DIGITAL SKILLS ASSESSMENT
REPUBLIC OF NORTH MACEDONIA

Acknowledgements:

Disclaimer:

Table of Contents

Introduction

Digital skills are nowadays seen as a key factor in the digital transition of countries, necessary for its success. Strengthening digital skills has therefore become an integral part of national digital transformation strategies. In 2018, the Commission on Science and Technology for Development defined digital skills as "the knowledge and skills a person needs to use ICT to achieve identified goals in personal and professional life."[1] UNESCO defines digital skills as a set of abilities to use digital products, communication applications and networks to acquire and manage information.[2] Digital skills allow people to generate and share digital content, connect and cooperate, and address challenges for effective and creative realization in private and professional life.

The ITU has taken a more hands-on approach to the concept of digital skills and defined three skill levels with a focus on technical competencies or skills:[3]

- *Basic skills*: Basic skills for basic tasks, including hardware, software, and basic Internet operations.

- *Intermediate skills*: Skills that allow people to use technology in more meaningful and useful ways, including professional digital skills, and broaden with the latest technology updates.

- *Advanced digital*: Skills that are required by ICT professionals, such as computer programming and data analysis, including skills related to emerging technologies such as AI, big data, cybersecurity, Internet of Things, and application development, and are acquired through advanced formal education.

Technological advances lead to significant changes in the skills needed in the labour market. The future requires a certain set of digital skills, indispensable for economic development and prosperity of society in any country. Hence, any gaps and deficits in these skills can be seen as a challenge to further progress. Thus, governments must ensure that digital skills development programmes are aligned with citizens' needs and market requirements. Also, governments need to provide an effective and efficient implementation of existing tools and programmes for the citizens to gain the skills they need to lead productive lives and actively join the labor market, including the vulnerable groups such as people with disabilities, women, and girls.

This report is produced by the International Telecommunication Union, in cooperation with the Ministry of Information Society and the Administration of Northern Macedonia, with an aim to determine the current situation with digital skills in North Macedonia.

The scope of the project includes an assessment of basic digital skills in the private sector, start-ups and the education sector, as well as an assessment of current demand for all levels of digital skills across the economy. This assessment excludes analysis of the digital skills in public administration.

The purpose of the assessment is to assess the current supply and demand of digital skills in North Macedonia and to contribute to the development of a digital skills strategy that will meet citizen needs

---

[1] https://unctad.org/system/files/official-document/ecn162018d3_en.pdf

[2] https://en.unesco.org/news/digital-skills-critical-jobs-and-social-inclusion

[3] https://www.itu.int/en/ITU-D/Digital-Inclusion/Documents/ITU%20Digital%20Skills%20Toolkit.pdf

and contribute to further growth of the digital economy and digital society. The assessment will result in a set of explicit and implementable recommendations.

1. Country background

Table 1: Key country indicators

KEY INDICATORS			
Population [2020]:	2.072 million	**ITU Global ICT Dev. Index [2017]:**	Rank 69/176, Score 5.88/10
Population Density [2020]:	83	**Global Innovation Index [2021]:**	Rank 59/132
GDP per capita [2020]:	5,917.0	**Global Competitiveness Index [2019]:**	Rank 82/140
GNI per capita [2020]:	16,316	**Innovation capability (GCI):**	Rank 97/141
Region:	Europe	**Business dynamism (GCI):**	Rank 65/141

The Republic of North Macedonia is an upper-middle income country that has made great progress in reforming its economy over the past decade. The government of North Macedonia has made ongoing efforts to ensure economic growth and a higher standard of living for all.

Economic growth in North Macedonia declined by 4.5% in 2020.[4] In recent years, private consumption has been the main driver of economic growth. However, as a result of restraining measures, it is declining by about 5% each year. In 2020, the level of investment, for example, declined by 10%, although it soon recovered in the third quarter. Public consumption, which increased by more than 10%, partly mitigated the decline in domestic demand. In addition, exports fell by about 10%.

At the same time, agriculture, information and communications technology and real estate showed growth in 2020. The unemployment rate remained almost unchanged, but this was partly a result of people no longer entering the labour market. Due to the COVID-19 pandemic, the activity rate dropped to 56.4%, the lowest rate since 2008.

Economic growth is expected to recover to 3.6% in 2021. This scenario assumes accelerated vaccination, no further blockages, and increased external demand. In the gradual recovery scenario

---

[4] https://www.worldbank.org/en/country/northmacedonia/overview#3

after a prolonged recession, a subsequent rise is expected in 2021, as restored consumer and investor confidence will boost personal consumption, private investment, and exports.[5]

In addition, North Macedonia's Innovation Capability Index increased in 2021 and is 59 among 132 GII 2021 economies, up from 57 in 2020.[6] North Macedonia scores better on innovation inputs than on innovation outputs. It ranks 40th in innovation inputs, higher than in 2020 and 2019. In terms of innovation output, North Macedonia ranks 69th, lower than in 2020 and 2019. According to the Global Innovation Index 2021, North Macedonia ranks 12th among 34 upper-middle-income countries in the world and 35th among 39 European economies.

Therefore, special attention must be paid to skills development, knowledge creation, and effective policies that enable growth. Special attention should be paid to the development of digital skills as one of the main factors for accelerating economic growth. Thus, the country should continue to develop technology, innovation and skills for further improvement.

2. Current state of affairs

Digital technologies provide opportunities for inclusive and sustainable economic growth in all sectors of the economy and society. Digitalization is the main driver of competitiveness, economic development and employment growth. The development of digital infrastructures includes ensuring that all citizens regardless of their location or place of living can use digital opportunities without any technical, organizational and financial restrictions or difficulties.

Since the outbreak the of COVID-19 pandemic, digital development through digital transformation has become ever more important. Enhancing the availability of products and services and empowering citizens, workers, and students in their daily affairs and needs during the lockdown has become a clear priority for all countries, and the ability to take advantage of the progress made in the digital sphere has become an important factor in determining sustainability.

Over the past few years, the electronic communications market in North Macedonia has seen a rapid development due to the opening of the telecommunications sector to competition and the reform of the regulatory system, which has been aligned with the current EU legislation. The speed of development has slowed down since the COVID-19 outbreak but is expected to get back on track shortly.

