Thus, the experiences children actually gather as regards digital technology as part of their daily lives are only insufficiently covered by school curricula. Additionally, especially the labour market experts interviewed felt that the digital skills taught at school do not necessarily match the skills required for being successful on the labour market. Hence, it is necessary to update the national school curricula regularly in order to keep track with accelerated technical advance which continue to change everyday life.

- **More opportunities for all citizens to develop or enhance their digital skills.** Digital skills are vital for successful participation in the labour market which is why decision-makers have a big responsibility in supporting the re- and upskilling of the current workforce. However, it is essential to not limit these efforts to the economic sphere. Digital skills become also increasingly important to fully participate in society and to be active citizens, for instance through a growing trend towards e-government. Hence, the state needs to create lifelong learning opportunities for all citizens, and pay special attention to those groups which are easily overlooked in this context because they do not actively take part in the labour market, for example the elderly or the unemployed.

- **Increased digital skills and training opportunities for teachers.** Digitally skilled teachers are a central prerequisite for the successful development of young people's digital skills at schools. Therefore, digital skills should be part of the continuous teachers' training as well aas an integral part of initial teacher training.

- **Investment in technical equipment is required.** Although access to the Internet is widespread in Europe and the majority of people possess some form of digital equipment, there are still people who only have limited or no access to these technologies. These people face growing educational and social exclusion as digital technologies become a more and more indispensable part of our daily lives. Therefore, there should be a continuous effort to invest in both hardware, especially at schools, and education initiatives to make sure that social inequalities are minimised.

- **There is a need for more initiatives which will help families to offer the guidance their children require regarding digital technologies.** Particularly in families from a socioeconomically disadvantages background, parents often struggle themselves with digital skills. In these families, the roles are sometimes reversed: children teach their parents how to use digital technologies. However, the assumption that young people acquire digital skills easily on their own seems misleading. Therefore, it is important that parents receive enough support to be able to accompany and and guide their children's engagement with digital technologies.

### 6.2 Educators

- **The formal educational sector has a key role in the development of digital skills.** Schools are in a unique strategical position as they are able to reach all children and their families. In order to reduce digital and social inequalities, it is essential to ensure that everyone has access to the training and resources required for advancing their skills. Therefore, schools need to offer thorough digital education. However, they need to be supported in this task. This requires a cohesive overarching framework as well as investment in human capacity and technical resources.

- **Digital education in school should focus on both technical and non-technical aspects.** Children and young people need to know how to use certain digital tools and technologies and understand how they work on a technical level. However, the interviews with the experts showed that digital education cannot stop there. The digital skills children need both as members of a modern society and as future labour market participants are becoming increasingly complex. Comprehensive digital education programmes which cover social interaction, communication and collaboration skills are therefore crucial. Equally, critical thinking skills need to be fostered among young people, so they are able to critically assess and evaluate the vast amount of information and data available to them online.

- **Schools and teachers need to stay up-to-date with technological innovations and trends concerning young people's digital usage.** Our experts often expressed the opinions that schools are slow to adapt to technological or societal changes and that, thus, teaching content and methodologies quickly become outdated. Particularly digital technologies and digital trends, however, are fast-paced. In this contest, it is crucial that schools keep up with these development as, otherwise, they risk to loose touch with the reality of young people's lives and to not offer the necessary guidance for children to fully participate in society. This requires, however, the creation of training opportunities for teachers to update and enhance their skills in the course of their career.

- **A closer coordination of the educational sector with the labour market is necessary to ensure that teaching content and requirements of the labour market are congruent.** Particularly, the interviews with experts of the labour markets showed us that the educational system appears to sometimes fail to reflect the priorities of the labour market. Nonetheless,

equipping youths with necessary skills for their future entry into the labour market should be one of the many objectives of school education. Therefore, there should be more coordination between the formal educational sector and the private economic sector and an open exchange about how youths can be best prepared for their professional lives.

### 6.3 Private economic sector

- **Private companies should invest in upskilling and reskilling opportunities for their employees.** It is important to ensure that people have the opportunity to develop digital skills after they left school. Private companies should, therefore, invest in continuous training for their employees. This will not only benefit the employees but also increase efficiency and quality of work and, thereby, strengthen the company.

- **The private economic sector should cooperate with the educational sector** and thereby help schools to prepare young people for their entry into the labour market. However, it is crucial that these partnerships take place within an ethical framework which respects all children's rights and ensure their safety in a digital environment.

### 6.4 Families

- **Parents should be well equipped to guide their children's online activities.** Digital technologies are already deeply embedded in the everyday life of children and young people. While they expose children to certain risks, digital tools also offer vast opportunities. It is important that parents show interest in the digital activities of their children, communicate openly about potential risks and benefits of these technologies and offer guidance and support as well as regulate the usage of these tools were necessary.

- **Parents need to be aware that they are role models for their children. This includes the use of digital technologies.** Therefore, parents should reflect on their own usage patterns and potential problematic aspects that could negatively impact their own children's engagement with digital technologies.

### 6.5 Children and young people

- **Children should learn to take on an active role in their own education.** The basis for this should be created in schools where children should not only learn how to learn, but also be offered enough opportunities to actively participate in their school community. They, thus, should be taught to embrace the responsibility they have themselves to continue learning and developing their skills in the course of but also after their school education, and, whenever, possible to share their knowledge and skills with peers, for instance helping friends or teaching their younger siblings. Children should also have a more active role in the conceptualisation and development of the digital education aspects of school curricula.

### 6.6 Academic research community

- **The research community should address the increasing complexity of the conceptualisation of 'digital skills' and related concepts which cause confusion among stakeholders outside of the academic sphere.** While the academic research community conceptualises and defines and uses terms such as 'digital skills', 'digital literacy' and 'digital competences' distinctively, non-academic actors tend to use these terms interchangeably, as

witnessed in this report. The lack of common definitions and understandings of concepts increases the difficulty of designing an overarching, systematic strategy for the development of digital skills.

- **The research community should engage in a stronger effort to make their findings more easily available and accessible for a wider audience.** For instance, educators, policymakers and other practitioners working with children could profit from having access to evidenced based recommendations and accessible scientific information about children's digital engagement with digital technologies and the consequences of their use.

### 6.7 Media outlets/journalists

- **Journalists should endeavour to provide a balanced coverage on digital technologies.** While it is highly important to inform the public about potential risks of digital technologies, the media should not one-sidedly concentrate their reporting on negative effects. Instead, the media coverage should present a nuanced view demonstrating also on the opportunities of technical innovations and highlight the importance of digital skills education.

- **The media can also take on responsibility for educating the broader public about digital technologies.** This can be achieved if the media sector takes on a more active role in informing and educating all citizens on the positive and negative effects of digital technologies.

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## Appendix I: List of Experts and Affiliation

| Country | Expertise category | Expert name | Affiliation | Area of expertise |
|---|---|---|---|---|
| **Estonia** | NGO experts/Practitioners | Margit Laidvee | Luunja Highschool | Teacher of English and German |
| | | Henri Liiva | Reach-U | Team Lead |
| | Researcher/scientist | Dr. Kairit Tammets | Tallinn University, School of Digital Technologies, | Head of the Centre for Educational Technology |
| | | Prof. Raul Eamets | Universitu of Tartu | Professor of Macroeconomics, Dean of Faculty of Social Sciences |
| | Policy maker | Heli Aru-Chabilan | HITSA (Information Technology Foundation for Education) | Education innovation, lifelong learning |
| **Finland** | NGO experts/Practitioners | Tuula Pihlajamaa | Tekekniikan Akateemiset (TEK) | Senior adviser, Youth relationships with technology |
| | | Karoliina Nisula | Oy Tawasta OS Technologies | Product developer , project manager and teacher trainer with expertise in ERP systems, educational applications &learning environments |
| | Researcher/scientist | Jarmo Viteli | University of Tampere, Faculty of Information Technology and Communication Sciences | Digital media, E-learning, social media |
| | | Ari Myllyviita | Viikki Teacher Training School, University of Helsinki | Lecturer and experienced educator whith vast knowledge about and experience in the use of digital technologies in schools. |

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|---|---|---|---|---|
| | Policy maker | Saara Salomaa | National Audiovisual Institute (KAVI) | KAVI Deputy Director |
| | | Juha Kiviniemi | Verke, the National Centre of Expertise for Digital Youth Work | Planning Officer, Digital Youth Work |
| Germany | NGO experts/Practitioners | Anonymous | High school in the city state of Bremen | Senior teacher at the school (more than 20 years of teaching experience) and particularly in charge of media and ICT education at the high school |
| | | Daniel Muschinski | hmmh AG | Digital innovation and strategies in e-commerce, online-marketing |
| | Researcher/scientist | Dr. Iren Schulz | University of Weimar, University of Erfurt | Media pedagogy, media literacy education |
| | | Prof. Dr. Jürgen Seitz | The German Association for the Digital Economy (BVDW), | Marketing and digital economy |
| | Policy maker | Uta Brammer | State Institute for Schools Bremen (Landesinstitut für Schule Bremen) | consultant for digital media use and curricula development in schools |
| | | Anna Kaiser | Tandemploy / The German Association for the Digital Economy (BVDW) | Digitization of the economy and labour |
| **Italy** | NGO experts/Practitioners | Sara Brunno | Innovation team at Liceo "O.M. Corbino" Siracusa, Équipe | School teacher and education practitioner focused on school innovation. |

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|---|---|---|---|---|
| | | | Formativa Territoriale Sicilia | eTwinning Erasmus+ |
| | | Donatella Solda* | Future Education Mopdena | Digital literacy education policy-making plus media literacy education |
| | | Stefano Besana | EY | Digital organization strategiest |
| | Researcher/scientist | Prof. Pier Cesare Rivoltella | CREMIT, Faculty of Educational Sciences, Catholic University of Milan | Educational technology |
| | | Michele Faioli | UCSC, Milan | Labor law and industrial relations & Member of CNEL (National Committee for Labour and economy) |
| | Policy maker* | Donatella Solda, who currently runs her own Non-profit organisation, worked formerly for the Italian Ministry of Education and she was responsible for the national plan for digital education. Therefore, we considered her profile/expertise as having both policymaking and NGO expertise. | | |
| **Portugal** | NGO experts/Practitioners | Liliana Silva (F) | Ministry of Education | Secondary school teacher and responsible for Civic Education in the network of school libraries (Ministry of Education). |
| | | António Câmara (M) | yDreams. | Digital Innovation, Founder of yDreams and other digital services and companies |

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|---|---|---|---|---|
| | | Margarida Lucas | Ministry of Education | Member of the task force that adopted the EU framework on digital competencies to Portugal - inCode 2030 Program. |
| | Researcher/scientist | Paulo Dias (M) | Universidade Aberta | Full Professor Educational policy on ICT skills |

## Appendix II: Experts' profiles

Presented below are the short profiles of the experts who took part in the study.

### Estonia

**Education expert 1: Margit Laidvee** (Luunja High school, Teacher). She has been a leader of several international projects on students' digital and media competences. She also uses different digital platforms and environments in her everyday teaching.

**Education expert 2: Dr. Kairit Tammets** (Tallinn University, School of Digital Technologies, Head of the Centre for Educational Technology). She is an expert on educational innovations in schools and technology enhanced learning; she is working on several topical research projects.

**Education expert 3: Heli Aru-Chabilan** (HITSA: Information Technology Foundation for Education, CEO). She leads the foundation that promotes the use of information and communication technology in education.

**Labour market expert 1**: **Henri Liiva** (Reach-U, Team Leader). He has been working as a team, project and product manager in different fields, among them the space sector, e-governance, logistics and healthcare.

**Labour market expert 2**: **Prof. Dr. Raul Eamets** (Universitu of Tartu, Professor of Macroeconomics). He is an academic with extensive experience in advising politicians and decision-making bodies. Thus, he is, among others, a member of Governing Board of Eurofound in Dublin, chairman of Fiscal Council of Estonia (EU Independent Fiscal Institution) and member of the Supervisory Board of BIGBANK. His research interests include labour market and education, youth unemployment, migration, labour market flows, labour market flexibility, flexicurity, efficiency of PhD studies, wage gap, labour market prognoses, productivity and structural changes.

### Finland

**Education expert 1: Ari Myllyviita** (Viikki Teacher Training School, University of Helsinki, Lecturer). An experienced educator who has vast knowledge about and experience in the use of digital technologies in schools. She participates in the research community Maker@STEAM at the University of Helsinki.

**Education expert 2: Saara Salomaa** (National Audiovisual Institute, KAVI, Deputy Director). She is the current deputy director of KAVI. She is a media literacy and education specialist working for the Finnish government to promote media literacy, active citizenship and better media environment for all.

**Education expert 3: Juha Kiviniemi** (Verke, the National Centre of Expertise for Digital Youth Work, Planning Officer)

**Labour market expert 1**: **Karoliina Nisula** (Oy Tawasta OS Technologies, Development Manager and Educator). She holds a master's degree in Industrial Economics and recently obtained a PhD. After working as a lecturer at the Tampere University of Applied Sciences for about 10 years, she now works as product developer and project manager in a small open source IT company that deals with ERP systems and educational applications. In addition, she works as an instructor for learning environments training teachers how to use those systems for education. Her speciality is the software Moddle.

**Labour market expert 2**: **Jarmo Viteli**, (Tampere University, Faculty of Information Technology and Communication Sciences, Research Director). He obtained a doctoral degree in the 1980s in the USA in one of the first programmes in computers education in the world. Since then, he has continued to work on the topics digitalisation and education. In 1990, he established the "Interactive Technology in Education Conference" in Finland.