Eurostat 2019 data shows that 32% of the population had a basic or average level of digital skills, compared to 56% in the rest of the EU-28.[7] Only 29% of Macedonian citizens used the Internet to interact with public authorities, less than half of the EU average (64%).[8] In 2020, 79% of households in North Macedonia had access to the Internet. This is a decrease of 3% over the previous year. The

---

[5] https://www.worldbank.org/en/country/northmacedonia/overview#3

[6] https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2021/mk.pdf

[7] https://ec.europa.eu/eurostat/databrowser/view/isoc_sk_dskl_i/default/table?lang=en

[8] https://ec.europa.eu/eurostat/databrowser/view/isoc_ciegi_ac$DV_515/default/table?lang=en

total proportion of households in North Macedonia with Internet access was the same as in neighbouring countries such as Bulgaria and Greece. In comparison with the average share of coverage in the European Union countries, the coverage in North Macedonia remained low. [9] Additionally, the majority of the population accesses the Internet through mobile devices.

There is a 27% gap between the participation of women and men in the labour market. In the ICT sector, women comprise 27% of the workforce and are represented with only 12% at management positions.[10] Company owners and public sector jobs also see women to be underrepresented.

The government is currently in the process of adopting a new ICT strategy, where one of the main pillars is the pillar for Digital skills. The strategy has been published on the government's online platform for comments from all stakeholders and remains in draft format. This consultation process will help shape the future strategy according to their requirements. Once the text is finalized, the strategy should be approved by the government.

The following points are identified as obstacles to better digital skills level of population in North Macedonia:

- Lack of access or connectivity
- Lack of digital skills for using online services
- Lack of confidence and trust in online services
- Lack of motivation and understanding of the benefits of digital

The National ICT Strategy 2021-2025 focuses on overcoming these and other challenges such as:

- Lack of systematic and continuous curricula throughout the formal education
- Lack of affordable training
- Lack of understanding of the value and advantages of digital skills
- Challenges related to the COVID-19 pandemic

and aims to support digitalization and improve the digital skills level of citizens.

2.1 Vision and strategy

The government of North Macedonia recognizes the importance of digital transformation and its potential impact on the social and economic development of the country. To contribute to the digitalization process and to become one of the digital champions in the region, the Ministry of Information Society has launched the consultation for the Draft Action Plan of National ICT Strategy for 2021-2025.

---

[9] https://www.statista.com/statistics/702236/household-internet-access-in-north-macedonia/

[10] https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/Digital%20Development%20Country%20Profiles/Digital%20Development%20Country%20Profile_North%20Macedonia_%2029.10.21.pdf

The government has established the National ICT Strategy 2021-2025, in order to raise the number of digital citizens, build up digital users, foster digital creativity, and establish partnerships for future jobs.[11] The strategy has four main target groups:

1. Educators and trainers,
2. Citizens,
3. Labour force, and
4. ICT professionals.

The goal of the strategy is to transform these target groups into digital citizens, digital users, and digital creators. These goals will be achieved by creating tools, increasing digital literacy and fostering collaboration; each of these differs depending on the structure in which they are needed (individual level, company and administration level, NGOs). In addition, the strategy will be implemented at the regional and local level, as well as at the national level, depending on contextual needs. The implementation will seek appropriate partnerships with national stakeholders (ICT Forum, ministries, faculties, telecom operators and ICT companies, training organizations, NGOs, etc.) that will be mapped, creating a coalition for digital empowerment.

The Strategy identifies following priorities:

- To adopt a reference framework for governance of digital empowerment.
- To enable every citizen to digitally upskill.
- To provide solid digital knowledge in the education system.
- To reinforce the way the labour force has access to digital upskilling.
- To arrange a favourable environment for professionals in the ICT sector.

Moreover, the government has also established a series of objectives regarding the Digital Skills (2020-2025):

- Provide a national framework for digital skills empowerment consistent with EU and international initiatives.
- Ensure public and private stakeholders' involvement under a common structure such as a national coalition.
- Engage actions focused on the four main target groups – educators and trainers, citizens, labour force, ICT professionals.
- Develop digital skills empowerment in public spaces as means to guarantee inclusiveness especially for underrepresented groups.
- Support dedicated ICT training programs to upskill the labour force and unemployed people.
- Link digital upskilling of civil servants to e-government development in public administrations.
- Support networking activities of ICT professionals as a means to raise digital skills of this sector and retain ICT professionals in the country.

To achieve these objectives, the strategy will be based on three key pillars: infrastructure, resource centralization, digital skills. The objective is to achieve digitalization of citizens, whereby citizens would

---

[11] https://ener.gov.mk/Default.aspx?item=newdocumentdetails&detalisId=23

be equipped with knowledge and skills to communicate and engage with other users and to create and use digital content. Moreover, amongst these "digital citizens", some will be able to use knowledge and skills to use digital technologies in everyday life (digital users), while others will be able to create digital content and tools (digital creators).

The responsible authority for monitoring the implementation of the National ICT Strategy 2021-2025 is the Ministry of Information Society and Administration (MISA). Established in 2008, it is delegated with tasks related to information society, public administration, telecommunication and broadcasting, as well as with training and professional development of state and public officials, organization and implementation of training. In this capacity, MISA has made important steps forward to digital up-skilling:

- The e-Content Development Strategy 2010-2015 was developed by MISA together with MoES, BDE, Academic and Business sectors[12] It covers very generic processes, concepts and guides, and is considered as still valid as content.

- MISA in cooperation with the Employment Service Agency (ESA) for several years in a row provided training or training vouchers for IT topics, aiming to retrain the unemployed with their pre-qualification. The topics included in this initiative were identified and defined together with MASIT and the academic sector.

- The Action Plan of the Public Administration Reform Strategy, in particular, the activity A 4.1.2.5., refers to the development of a training program to improve digital literacy.[13] There is a very initial working version, which needs finalization and implementation. It should cover mapping of the different levels in defined ICT areas with the job positions for the purposes of developing the training programme and its delivery.

- The training Department in MISA is competent and responsible for planning and managing training for administrative servants. It is envisaged for this department to be transformed into a Training Academy.

2.2. Digital Citizenship Model

Digital citizenship involves all vertical groups such as ICT professionals, unemployed persons, educators and instructors, public servants and vulnerable categories. Digital citizenship is developed following the digital inclusion approach.