**Labour market expert 3**: **Tuula Pihlajamaa** (TEKEKNIIKAN AKATEEMISET, Academic Engineers and Architects in Finland TE, Senior Adviser). She graduated from the Helsinki University of Technology with a degree in Civil Engineering in 1996. Currently, she is working as a senior adviser to the organisation TEKEKNIIKAN AKATEEMISET.

### Germany

**Education expert 1: Anonymous** (High school in the city-state of Bremen, Teacher). A senior teacher at the school (more than 20 years of teaching experience) and particularly in charge of media and ICT education at the high school.

**Education expert 2: Uta Brammer** (State Institute for Schools Bremen: Landesinstitut für Schule Bremen, Consultant for digital media use and curricula development in schools). She has more than 20 years of experience in her area of expertise; the state institute is an educational agency by Bremen's Senator for Children and Education (the Senator is equivalent to a Federal State's Ministry of Education).

**Education expert 3: Dr. Iren Schulz** (University of Weimar, University of Erfurt, Lecturer). She is a researcher and lecturer on media skills of children and youth; has more than 10 years of experience in providing workshops on media literacy to parents, teachers, schools and social workers.

**Labour market expert 1.1**: **Daniel Muschinski**, hmmh AG. He studied Cultural Studies and English Language and Literature at the University of Bremen with a focus on media practice. While he was still a student, he started working for Hanke-Multimediahaus (hmmh), an e-commerce agency based in Bremen. There he is currently employed as an account manager.

**Labour market expert 1.2**: **Prof. Dr. Jürgen Seitz, (**Hochschule der Medien Stuttgart, Professor) He is a representative of the BVDW **(**The German Association for the Digital Economy) and a professor in the field marketing, media and digital economy at Hochschule der Medien (University of Applied Science) Stuttgart.

**Labour market expert 2**: **Valentina Kerst**, (Ministry of Economics, Science and Digital Society of the Free State of Thuringia, State Secretary). She is an economist and founder of a digital consultancy firm. Moreover, she has more than 7 years of experience of political policy-making on digital affairs and development. Since 2018, she is State Secretary at the Ministry of Economics, Science and Digital Society of the Free State of Thuringia.

### Italy

**Education expert 1: Donatella Solda** (Future Education Modena, Adviser on (data driven) innovation, IT Law researcher). Previous to her currenty position, she worked at the Ministry of Education and wrote the national Plan for Digital Schools.

**Education expert 2: Anonymous** (Università Cattolica del Sacro Cuore, Professor)

**Education expert 3**: **Anonymous** (Teacher)

**Labour market expert 1: Stefano Besana** (EY, Digital organisation strategiest). Besana is a digital organisation strategist, professor and lecturer.

**Labour market expert 2: Michele Faioli** (Università Cattolica del Sacro Cuore, Associate Professor). He is an Associate Professor specialising in Labor Law and Industrial relationships and member of the CNEL (National Committee for Labour and Economy).

### Poland

**Education expert 1 - Grzegorz D. Stunża** (Media Education Lab at the Institute of Pedagogy of the University of Gdańsk, Assistant Professor). He is an Assistant Professor at the Media Education Lab at the Institute of Pedagogy of the University of Gdańsk. Since 2016, Grzegorz also has served as Vice President of the Polish Society for Media Education. He worked on or coordinated many research projects dealing with digital skills.

**Education expert 2: Dariusz Stachecki** (Feliks Szołdrski Primary School in Nowy Tomyśl, Headmaster). He is a chartered teacher and a headmaster of primary school. He is a member of the Polish Information Processing Society and also Council for Computerization of Education and Teams for Strategy in the Ministry of National Education the subsidiary bodies of the Ministry of National Education. Dariusz actively acts as an animator and propagator of the idea of using ICT in school work. He is the ECDL examiner.

**Education expert 3: Rafał Lew-Starowicz** (Ministry of Education, Deputy Director). He is a deputy director at the Ministry of National Education in Poland, coordinates the educational policy of innovation in Poland. As an employee of the Educational Research Institute, he participated in the evaluation of the "Digital School" Government Programme. He is a Polish delegate to the OECD Education Policy Committee, the European Commission Working Group on Digital Skills and Competences and the Consultative Committee of the "Safer Internet" in Poland, an expert at "Classroom 2.0" Project.

**Education expert 4: Dr. Łukasz Tomczyk** (Pedagogical University of Kraków, Researcher). Research area: media education, educational technology, andragogy, social gerontology. Leader of research projects dealing with digital skills.

**Labour market expert 1: Jakub Chabik (**EPAM Systems, IT Manager and Publicist). Jakub Chabik graduated with a degree in Computing from the Wrocław University of Technology as well as with a degree in MBA studies at Poznan University of Economics / Georgia State University Atlanta. He

has a doctoral degree in Management. For almost 30 years he's been working in international companies in management positions in the IT sector. Currently he works in an international IT company, managing projects in a global environment. His main professional area of interest is information technology management. He is a regular publicist in "Computerworld" and "Wiedza i Życie" monthly.

**Labour market expert 2: Marcin Bochenek** (NASK, Director of Information Society Development Division). He is a graduate of the Jagiellonian University. In the years 1990 - 1993 he worked as a journalist. In the years 2006 - 2009 he was a member of the Management Board of the Polish Television (the national broadcaster) responsible for technological development and internet. Author of numerous articles and papers concerning, among others, new media. Currently he leads the Information Society Development Division of NASK.

### Portugal

**Education expert 1: Liliana Silva** (Secondary School Teacher). She is a teacher of Philosophy and has a large experience of working with students and teachers from different grades in the school libraries and resource centers.

**Education expert 2.1: Paulo Dias** (Universidade Aberta, Full Professor). He is responsible for the curriculum development with a special focus on ICT and digital technologies and was previously the Dean of Universidade Aberta.

**Education expert 2.2: Margarida Lucas** (Universidade de Aveiro, CIDTFF, Researcher). An expert involved with one of the European Commission's JRCs in the development and validation of the European Digital Competence Frameworks for Citizens and Educators (DigComp and DigCompEdu).

**Education expert 3: Francisco Machado** (ISMAI - Instituto Superior da Maia, Psychologist, University Professor). Responsible for the Erasmus+ G-Guidance, he also works on ISMAI initiatives which includes workshops, such as Parents in Tech.

**Labour market expert 1: António Câmara** (Universidade Nova de Lisboa, Engineeer, Full Professor). A serial digital entrepreneur having started three public, he received the national Pessoa Award in 2006, and an EU Entrepreneur of the Year Award in 2008.

**Labour market expert 2: José António Vieira da Silva** (Instituto Universitário de Lisboa, Economist, Guest Professor). He was Minister of Labour (2005-2009 and 2015-2019) and of Economy, Innovation and Development (2009-2011) of the Portuguese Republic.