---

[12] http://mioa.gov.mk/?q=mk/node/1294

[13] http://mioa.gov.mk/?q=mk/node/1587
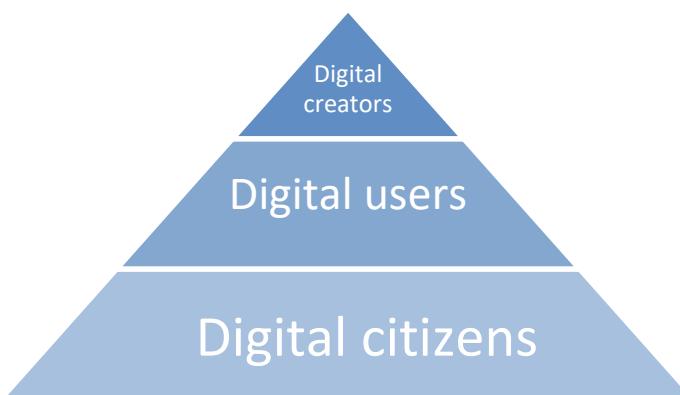
Digital citizens have the knowledge and skills for efficient use of digital technologies in order to communicate with other citizens, engage in society, and create and use digital content.

Digital users are digital citizens who have the knowledge and skills for efficient use of digital technologies in everyday life, professional life, learning or socializing.

Digital creators are digital citizens who create hardware and software digital content, in the form of new digital tools, technologies and resources, while taking care of their implementation, management and maintenance, guided by ethical principles.

See Annex II for main characteristics and digital skillset.

The Government has outlined objectives for digital citizenship:

- Increase the number of confident and secure digital citizens.
- Build up digital users ready to embrace innovative digital tools and technologies.
- Foster digital creativity.
- Partnerships for future jobs.

The Strategy aims to enhance digital skills of communities in line with the Digital Skills Agenda for Europe[14] and the Digital Agenda for the Western Balkans[15]. Digital empowerment of communities involves building ICT infrastructure and equipment, software tools, along with training and digital transformation of service providers. Connecting the components of the digital transition is a priority. The purpose of including digital empowerment of communities as one pillar of the long-term ICT Strategy 2021-2025 is to secure links between all the necessary components of the digital transition. Also, North Macedonia supports other EU initiatives, such as participation in Code Week, as they provide an opportunity for the country to participate and contribute to the digital skills development.

The National ICT Strategy 2021-2025 is a key opportunity for the country to make digital skills improvement a priority. This means that the government will be involved in bridging the digital divide between the part of the population that already lives in the digital world and those who are not yet equipped. Moreover, North Macedonia will address the digital divide in terms of competencies to prepare citizens to work in an environment directly influenced by digital technologies (most jobs in

---

[14] https://ec.europa.eu/social/main.jsp?catId=1223&langId=en

[15] https://www.wbif.eu/storage/app/media/Library/9.Sectors/6.DigitalInfrastructure/2019-Digital-Agenda-for-the-Western-Balkans.pdf

the near future will require some digital skills along with the digital transformation of the economy) and to live in a digitized society (e.g., e-public services, online banking, etc.). In addition, the future economy will require more skilled ICT professionals in all sectors. It is imperative that the Government increases and retains ICT professionals in the country to ensure a positive transformation of the economy and society. Finally, expanding digital skills will benefit everyone regardless of age, gender, physical ability, ethnicity, health, or socioeconomic status, ensuring equal access to digital opportunities.

2.3. Instruments and programmes

The government of North Macedonia is focusing on the following activities in the digital transformation process (Table 2):

Table 2: Activities undertaken towards digital transformation

Digital skills development of the youth	• Encourage digital creativity among young population • Provide online trainings • Distribute free vouchers for online digital training during COVID-19 pandemic
Digitalization of the education sector	• The VET Strategy 2013-2020 and Action Plan "Better skills for better tomorrow" with the focus on both teachers and students • ICT in teaching and learning for developing digital skills of VET students • Digital skills as a key competence for lifelong learning • Online digital skills trainings for primary and secondary school teachers, including video tutorials
Gender and Digitalization	• Improve gender context by encouraging women participation • Reduce the gap between women and men in participation in the labour market • Encourage ICT education for girls
ICT Accessibility	• National Strategy on Achieving Equal Rights for the Persons with Disabilities • Provide accessible information and enabling communication for persons with disabilities • Adapt the educational process depending on the type of disability

Child online protection	• "Privacy Lessons" Project on secure use of social networks for high school students
	• Safer Internet Day
	• Workshops and educational content for parents and children on cyber security;
	• "Red Button", direct phone service to report cybercrimes
	• Support education and promotion of the protection software for safe and responsible use of the Internet
Refugees, asylum seekers and stateless persons	• Digitalization of the registration process
Digital ID	• Digital public services
	• Long-distance, digital-only verification and communication between governmental institutions, citizens, and businesses

2.3.1. Youth support

Substantive efforts have been undertaken by the government to strengthen digital skills development of youth. The Government focuses on skills development and creativity for the young population. One of the measures for support due to the COVID crisis was to give vouchers to young people (not older than 29 years of age) for digital skills training. During the summer of 2020, 2500 young persons received vouchers for training provided by digital education companies, and the project is ongoing.

2.3.2. Education sector

The education sector is one of the most robust and complex systems in the country, encompassing over 256,000 students and 28,000 teachers in K-12 public schools, along with few hundreds employees in the Ministry of Education and Science and numerous other government institutions, including the Bureau for Development of Education, Center for VET, Center for adult education, State Education Inspectorate, etc.

Nevertheless, the COVID-19 health crises has demonstrated that it can swiftly re-prioritize its operations and develop and implement a National Platform for Digital Learning (Digital Education Platform), thus ensuring an uninterrupted educational process in most difficult of times. The Digital Education Platform has greatly accelerated the process of digital transformation of the education sector by setting an overall digital ecosystem that ensures uniform standards and consistent practices for online synchronous and asynchronous teaching and learning across all public schools nation wise, provides training to all K-12 teachers and learners and supports them with creation and sharing of digital teaching materials. Despite the numerous challenges along its implementation, the Digital Education Platform has significantly enhanced the quality and inclusiveness in education and has

supported acquisition of digital competencies by teachers and students, thus making some of the existing policy documents obsolete.

Namely, in an absence of Digital education strategy or other high-level policy document that would specifically serve the process of digital transformation of the education sector, different aspects of this domain, i.e. enhancement of digital competences of teachers and students, development of digital infrastructure and schools' digital capacities etc. are addressed in various other policy documents of a general, sectorial nature.

Digital literacy and ICT in schools is incorporated as a topics in the Education Strategy 2018-2025 and Action Plan (2018). The document has a much broader objective of supporting students develop critical thinking and become active citizens, nevertheless, this process requires a set of competences, including ICT and digital competences. Hence, the Strategy defines ICT and digital literacy as one of the five general topics related to the overall education system and specifies it as Priority III: *Ensuring widespread use of ICT in education and training and digital literacy*. The outcomes of this priority, along with the measures, activities and indicators, are further specified in *Pillar 7* of the Action Plan to the Strategy, and include: increased number of ICT-related curricula; upgrading schools' ICT infrastructure; enhanced use of ICT in teaching and learning processes; promoting ICT events and career fairs; holding MOOCs at high schools and colleges; development of an electronic platform for teaching, learning and sharing of methodological resources, etc.