## Appendix III: Interview Protocol: Educational Experts

### 1. Aims and method

The aim of this interview protocol is to describe the interview structure and the main steps to ensure that all interviews carried out with experts will follow the same methodology and will have the same focus.

The methodological approach chosen are semi-structured interviews with educational experts from the six ySKILLS survey countries, namely, Estonia, Finland, Germany, Italy, Poland and Portugal. The interviews will be carried out by members of the ySKILLS consortium, and/or partners appointed by them.

### 2. Criteria for the interviewees' selection

In every country at least **3 educational experts** will be interviewed. These experts will have a minimum number of years of experience working in the educational sector and should be knowledgeable and/or experienced in the sector they represent, as specified below:

In every country **at least one expert from each of the following groups** must be interviewed:

- **Educational expert 1**: Someone with **10+ years of experience** working in/for the formal educational sector. The expert should be **currently working in the educational sector** or have recently worked there (no more than 2 years ago)**,** I.e. (s)he should be a practitioner. This expert should have plenty of knowledge about the use of digital technologies in schools, in particular among children aged 12 and older. It could be an ICT coordinator, a school management representative in charge of the school digital strategy, an experienced teacher actively using technology in class, the STEM teacher/coordinator, etc. (Minimum 1 interviewee)
- **Educational expert 2**: A person **with profound knowledge of educational policy or curriculum development** with a special focus on ICT and digital technologies, such as a ministry representative, an educational policymaker, a researcher, an expert working at educational agencies with a government mandate. The expert should have **5+ years of experience** in the field, not necessarily working in the same organisation. (Minimum 1 interviewee)
- **Educational expert 3**: A **representative of an organisation, public or private, developing programs/training/educational materials for formal or informal education** around topics related to digital skills, media literacy, digital citizenship, online safety, etc. for students, parents and/or educators. For instance, the pedagogical expert from a Safer Internet Center, a representative of an organisation providing coding camps or after-school digital workshops for children. Ideally, they should have **5+ years of experience** in the field, not necessarily working in the same organisation. (Minimum 1 interviewee)

### 3. Interview Guidelines

- **Interviews will be carried out online using the online platform for which your institution has a data processing agreement (DPA) in place.** The approximate length of an interview will be between 1-1.5 hrs. **All interviews will be audio-recorded.** Therefore, you will need at least **one recording device** per session. Although interviews will be recorded, it is advisable to take notes during the interviews. This will facilitate the analysis and report writing phases

and will also serve as a back-up in case unexpected technical problems may arise. The interviews can be carried in a local language or in English, but the reporting language will be English.

- **Make sure that the devices have enough battery and storage capacity** available to last the whole interview. Before starting each interview, it is advisable to test that the device is working properly and that the audio quality is good enough to listen to the interviews at a later stage.
- Because interviews will be recorded you will have to **inform participants in advance**. Besides, **informed consent should be obtained** from them before the interview starts. Exceptionally, if some respondent requests that their interview is not recorded (and if this respondent cannot be replaced by an equivalent one) the interviewer should take notes, instead. If possible, use two interviewers in these cases, so that one can focus on taking notes and the other one on keeping the conversation going.
- Start each interview by:
    - Thanking interviewees for their collaboration in the ySKILLS project
    - Introducing yourself and/or other interviewers
    - Briefly explaining what the ySKILLS project is about and how the data from the interviews will be used
    - Asking interviewees to briefly introduce themselves.
    - Before you start asking the interview questions, tell participants that you are interested in hearing their views, opinions, experiences and thoughts and ensure them that there are no right nor wrong answers.
- At the end of the interview **thank participants** for their time and invite them to get in touch with you/someone from your team, the WP leader and/or the project coordinator may they have any questions, or may they require further information about the project. Also, tell participants that if they wish, they will be sent a copy of the publication(s) where the findings of the interviews with experts will be summarised. For this reason, they should inform you or the project coordination about any changes in their contact details.
- **Transcribe (key parts of) the interviews**. To facilitate the analysis and reporting processes it is advisable to transcribe the interviews. Nevertheless, considering that not all countries have resources allocated for this task, verbatim transcriptions will not be a requirement.
- Each country shall provide the WP3 coordinator with **a report in English summarising the main findings across the interviews** carried out in their respective countries. To facilitate this task, the WP3 coordinator will provide an interview and a country report template. If no verbatim transcription of the interview will be produced, it is advisable to fill in the interview report right after the interview has finalised or as soon as possible after the interview has finished in order to capture as much information and details as possible. Based on the interview templates, the country reports will be produced.
- **Keep track of interesting quotes** that could potentially be used in future ySKILLS publications by any consortium partner. Given the richness of interview materials, we will create a quotes database that can be accessible by all project partners to enlighten their publications. For this reason, as you carry out and analyse the interviews, make notes of any interesting quote that you believe could be used in future publications or internal reports to

the EC. After all quotes have been collected, we will classify them by topic so that they can be easily searchable.

### 4. Background documents

A number of documents were consulted to develop this interview protocol. In particular, it is advisable to have a look at the DigComp 2.0 as the interviews contain an activity based on this EC framework (1.5.1 Question 4). Note that these reports and articles are only suggested in order to make you well prepared for the interviews. We also suggest you consult relevant national documents such as policy documents or your national digital agenda to be better prepared for the interviews.

- DigComp 2.0: https://ec.europa.eu/jrc/en/digcomp/digital-competence-framework
- Digital Competence Framework for Educators (DigCompEdu): https://ec.europa.eu/jrc/en/digcompedu
- 2nd Survey of Schools: ICT in Education: https://ec.europa.eu/digital-single-market/en/news/2nd-survey-schools-ict-education
- Digital Education Action Plan: https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en
- Manifesto for enhancing digital competences across Europe: https://all-digital.org/manifesto/
- Teachers and technology: Time to get serious: https://impact.chartered.college/article/editorial-education-technology/
- MIT news (2019). What 126 studies say about education technology: http://news.mit.edu/2019/mit-jpal-what-126-studies-tell-us-about-education-technology-impact-0226

### 5. The interview themes

The interviews will focus around five main overarching themes:

| Overarching themes | Key questions to be answered |
|---|---|
| **Conceptualising digital skills** | • How do experts define/describe digital skills? |
| **Core skills needed in the digital age** | • What digital skills do they consider as essential for now and for the future? Why? |
| **The development of digitals skills** | • How are digital skills developed/promoted in each country (e.g., through formal/informal/non-formal education, lifelong training, etc.)?<br>• Which types of actors/stakeholders are involved in this process (e.g., parents/families, educational system, policy makers, the industry, etc.)?<br>• How do different actors (especially families and schools) cooperate in developing students' digital skills?<br>• What is the specific role of (formal) education in supporting the development of digital skills among adolescents? in each of the countries interviewed? |
| **The importance of digital skills as compared to non-digital skills** | • How important are digital skills as compared to more traditional or non-digital skills (e.g., literacy, numeracy or other types of non-digital skills)?<br>• Can digital and non-digital skills be separated/detached from each other? And does this distinction make sense these days? |
| **Digital skills education/training SWOT** | • Considering the current provision of digital skills education available in this country, what are the main strengths, weaknesses/gaps, potential threats and opportunities?<br>*e.g., If the current provision is not accessible to all, what are potential consequences for future employability, for the digital divide, etc.?* |