Digital skills in the education sector are also mentioned in the Strategic Plan of the Ministry of Education and Science for 2019-2021, in which *Investment and development of digital skills* is defined as one of the goals within the priority *Reforms in primary and secondary education and improving the student standard*. Certain aspects of digital education are also regulated with the Lifelong Learning Strategy 2017-2020, which aims to improve lifelong learning by modernizing the systems of vocational education and training and adult education. Another sectorial document - VET Strategy and Action Plan 2013-2020 "Better Skills for a Better Tomorrow", promotes the digital skills as a key competency for lifelong learning and stimulates development of digital skills in VET students. Various initiatives are designed to support this process, such as the E-School initiative that aims to assist VET teachers in using digital tools in their teaching practices. Further, the ICT Implementation Council for Primary and Secondary Schools is tasked with activities aimed at further integration of ICT in education institutions. This includes supplying schools with digital tools and more effectively incorporating ICT in the teaching programs and curricula.

Timely and comprehensive implementation of the ambitious goals of the different strategic documents outlined above requires a close collaboration and strong support from private partners. Hence, various incentives are being designed to encourage partnerships with the private sector in designing scholarship programs to attract young talents to the ICT industry, developing accelerated learning programs and courses, and in cost-sharing of education through sponsorship and donations.

2.3.3. Gender divide

The Government adopted a national action plan to implement the Istanbul Convention and a national action plan for gender equality for 2018-2020. There is a 27% gap between women and men in

participation in the labour market.[16] This gap is reinforced in the ICT sector, in particular in senior and management positions, which sees a gender ratio of 80% men to 20% women. Such divides are rooted in the education system with substantially less women pursuing degrees in STEM. Women comprise only 27% of the IT workforce, hold only 12% of management level positions and are underrepresented as owners of companies and in public sector jobs.

In order to tackle this issue, the government adopted a Convention and a national action plan for gender equality (2018-2020) and established a venture fund of EUR 10 million that includes gender equality as part of its priorities and is mandated to invest in early-stage start-ups, accelerators and other innovative programs. Additionally, support is offered by organizations like the Women in Tech Macedonia Chapter, through programmes that seek to educate, equip and empower women and girls with the necessary skills to succeed in STEM careers.[17] The Macedonian Chapter of women in tech has also organized a boot camp for first women entrepreneurs. Additionally, the Government has launched a national gender equality index, which allows comparison of the country's performance with other EU countries.

2.3.4. ICT Accessibility

When it comes to ICT accessibility, North Macedonia has achieved several key milestones in building a legislative framework for digital inclusion and ICT accessibility. The country has adopted the National Strategy on Achieving Equal Rights for the Persons with Disabilities, which among others, emphasizes the need to provide accessible information and enabling communication for persons with disabilities, and the provision of appropriate materials in the educational process depending on the type of disability.[18] In 2018, the country adopted the Public Administration Reform (PAR) Strategy and Action Plan 2018–2022,[19] in which one of its key objectives is to provide public services in a fast, simple and easily accessible way. [20] Yet, substantive efforts are required at the country level to meet the requirements of the European Union on the European Accessibility Act. [21] Non-government organizations and other relevant partners are the primary catalysts for the improvement of ICT accessibility.

Among successful initiatives implemented with their support are: e-accessible education, active inclusion in mainstream schools, and collaboration among museums in the Balkans to develop accessibility. Text to Speech Synthesis software for the Macedonian and Albanian languages has been

---

[16] https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/Digital%20Development%20Country%20Profiles/Digital%20Development%20Country%20Profile_North%20Macedonia_%2029.10.21.pdf

[17] https://women-in-tech.org/mk/

[18] https://www.un.org/development/desa/disabilities/wp-content/uploads/sites/15/2019/10/North-Macedonia_National-Strategy-on-Achieving-Equal-Rights-for-the-Persons-with-Disabilities-in-the-Republic-of-Macedonia-2010-–-2018.pdf

[19] https://mioa.gov.mk/sites/default/files/pbl_files/documents/strategies/ap_for_pars_2018-2022_april2018_eng.pdf

[20] https://mioa.gov.mk/sites/default/files/pbl_files/documents/strategies/par_strategy_2018-2022_final_en.pdf

[21] https://ec.europa.eu/social/main.jsp?catId=1202

developed by UNDP and Ministry of Labour in partnership with the National Association of Blind, to help blind people, people with visual impairments, persons with dyslexia and learning difficulties supporting their independent functioning in the society.[22] Another initiative to be implemented by the end of 2021, aims to offer reliable information and tools for sexuality education that meet the needs of children and youth with autism spectrum disorder.[23]

2.3.5. Child online protection

The efforts to prevent violence against children are included in the 2020-2025 Digital Skills Strategy and the Action Plan for 2020-2022 to prevent violence against children. A yearly Safer Internet Day was organized by the Ministry of Information Society and Administration and the Metamorphosis Foundation to raise awareness on these matters. [24] Besides, a number of initiatives have been introduced by various national stakeholders. One such initiative is the "Privacy Lessons" project. It contains recommendations on the safe use of social media, such as preventing hate speech.[25] The project is aimed at high school students and has been implemented in 21 schools. In addition, various institutions offer direct phone numbers for people to report cybercrimes. The Ministry of Interior has created a Red Button service, and the government maintains a website aimed at educating and promoting protective software for safe and responsible use of the Internet.[26] However, these efforts could benefit from better coordination to ensure broader impact.

2.3.6. Refugees, asylum seekers and stateless persons

Refugees, asylum seekers, and stateless persons are not included in the various national assessments on digital inclusion. However, digitalization of registration procedures for refugees and asylum seekers would ease the transition process and remove obstacles such as language barriers. Asylum seekers and stateless persons do not have an identity card, resulting in limited access to SIM cards and mobile financial services. Also, often they lack digital skills to use existing e-services.

2.3.7. Digitalization of the state administration

Furthermore, the Ministry of Information Society and Administration is currently working on the digitalization of the state administration, through the establishment of the Agency of Digitalization. It is the institution of the Unique National Electronic Registry of Regulations, which would include existing regulations, notifications of preparation of draft law, reports and documents; the fostering of open data, both for the innovation of services and to enhance accountability and transparency of the public sector – ultimately to form an information society; the creation of a Learning Management System for all civil servants; the increase of Interoperability amongst registers and databases of different government bodies; the development of trainings, both offline and online.

2.3.8. Digital ID

---

[22] https://www.mk.undp.org/content/north-macedonia/en/home/presscenter/pressreleases/press-releases-2021/text-to-speech-app-announcement.html

[23] https://www.unfpa.org/updates/app-help-young-people-autism-learn-about-their-bodies

[24] https://www.mioa.gov.mk/?q=en/node/2323

[25] https://dzlp.mk/en/node/3060

[26] http://redbutton.mvr.gov.mk

North Macedonia is one of the first Balkan countries which introduced a nationwide digital ID, offering various digital public services to the citizens.[27] It facilitates verification and communication between government agencies and citizens, as well as the country's long-distance businesses, only in digital format. It allows people to acquire documents from government agencies, remotely open a new bank account or obtain a prepaid or postpaid cell phone account. This initiative is part of a long-standing national effort to introduce e-government solutions in North Macedonia.

3. Stakeholders

This section indicates the stakeholders that supported the process of digital skills assessment by participating in the online self-assessment survey and in individual interviews.

Due to ongoing regional initiatives for assessment of the level of digital skills of the public servants, the public administration sector has not been included in this assessment.

3.1 Private sector

A significant number of private companies have been invited to participate in the digital skills assessment survey by disseminating the online questionnaire to their employees. The companies have been identified with the support of three business associations in the country, namely the Chamber of Commerce of North Macedonia, the ICT Chamber of Commerce, and the Macedonian Chambers of Commerce (Chamber's ICT division). As a result, 602 employees from these companies took part in the self-assessment survey by filling in the online questionnaire.

In parallel to the administration of the online survey, a number of companies have been invited to participate in individual interviews for identifying the current market demand for digital skills in different industries. Individual interviews were conducted with 17 companies listed in Table 3.

Table 3: List of companies that participated in the interviews

#	Company	Sector
1.	Comfy-Angel	Textile
2.	Kromberg and Schubert	Automotive manufacturing
3.	NLB Banka	Banking & Finance
4.	Rade Koncar TEP	Electromechanical
5.	Makedonski Telekom AD	Telecommunication
6.	Halkbank	Banking & Finance

---

[27] https://therecursive.com/among-the-pioneers-in-see-north-macedonia-officially-introduced-digital-ids-to-its-citizens/

#	Company	Sector
7.	Alkaloid	Manufacturing of drugs, cosmetic and chemical products
8.	Veze Sharri	Agriculture
9.	Semos	Education
10.	Stopanska banka AD	Banking & Finance
11.	Eurolink Insurance Inc.	Insurance
12.	Komercijalna Banka AD	Monetary intermediation
13.	Zavar	Metal processing
14.	INBOX Archive & Datacenter	Documents management services
15.	Grant Thornton	Accounting and auditing
16.	Ultra DOO	IT
17.	Sparkasse Banka	Banking & Finance

3.2 Start-ups

The start-up sector is at the developing stage in North Macedonia. A number of start-ups participated in the digital skills assessment survey by filling in the online questionnaire. The questionnaire was disseminated by the Fund for Innovation and Technological Development to the start-ups that have been financially supported by the Fund in recent years. As a result, 16 responses were received.

3.3 Education sector

Education sector has an indispensable role to play in raising digitally literate citizens. Hence, it has been identified as one of the key sectors for evaluating the proficiency of employees' digital skills. Number of primary and secondary public schools from across the country participated in the digital skills assessment survey. The online questionnaire was distributed to the schools' principals through the network of school administrators governed by MISA. Survey responses were received from 201 teachers.

4. Methodology

The digital skills assessment was carried out by using the self-assessment approach, which allows measuring of the digital skills by asking participants to rate their own level of knowledge, ability, confidence or usage in the digital domain.

It was administered by using two different methods. A **self-assessment survey** was used to measure the level of *basic* **digital skills** of the employees in the selected sectors, while the method of **individual interviews** was used to identify current demand for *basic, intermediate* **and** *advanced* **digital skills** across various industries.

The assessment process involved several phases:

1. **Desk research**, which aimed to depict the current state of affairs within this domain in the country, including accomplishments, ongoing projects and initiatives.
2. Designing, disseminating and conducting an **online self-assessment survey** for the employees in the specified sectors.
3. Conducting **individual interviews** with top-management representatives from selected companies.
4. Processing and interpreting the collected data in **basic findings**.
5. Drawing **conclusions** from the findings, relevant to the purpose of the assessment.
6. Developing **recommendations** that will support the country's future digital agenda.

4.1. Limitations of the Methodology

It has to be noted that this assessment is based on the sample's self-assessment, and there are no objective KPIs or third party evidence based evaluation processes for evaluation used. For the purposes of preventing, to the extent possible, the risk of not understanding or misunderstanding the questions, the self-assessment questionnaire was tested before it was released online. The same procedure was applied to the questionnaire used for the individual interviews.

Nevertheless, due to the limitations associated with self-assessments in general, the collected responses may not accurately and objectively reflect the actual level of digital skills of the individuals participating in the online survey. This limitation was taken into consideration in the process of analyzing the collected data, interpreting the results and in drawing the conclusions.

Regarding the one-on-one interviews, the validity of the analysis relies on the honesty and openness of the responders. Some of the interviewees, upon their request, have received the interview questions in advance to the interview. This has given them time to sufficiently prepare for the interviews, however, it could have been also used as an opportunity to prepare "nice-to-hear" or indirect and/or general answers.

4.2. Interviews

The process of preparing for and holding individual interviews with top-management representatives from the selected companies involved several steps:

- Designing the **interview template** (Interview Questions in Annex III).

- Identifying the **target sample** of companies for individual interviews and scheduling interviews with the representatives from each of the companies that have accepted the invitation to participate in the assessment. A separate interview session was scheduled with each of the interviewees. The sessions were held online via Zoom and lasted around 30 minutes each.

4.3. Survey

The process of conducting the online self-assessment of digital skills of the employees in the targeted sectors involved several steps, as follows:

- Developing and testing a **Self-assessment questionnaire** (Questionnaire in Annex IV). The questionnaire was anonymous, with its data protected and used only in the framework of this assessment.