## 6. The interview questions

### *6.1 Conceptualising digital skills*

1) According to you, what makes a person 'digitally skilled'?
2) In your view, how important (or unimportant) are digital skills for adolescents now and in the future (10-15 years from now)? Why?
3) What digital skills do children, especially adolescents, need these days? Think about different possibilities, such as digital skills to support learning, creativity, civic engagement, etc.
    a. *Encourage participants to reflect beyond technical skills (e.g., soft skills such as communication, critical thinking, etc.).*
    b. *Encourage participants to consider learning in a broad sense, including formal, non-formal and informal learning experiences (e.g., formal ICT classes, coding camps outside school, talking about online safety with parents, learning about new videogames with friends, etc.).*

### *6.2 Core skills needed in the digital age*

1) The following cards contain different digital skills which are contained in the EC Digital Competence Framework 2.1 (DigComp 2.0)
    a. Read the cards (21 competences in total). Would you add any other digital skills to the current list of competences? If so, which ones?
    b. Select the 5 competences, including the ones you may have added, that you consider as the most important to be taught/developed at school. Rank them in order of importance.
    c. In your opinion, why are the selected skills more important than the rest?
    - The Competences Dimension 2 will be presented as individual cards so that participants can easily chose cards and rank them. This will give us an idea of which competence areas they find most important and can open a discussion about the importance of these dimensions:
        i. Information and data literacy
        ii. Communication and collaboration
        iii. Digital content creation
        iv. Safety
        v. Problem-solving
        vi. Other dimensions proposed by the interviewee
2) Think about 15 years from now. Probably new types of jobs will exist, and existing jobs may demand different skill sets. Which skills will adolescents need in the future to succeed in the workplace and be able to fully participate in society?
3) Do you consider digital skills as important, less important or more important than non-digital skills such as literacy and numeracy?

### *6.3 The role of education in the development of digital skills*

1) Do you think that children's development of digital skills is well supported in your country?
    a. *Is the current support/provision (good) enough?*
    b. *What works well? What doesn't work (so) well?*
    c. *What is currently missing?*
2) In which way do children, especially adolescents, develop digital skills in your country?

a. *Make sure to encourage interviewees to reflect both on formal, non-formal as well as informal learning contexts. Explain that by formal education we mean the formal school system (i.e. primary, secondary and tertiary educational levels which lead to a diploma) and by informal/non-formal education any instance outside of schools which could offer children the opportunity to develop their digital skills (e.g., home, educational software, apps, TV programmes, after-school workshops or activities, etc.)*
b. *Encourage participants to think as broad as possible. They may reflect on aspects such as:*
    i. What types of activities help develop children's digital skills?
    ii. From which age do children start developing digital skills in their country? From pre-school, primary school, secondary school, etc.?
    iii. Where are digital skills developed? At school? at home? Somewhere else?

3) *Are digital skills* explicitly covered by the curriculum in your country? Tell us about it.
    a. Are digital skills taught in schools? Give us some concrete examples.
    a. Are there any important differences/gaps among different school levels (e.g., pre-school, primary and secondary school)
    b. Are there any important differences among different types of schools (e.g., public vs. private; technical vs. vocational; rural vs. urban; boys' schools vs. girls' schools, etc.)

*4)* What is necessary for children to develop adequate digital skills at school and out of school?
    a. *Prompt for things such as school infrastructure, knowledgeable teachers/adults/parents, teacher training, clear school policies/rules, after-school workshops, coding or ICT camps, workshops, awareness-raising, etc.*

5) Who is responsible for supporting the development of children's digital skills in your country?
    a. *Encourage interviewees to identify all possible stakeholders/actors involved in this process (e.g., governments, ministries, schools, civil society, the industry, etc.)*

6) Do families/parents also support these efforts?
    a. Are families and/or parents motivated to cooperate with schools in this field? If so, how?
    b. Whether and to what extent do teachers and parents/carers discuss ICT education-related issues and have a dialogue about children's digital skills and literacies? Who initiates these discussions more likely?
    c. Can you give us an example of school and home working together on digital skills development?
    d. To what extent is this kind of cooperation on the public and/or policy agenda? If not very present, what needs to be done to put/keep such cooperation on the public and/or policy agenda?

7) The coronavirus crisis/emergency is affecting countries around the world in unprecedented ways. In your opinion, how is this crisis affecting the educational sector, in particular as regards the use of digital technologies for home-school communication and collaboration?

### *6.4 Digital skills education: Strengths, Weaknesses, Opportunities and Threats*

1) In your opinion, what are your country's main **strengths** as regards digital skills education?
**Note:** Strengths refer to internal factors, i.e. aspects which are under the control of educational actors, such as:
    - *The current provision is universal. All children receive digital skills education through schools*
    - *The quality of the current provision is good*

- *Highly qualified staff able to provide good quality education*
- *Schools are interested in the topic*
- *Schools have adequate infrastructure to support the development of digital skills*
- …

2) In your opinion, what are your country's main **weaknesses or gaps** as regards digital skills education?

   **Note:** Weaknesses refer to internal factors, i.e. aspects which are under the control of educational actors, such as:
   - *The curriculum does not consider (the development of) digital skills*
   - *The current provision is not accessible to all, only children from certain schools or segments of society benefit from such programmes*
   - *The current provision depends on every school/region. Therefore, there are big differences in the offer and quality of digital skills education offered by different schools*

3) In your opinion, what are your country's main **opportunities** as regards digital skills education?

   **Note:** As opposed to strengths, opportunities refer to external factors, i.e. aspects which are outside the control of educational actors, such as:
   - *National, local, EU policies supporting and/or encouraging children's development of digital skills (at school).*
   - *Good collaboration between external stakeholders and schools, such as the police, safer internet centres, the industry, etc.*
   - *Increased public media attention as regards digital-related issues (e.g., fake news, (online) radicalisation, GDPR, online risks, etc.) encourages schools and the educational sector to invest in children's digital skills*
   - *Parents' interest in the topic*

4) Last, what are your country's main **threats** as regards digital skills education?