- Identifying the **target sample** of companies, start-ups, and schools for disseminating the questionnaire to their employees. The selection of companies was done with the support from the business associations in the country, while the Fund for Innovation and Technological Development helped identify the start-ups, and the IT administrators from the public primary and secondary schools were engaged in identifying participatory schools.

  The following **criteria** was used for selecting the target sample:

  - For the **companies**: production and services-oriented companies; tech and non-tech companies; large and small companies; targeting mainly local customers, export-oriented companies or both; companies with their central offices in the larger cities or in rural areas in the country;

  - For the **start-ups**: the questionnaire was disseminated by the Fund for Innovation and Technological Development to the most prominent start-ups that have received a financial support from the Fund in recent years;

  - For the **schools**: primary and secondary public schools; schools in urban and rural areas; vocational secondary schools, general gymnasiums, and mixed schools; large schools and small schools (by number of students); schools with one and schools with two or more languages of instruction.

- The questionnaire was published online for 14 days and data was collected. There were three separate copies of the online questionnaire prepared for each of the target groups, namely for the employees in the companies, employees in the start-ups and for the school teachers.

4.4. Questionnaire and methodology of processing and interpreting collected data

The questionnaire includes three segments of questions: **general** questions**, technology** questions and **digital skills-related** questions.

The **general** questions refer to the age, education level and occupation of the respondents, as well as to the digital skills training they are provided with at the workplace. There is a mix of open-ended and closed-ended questions in this segment of the questionnaire, designed in the format of demographic questions, as well as Yes/No and multiple-choice questions.

The **technology** segment of the Questionnaire includes questions on the types of digital devices used by the respondents and the frequency of their use, the level of knowledge and skills in utilizing individual digital devices as well as the Internet connectivity at home. Several different formats of questions were used in this segment, such as: multiple-choice, Yes/No, and a series of 4-point Likert scale questions as matrix questions.

The **digital skills-related** segment of the Questionnaire consists of five (5) clusters of questions that reflect the **digital skills competence areas** included in the Digital Competence Framework for Citizens (DigComp), namely:

- *Information and Data literacy*,
- *Communication and collaboration*,
- *Digital Content creation*,
- *Safety*, and
- *Problem solving*.

The questions in this segment are designed as closed-ended questions in the format of Yes / No questions, or as multiple-choice (4-point Likert scale) questions with the following predefined answers: "Not at all", "Little", "Well" and "Advanced user".

Foreseen to take around 20 minutes to respond to the questionnaire, it took respondents from 4 to 51 minutes to answer it, or on average 16 minutes.

For the purposes of this assessment, the responses to the **digital skills-related questions** were subjected to further data processing and analysis.

Each possible response was being assigned points as presented in Table 4.

Table 4: Points assigned to each predefined answer to the closed-ended questions:

Answer	Points
"Yes"	2
"No"	0
"Not at all"	0
"Little"	1
"Well"	2
"Advanced user"	3

The total number of questions, as well the number of Yes/No and multiple-choice questions, in each of the 5 digital competence areas is presented in Table 5. The far right column shows the maximum points per competence area, derived by multiplying the number of questions (Yes/No and multiple-

choice) with the points presented in Table 4. The minimum score remains the same across all of the competence areas, and it is 0.

Table 5: Number of different questions and maximum possible scores per competence area

Competence area	Total number of questions	No. of Y/N questions	No. of multiple-choice questions	Max scores per competence area
Information and Data literacy	4	2	2	2 x 2 + 2 x 3 = **10**
Communication and collaboration	10	5	5	5 x 2 + 5 x 3 = **25**
Content creation	4	1	3	1 x 2 + 3 x 3 = **11**
Safety	4	4	0	4 x 2 = **8**
Problem solving	4	3	1	3 x 2 + 1 x 3 = **9**

The scores calculated per competence area are further translated into four proficiency levels of digital skills, as presented in Table 6.

Table 6: Translation of scores per competence area into proficiency levels of digital skills

Proficiency Level Competence areas	No skills	Low	Basic	Above basic
Information and Data literacy	0 - 3	4 - 5	6 - 8	9 - 10
Communication and collaboration	0 - 8	9 - 15	16 - 20	21 - 25
Content creation	0 - 3	4 - 6	7 - 9	10 - 11
Safety	0 or 2	4	6	8
Problem solving	0 - 2	3 - 4	5 - 6	7 - 9

Proficiency Level Competence areas	No skills	Low	Basic	Above basic
Assigned grades	1	2	3	4

Each proficiency level of digital skills, from "No skills" to "Above-basic", is assigned a grade from 1 to 4, respectively, as presented in Table 6.

The overall score across all the competence areas is calculated by summing up the scores in all of the 5 competence areas, and is interpreted by using the ranges presented in Table 7.

Table 7: Ranges for Overall score

Proficiency Level	No skills	Low	Basic	Above basic
Overall score	5 - 9	10 - 13	14 - 17	18 - 20

5. Report findings

5.1. Findings from the Interviews

The individual interviews, held with the top management from the selected companies, served to assess the current labor market demand - both met and unmet - for various types of digital skills, at different levels of proficiency (*Basic*, *Intermediate* and *Advanced*).

The data gathered in the interviews reflect employer perceptions of the digital skills requirements in various industries, of the most-pressing digital skills gaps in the labor market, as well as of the measures and tools which may assist in effectively addressing the current digital skills shortages (Interview questions in Annex III).

The method of thematic analysis was used to identify patterns and most frequent themes across the conducted interviews.

The analysis shows that various office management and business specific digital skills are being required for working at various positions in the interviewed companies. The levels of proficiency of the needed skills range from basic to advanced digital skills. Mostly **reported *Basic* digital skills** refer to the skills and competencies needed for effectively using the MS office tools, communication and collaboration tools (E-mail, and videoconferencing platforms such as Zoom, MS Teams, Google Meet), search engine, and content management; ***Intermediate* skills** are required in advanced excel, social media management /digital marketing, and graphic design; while ***Advanced* skills** refer to the required skills in computer programing, database administration, software development, information security, application development, AI, data analytics and business intelligence.

Out of these required **skills, most commonly lacking** in candidates are the basic digital skills for using search engines, communication and collaboration tools and MS Excel, as well as the advanced skills in computer programing, information security, AI and data analytics.

The **shortages** of these skills in the labor market are perceived to be **related to the lack** of practical training within the formal education and the gap between the curricula and the market needs, the competition for skilled labor coming from foreign markets, brain drain and intergenerational gaps in digital skills.

Companies try to address this challenge by **deploying a range of measures**, such as: in-house and externally provided training, mentorship programs and peer to peer learning, collaboration with universities for more closely matching the curricula with the labor market needs, attracting and training students through internships, as also outsourcing IT services to external providers of services.

Most **companies propose** an enhanced dialogue between the educational institutions and the private sector, expanded internship programs, and public incentives for IT personnel to stimulate their increased engagement with local companies, as public policies and measures that have the potential to most effectively address the digital skills gap in the private sector.

All of the interviewed companies assign **high value to provisioning digital skills training** to their employees. Most of them provide it at least once per year, some companies organize training on employees' demand, while some go even further and develop individual training plans for each of the employees, on a yearly basis.

All of the interviewees responded that they have access to digital skills training that is affordable and relevant to the needs of their employees.

5.2. Findings from the Survey

In total, **819** responses to the online digital skills self-assessment survey have been received, as recorded by the survey tool.

Out of the total number of responses, **38** contain answers only to the **general questions**, i.e. lack answers on all **digital skills-related** questions**;** these "empty" responses are not taken into consideration for the purposes of this analysis.

The remaining **781** responses represent the pool of data used for processing and interpretation of findings (Table 8).

Table 8: Number of collected responses on the digital skills survey

Number of responses:		
Total	**"empty"**	**Subject of analysis**
819	38	**781***

*It should be noted that some of the responses that are subject of this analysis are lacking answers to some of the questions. The number of unanswered questions has been duly noted in the findings

under each of the digital competence areas, and their contribution to the results has been analyzed accordingly.

5.2.1. Findings from the General questions

The **General** segment of the Questionnaire provides data that refer to the respondent age, level of education and occupation, as well as to the frequency of digital skills training they are provided with at the workplace.

The analysis of the collected data per sector of employment of the respondents show that the vast majority, or three quarters of the respondents, are employed in the business sector, including startups, while one quarter of them work in the education sector (Table 9).

Table 9: Number of survey responses per sector of employment of respondents

Per **sector of employment** of respondents:			
Companies	**Startups**	**Schools**	**Total**
568	**16**	**197**	**781**
72.8%	**2.0%**	**25.2%**	**100%**

Figure 1: Number of responses per sector of employment
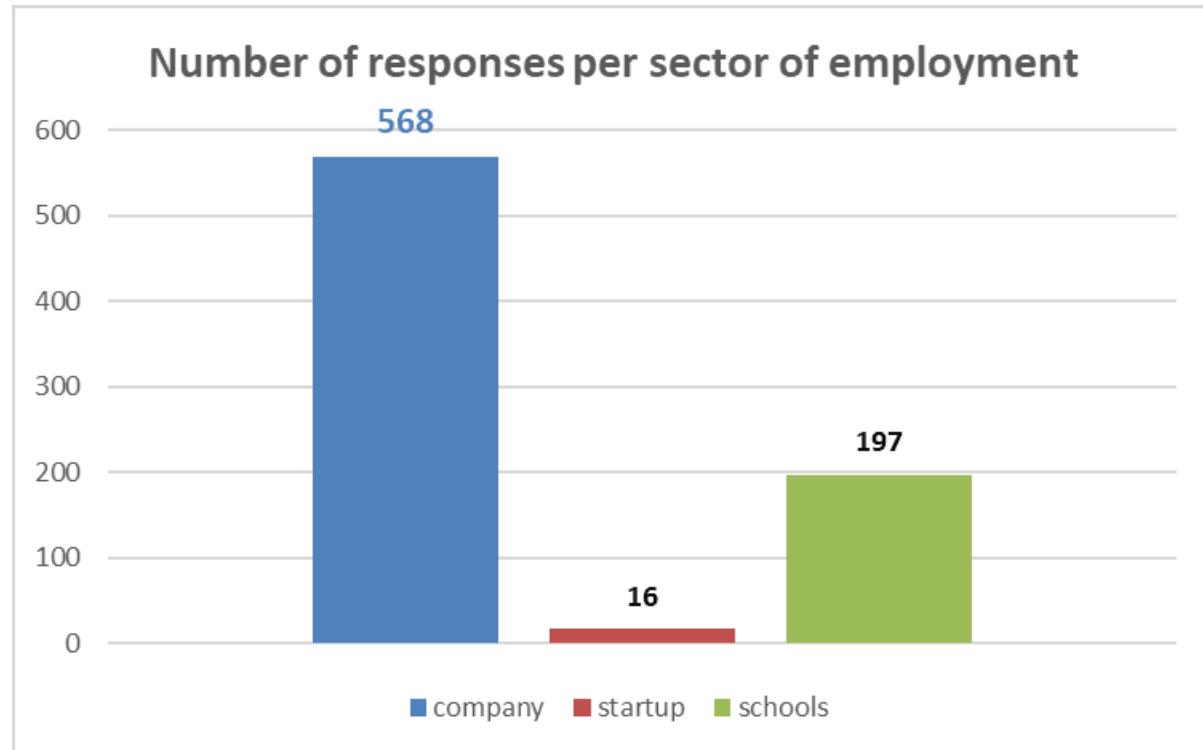
Most of the respondents (39.2%) are between 35 and 44 years of age, representing a group with significant work experience and in the middle of their professional life. Lowest number of the

respondents (3.3%) are at an age between 18 and 24 years, being at the beginning of their career (Table 10).

Table 10: Number of survey responses per age of the respondents

Per **age of** respondents:				
18 - 24	**25 - 34**	**35 - 44**	**45 - 54**	**55 - 64**
26	232	**306**	165	52
3.3%	29.7%	**39.2%**	21.1%	6.7%

Figure 2: Number of responses per age of respondents
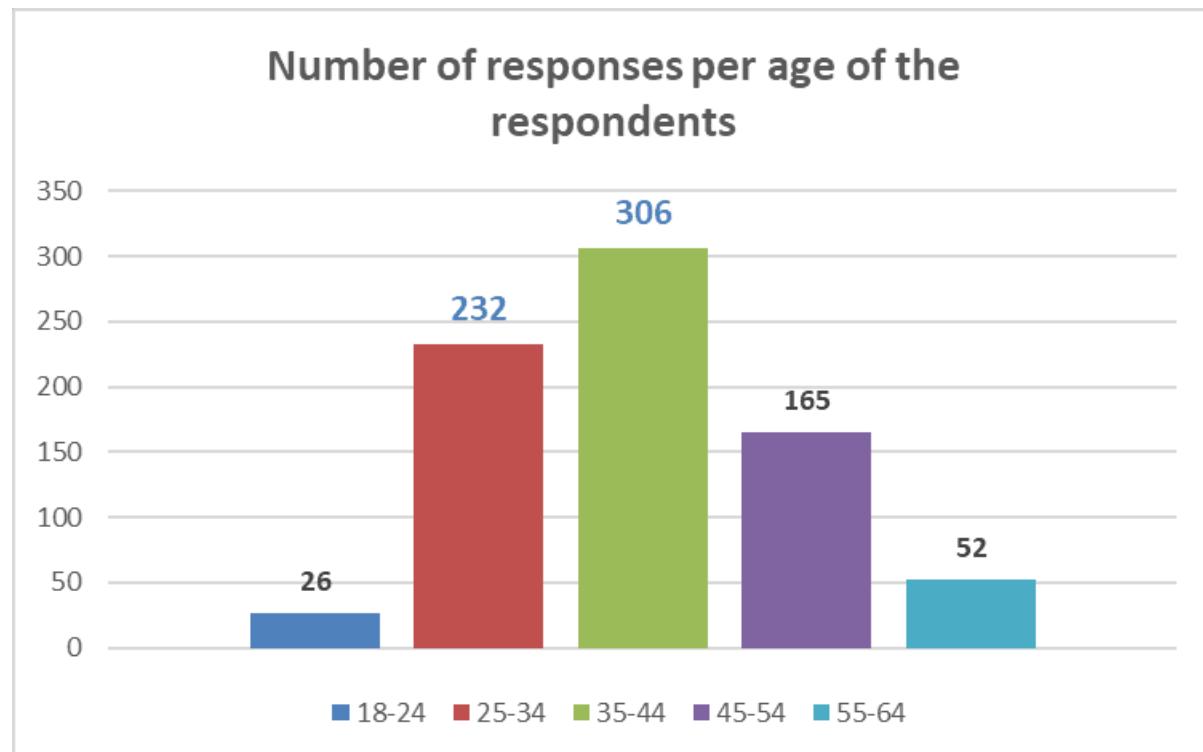
Analyzed by level of education, data show that most of the respondents have acquired a bachelor degree (69.1%), followed by those with a master degree (18.0%), a secondary (general or vocational) education (10.5%), and a PhD (2.3%) (Table 11).

Table 11: Number of responses per academic degree of respondents

Per **highest academic degree** of respondents:					
General secondary	**Vocational secondary**	**Bachelor**	**Master**	**Doctorat (Ph.D.)**	**Not answered**

education	education				
56	26	**540**	140	18	1
7.2%	3.3%	**69.1%**	18.0%	2.3%	0.1%

Figure 3: Number of responses per academic degree
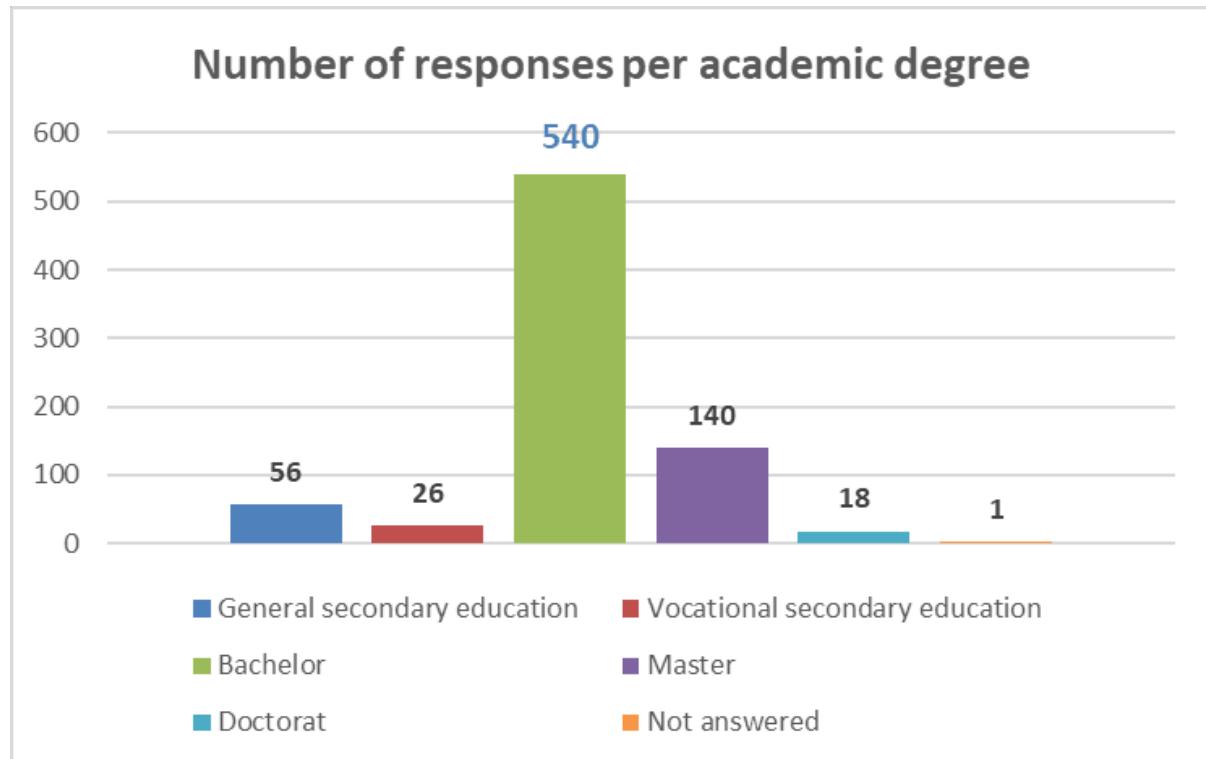
Respondents have reported a wide range of occupations, as listed below:

agriculture	human resources	medicine
analytics	IT, including developing, programming, network, security, hardware, etc.	metallurgy
architecture		natural sciences
archive	Legal	pedagogy
business management	linguistics, including translation	procurement
economy		quality, change management and standardization
educator	logistics	
electronics	marketing	sales
finance, billing, accounting	mechanic	security

Asked about the frequency of provisioned digital skills training at their workplace, more than half of the respondents (52.9%) reported that they are being offered regular digital skills training at work, once to twice per year.

A significant number of the respondents (35.3%) stated that they have not been provided with any training in this domain by their current employer. However, it should be noted that many of these respondents are employed in the ICT sector, where digital skills are considered a standard requirement for most job positions, and ICT professionals use different means for up-skilling on a daily basis to keep up with the rising demands of the emerging technologies in this industry.

Figure 4: Frequency of provisioning digital skills training