   **Note:** As opposed to weaknesses, threats refer to external factors, i.e. factors beyond the control of educational actors, such as:
   - *EU or national regulation, such as the GDPR, "scares schools" and make them limit the use of digital technologies, limiting also opportunities to learn or practice digital skills.*
   - *There are plenty of out-of-school opportunities available for children to develop their digital skills, but not all children can afford or have access to such opportunities.*
   - *Most of the out-of-school offer targets boys and older children. This limits the opportunities of girls and younger children to develop their digital skills.*
   - …

### *6.5. Summing up*

From your experiences in working in the [educational sector], is there anything you would like to add?

### *6.6. Thank you*

## Appendix IV: Interview Protocol: Labour Market Experts

### 1. Aims and method

The aim of these guidelines is to describe the interview structure to ensure that all interviews carried out with experts will follow the same methodology and will have the same focus.

The methodological approach chosen are semi-structured interviews with labour market experts from the six ySKILLS survey countries, namely, Estonia, Finland, Germany, Italy, Poland and Portugal. The interviews will be carried out by members of the ySKILLS consortium, and/or partners appointed by them.

### 2. Criteria for the interviewees' selection

In every country at least two labour market experts will be interviewed. These experts will have a minimum of **7 years of experience** working in their sector, although not necessarily in the same function, organisation or company. Less years of experience may be exceptionally possible if the interviewee candidate is knowledgeable enough through demonstrated experience/knowledge in other fields or sectors. A final decision as regards these exceptional cases will be made in consultation with the WP3 leader.

In every country **at least one expert from each of the following groups** must be interviewed:

- **Labour market expert 1**: A person well-acquainted with tech/innovation, ideally someone currently/recently engaged in the industry, services or innovation sector and/or active in a sector where digital technologies are widely used (e.g., online-banking, e-marketing, health industry/sector, etc.). The person should have a good overview of current and future technological trends and of the labour skills required in their sector, but also a broader understanding of the societal impact of digital technologies. We are not looking for someone with a pure technical background, such as a programmer or a software engineer. It is, therefore, advisable to look for experts at management, CEO or Board of Advisors level from tech industry, telecom companies, from R&D or innovation hubs, of organisations representing (high-tech) start-ups, etc.

- **Labour market expert 2**: An expert with a good understanding of broad, more general labour market trends and developments. As opposed to the labour market expert 1, this does not need to be a person with mainly technical knowledge, but rather someone knowledgeable of the labour market in their country. This could be a ministry representative (e.g., Ministry of Labour and employment), an expert on life-long learning and training, a professor or researcher knowledgeable in the area, a representative of a worker's Union association or from a national unemployment agency, etc. This person should have a broader understanding of (general) skills needed across the labour market (in their country) as a whole and not just of digital skills. We expect that an expert knowledgeable and aware of general labour market trends will also, to some extent, be acquainted with digital skills for the labour market.

### 3. Interview Guidelines

- **Interviews will be carried out online using the online platform for which your institution has a data processing agreement (DPA) in place.** The approximate length of an interview will be between 1-1.5 hrs. All interviews will be audio-recorded. Therefore, you will need at least one recording device per session. Although interviews will be recorded, it is advisable to take notes during the interviews. This will facilitate the analysis and report writing phases and will also serve as a back-up in case unexpected technical problems may arise. The interviews can be carried in a local language or in English, but the reporting language will be English.

- **Make sure that the devices have enough battery and storage capacity** available to last the whole interview. Before starting each interview, it is advisable to test that the device is working properly and that the audio quality is good enough to listen to the interviews at a later stage.

- Because interviews will be recorded you will have to **inform participants in advance**. Besides, **informed consent should be obtained** from them before the interview starts. Exceptionally, if some respondent requests that their interview is not recorded (and if this respondent cannot be replaced by an equivalent one), then interviewer should take notes instead. If possible, use two interviewers in these cases, so that one can focus on taking notes and the other one on keeping the conversation going.

- Start each interview by:
    - Thanking interviewees for their collaboration in the ySKILLS project
    - Introducing yourself and/or other interviewers
    - Briefly explaining what the ySKILLS project is about and how the data from the interviews will be used
    - Asking interviewees to briefly introduce themselves.
    - Before you start asking the interview questions, tell participants that you are interested in hearing their views, opinions, experiences and thoughts and ensure them that there are no right nor wrong answers.

- At the end of the interview **thank participants** for their time and invite them to get in touch with you/someone from your team, the WP leader and/or the project coordinator may they have any questions, or may they require further information about the project. Also, tell participants that if they wish, they will be sent a copy of the publication(s) where the findings of the interviews with experts will be summarised. For this reason, they should inform you or the project coordination about any changes in their contact details.

- **Transcribe (key parts of) the interviews**. To facilitate the analysis and reporting processes it is advisable to transcribe the interviews. Nevertheless, considering that not all countries have resources allocated for this task, verbatim transcriptions will not be a requirement.


- Each country shall provide the WP3 coordinator with **a report summarising the main findings across the interviews** carried out in their respective countries. To facilitate this task, the WP3 coordinator will provide an interview and a country report template. If no verbatim transcription of the interview will be produced, it is advisable to fill in the interview report right after the interview was finalised or as soon as possible after the interview has finished in order to capture as much information and details as possible. Based on the interview templates, the country reports will be produced.

- **Keep track of interesting quotes** that could potentially be used in future ySKILLS publications by any consortium partner. Given the richness of interview materials, we will create a quotes database that can be accessible by all project partners to enlighten their publications. For this reason, as you carry out and analyse the interviews, make notes of any interesting quote that you believe could be used in future publications or internal reports to the EC. After all quotes have been collected, we will classify them by topic so that they can be easily searchable.

- In the context of the ySKILLS WP3 interviews, we refer to education and training. Please be aware that by education we generally mean any formal/non-formal/informal education occurring during school years, for children and young people. By training we refer to any further learning after school years, such as on-the-job training, upskilling etc. Please note that the focus of this interview should generally lie on training and life-long learning of (young) adults relevant to their participation in the labour market, rather than formal/non-formal/informal education of children.

## 4. Background documents

A number of documents were consulted to develop this interview protocol. In particular, it is advisable to have a look at the DigComp 2.0 as the interviews contain an activity based on this EC framework (6., Question 4). Note that these documents and articles are only suggested in order to make you well prepared for the interviews. We also suggest you consult relevant national documents such as policy documents or your national digital agenda to be better prepared for the interviews.

- All Digital, "Manifesto for enhancing digital competences across Europe": https://all-digital.org/manifesto/
- European Commission: DigComp 2.0
- European Commission: Skills Agenda for Europe
- European Commission: Digital Skills and Jobs Coalition
- European Commission: Digital Education Action Plan

### 5. The interview themes

The interviews will focus around the following themes:

| Main themes | Key questions to be answered |
|---|---|
| **Conceptualising digital skills** | • How do experts define/describe digital skills? |
| **Core skills needed in the digital age** | • What digital skills do labour market experts consider essential for now and for the future? Why? |
| **The development of digitals skills** | • How are digital skills for the labour market developed/promoted in each country (e.g., initial and lifelong training, upskilling etc.)?<br>• Which types of actors/stakeholders are involved in this process (e.g., educational system, policy makers, the industry, etc.)?<br>• What is the specific role of industry/labour market in supporting the development of digital skills in each of the countries interviewed? Is it related to education? |
| **The importance of digital skills as compared to non-digital skills** | • How important are digital skills as compared to more traditional or non-digital skills (e.g., literacy, numeracy or other types of non-digital skills)?<br>• Can digital and non-digital skills be separated/detached from each other? And does this distinction make sense these days? |
| **Digital skills education/training SWOT** | • Considering the current provision of digital skills training available in this country, what are the main strengths, weaknesses/gaps, potential threats and opportunities?<br>*e.g., If the current provision is not accessible to all, what are potential consequences for future employability, for the digital divide, etc.?* |

## 6. The interview questions

### *6.1 Conceptualising digital skills and core skills needed in the digital age*

4) According to you, what makes a person 'digitally skilled'?
5) What digital skills do (potential) participants in the labour market need these days? Why?
    a. *Prompt for different forms and levels of employment (e.g., employees vs. managerial level or employed vs. self-employed workers).*
    b. *If necessary, prompt for non-digital skills (e.g., soft skills such as communication, critical thinking, work ethics, etc.) and behaviour online (e.g., netiquette or managing social media "wisely" at work).*
    c. *Consider "potential" labour market participants such as graduate students or (temporarily) unemployed people. What is needed for these people to be/remain "employable" these days?*
6) Think about 15 years from now. Probably new types of jobs will exist, and existing jobs may demand different skill sets. Which skills will employees need in the future?
    a. *When discussing digital skills, prompt for potential differences in the needs across different sectors and positions, such as technical vs. services-oriented jobs or lower vs. higher-skilled labour and ask them to reflect on the potential impact of those differences for the future, for instance:*
        i. *How will digital skills affect the employability capacity of some individuals and groups of people? Will people with lower digital skills be left behind?*
        ii. *Will differences in digital skills level among people help augment/diminish the digital divide in your country?*

    **Note:** Even though we are mainly interested in digital skills, this may be a good chance to expand the discussion about the importance of digital vs. non-digital skills. Therefore, try to guide the conversation towards digital skills, but leave some space to discuss other types of skills, if participants bring up the topic themselves.

7) In your view, how important (or unimportant) are digital skills now and in the future (10-15 years from now)? Why?
8) Do you consider digital skills as important, less important or more important than non-digital skills such as literacy and numeracy?
9) The following cards show different digital skills which are contained in the EC Digital Competence Framework 2.1 ( DigComp 2.0)
    a. Have a look at the cards (21 competences in total). Would you add any other digital skills to the current list of competences? If so, which ones?
    b. Select the 5 competences, including the ones you added, that you consider the most important ones for people to participate in the labour market. Rank them in order of importance.
    c. In your opinion, why are the selected skills more important than the rest?

- The Competences Dimension 2 will be presented as individual cards so that participants can easily pick up cards and rank them. This will give us an idea of which competence areas they find most important and can open a discussion about the importance of these dimensions:
    i. Information and data literacy
    ii. Communication and collaboration
    iii. Digital content creation
    iv. Safety

v. Problem-solving
vi. Other dimensions proposed by the interviewee.

10) According to you, is the workforce in your country/sector currently sufficiently (digitally) skilled to actively participate in the labour market and meet its demands?
    a. *Prompt for differences between employees' digital skill levels and differences between groups (gender/generational gaps, etc.)*
    b. *Apart from digital skills, are there any other types of skills that your country's workforce needs to develop more?*
11) The coronavirus crisis/emergency is affecting countries around the world in unprecedented ways. In your opinion, how is this crisis affecting the labour market sector, in particular, as regards the use of digital technologies (e.g., teleworking, etc.)?

### *6.2 The development of digital skills*

2) How urgent do you consider the development of digital skills for the labour market in your country?
    *a. Also keep in mind new/emerging and less traditional job profiles and business models (e.g., AI Business Development Manager, influencers, etc.)*
3) In order for labour market participants to develop the necessary (digital) skills, what needs to be done? What if this is not done?
    *a. If the question is too abstract, prompt participants to think about existing digital skills development programmes/initiatives in their country and to reflect on what is working sufficiently well and what not. In their opinion, what needs to change?*
    b. *Prompt for consequences at individual employee level (e.g., employability) but also the macro societal level (e.g., economic development).*
4) In your country, who is responsible for skills development?
    a. *Prompt for the role of governments/policies.*
    b. *Prompt for the role of formal, non-formal and informal education (e.g., schools vs. life-long learning/training).*
    c. *Does the educational system (including vocational education) respond well to the demands of the labour market?*
    d. *Prompt for the role of industry and for the relation between private business and (public) education institutions.*
5) Does your company (or employers in your country in general) actively support the (continuous) development of digital skills of employees or young people? If yes, how? Can you give us a concrete example?
    *a. Prompt for lifelong learning and the role of upskilling.*
    *b. Prompt for potential difficulties the industry representative might experience within his/her company.*
    *c. If expert is not from industry, prompt for professional development in the private as well as public sector.*
6) In your opinion, what are your country's main **strengths** as regards the development of digital skills?

    **Note**: Strengths refer to internal factors, i.e. aspects which are under the control of industry/companies/employers, such as:
    - *The quality of digital skills training is good*
    - *Highly qualified trainers*

- *Companies are interested in the topic and are willing to invest human, technical and/or financial resources on the development of employees' digital skills*
- *Companies have enough human, technical and/or financial resources available to support the continuous development of digital skills.*
- …

7) In your opinion, what are your country's main **weaknesses or gaps** as regards the development of digital skills?

**Note:** Weaknesses refer to internal factors, i.e. aspects which are under the control of industry/companies/employers, such as:

- *There aren't formalised long-term training programmes for digital skills*
- *There is little knowledge about what digital skills employees currently need or will need in the future and therefore most existing programs are not based on solid evidence/research.*
- *The provision of training is ad hoc. Therefore, there are big differences in the offer and quality of digital skills training employees receive within and across companies/sectors/…*
- *…*

8) In your opinion, what are your country's main **opportunities** as regards the development of digital skills?

**Note:** As opposed to strengths, opportunities refer to external factors, i.e. factors beyond the control of industry/companies/employers, such as*:*

- *Good quality of digital skills training at school*
- *National, local, EU policies supporting and/or encouraging continuous development of digital skills*
- *Enough government investment in the development of digital skills*
- *Increased public media attention as regards digital-related issues encourages employees to actively seek training in these areas*
- *Availability of cheap and good quality training programmes to develop employees' digital skills.*

9) Last, what are your country's main **threats** as regards the development of digital skills?

***Note:*** As opposed to weaknesses, threats refer to external factors, i.e. factors beyond the control of industry/companies/employers, such as:

- *There are opportunities available for continuous professional develop of digital skills but access to these is unequal across sectors/employee groups/geographical location*
- *Certain employees are less likely to take part in continuous training of digital skills (e.g., …)*
- …

### *6.3 Summing up*

From your experience in working at [company/institute] and knowledge of the labour market, is there anything you would like to add?

### *6.4 Thank you*

## Appendix V: Informed Consent Forms

# ySKILLS

## Interviews with educational and labour market representatives

## Informed consent form template for interviewees

You are invited to participate in an interview which is carried out as part of the ySKILLS ("Youth Skills") project. "Youth Skills" (ySKILLS) is a four-year project running under the European Union's Horizon 2020 Research and Innovation Framework Programme as a so-called "Research and Innovation Action" (RIA). It aims to enhance and maximise long-term positive impacts of the ICT environment on the wellbeing of all children.

**You must be 18 years or older to participate in this interview.** Your participation is voluntary. Please take as much time as you need to read this form and the accompanying information sheet. You will be given a copy of this form.

We identified you as an expert in the education and/or the labour market. All experts invited have a minimum number of years of experience working in the educational or the labour market sector and they are knowledgeable and experienced in the sector they represent. Your participation will help us analyse the role of digital skills education both in formal as in informal such as the school or home, as well as the (digital) skills needed in the 21st century to cope with technological transformations in the labour market.

**Purpose of the study**

We are asking you to take part in this interview because we are trying to 1) acquire extensive knowledge and better measurement of digital skills, 2) develop and test a model predicting the complex impacts of ICT use and digital skills on children's wellbeing, 3) explain the ways in which at-risk children can benefit from online opportunities despite their risk factors, and 4) generate recommendations and strategies for key stakeholder groups to promote digital skills and wellbeing.

***The knowledge acquired via these expert interviews will inform future project activities and ultimately be translated into specific digital skills measures and school education recommendations.***

**Procedures**

You will be interviewed by a ySKILLS project partner who will ask you some questions about your opinions regarding the digital skills that youth should possess, if you find the development of these skills important and how these skills are currently being supported or developed in your sector (e.g., education, labour market, etc.). The interview will take approximately 90 minutes and will be carried out online (e.g., via a conference call or chat service) by members of the ySKILLS consortium, and/or partners appointed by them. There will be a maximum of two interviewers present. If a second person is present, he or she will take notes during the interview, but will not participate in the conversation. The interview will be audio-recorded. We will transcribe the recording fully or partly and remove any names.

**Potential risks and discomforts**

There are no anticipated risks to your participation. When you feel some discomfort at responding some questions, please feel free not to answer them. If you decide that you want to stop during the course of the interview, then it is possible to do so at any time, without having to give a reason. Moreover, you have a right to the deletion of your data from the project after the interview has concluded.

**Potential benefits to subjects and/or to society**

You will not directly benefit from your participation in this interview. However, your participation will be valuable to better understand which skills adolescents must possess to knowingly and critically use digital technologies for their wellbeing, education, social life and how they can build resilience against their potential negative impacts. The project will enable new strategies and policy recommendations in this area.

**Payment/compensation for participants**

You will not receive any payment for your participation in this interview.

**Confidentiality**

The data obtained from this interview, such as the interview recording and transcripts, will only be used by ySKILLS members and project partners for analysis and to inform the further project activities described above. It may also be included in possible project reports or research publications. The acquired data might moreover be used in future projects investigating a similar topic to advance knowledge in the area, but never for other purposes, such as economic gain. Everything you say to us is kept confidential.

We will change your name and other identifiable information in publications based on this research. All transcripts of the interviews will be pseudonymised before being shared with the researchers in the ySKILLS project as well as in any ySKILLS project publications, unless explicit permission is obtained from you to share your name and affiliation in ySKILLS publications to acknowledge your participation in the project and/or to be cited in selected quotes from the interview.

**Accessing project outcomes**

The "*Report on the interviews with experts on digital skills in schools and the labour market"* will be sent to you. This report together with all other project-related publications will be publicly available via the ySKILLS project website: https://yskills.eu/

**Participation and withdrawal**

You can choose whether to be part of this interview or not. If you volunteer to participate in this interview, you may withdraw at any time without consequences of any kind. During the interview, you may also refuse to answer any questions you are reluctant to answer, and still remain in the study. You may be withdrawn from this research if circumstances arise which warrant doing so (e.g., conflict of interest).

**Further information**

If you have any questions or concerns about the research, please feel free to contact the national project leader at any time: [NAME] + (EMAIL OF PROJECT LEADER FOR EACH COUNTRY) or the ySKILLS interviews coordinator.

Should you have any complaints or comments about the course of the interview and the procedures it involves in relation to your participation, you can contact the European interview coordinator of the ySKILLS project or the ySKILLS project coordinator. For any complaints or concerns related to ethical aspects of this study, you can get in touch with the Social and Societal Ethics Committee of the KU Leuven. Any complaints or comments will be treated in the strictest confidence.

We hope that we have provided you with sufficient information. We would like to take this opportunity to thank you in advance for your assistance with this research, which we greatly appreciate.

Kind regards,

[signature]

[NAME OF PROJECT LEADER FOR EACH COUNTRY]

Name of institution

Name of Unit or Department

Address

Work phone number

**Informed Consent**

**Please read the statements below and return the completed form:**

- I have been clearly informed about the nature of the research, as described in this fact sheet.
- I understand that my participation is voluntary.
- I understand that I can withdraw at any time without adverse consequences.
- I understand that information gathered will be used for the purposes of the project and may be used for academic articles and conference presentations in pseudonymised form.
- If the research results relating to me are used in publications, or are made public in another way, any data which could potentially be used to identify me, will be pseudonymised in order to safeguard my privacy.
- My personal data (e.g., quotes from the interviews) will be accessible to researchers in the ySKLLS project. In case of joint publications, this data may also be made available to partner institutions or individuals who are not part of the ySKILLS consortium.
- I understand that I will not receive any payment for participating in the interview.
- I agree, fully and voluntarily, to participate in this research.

| | YES | NO |
|---|---|---|
| I have read the statements above and give consent to my participation in the interview. | ☐ | ☐ |
| I agree for the interview to be recorded for the purpose of data analysis and subsequent project-related publications. | ☐ | ☐ |
| I authorise the ySKILLS consortium to share my name and affiliation in ySKILLS publications to acknowledge my participation in the project. | ☐ | ☐ |
| In case quotes from my interview are selected for ySKILLS publications, I authorise the ySKILLS consortium to add my name and affiliation to these quotes. | ☐ | ☐ |

Signed in duplicate:

Name: ……..…

Date: ……

Signature: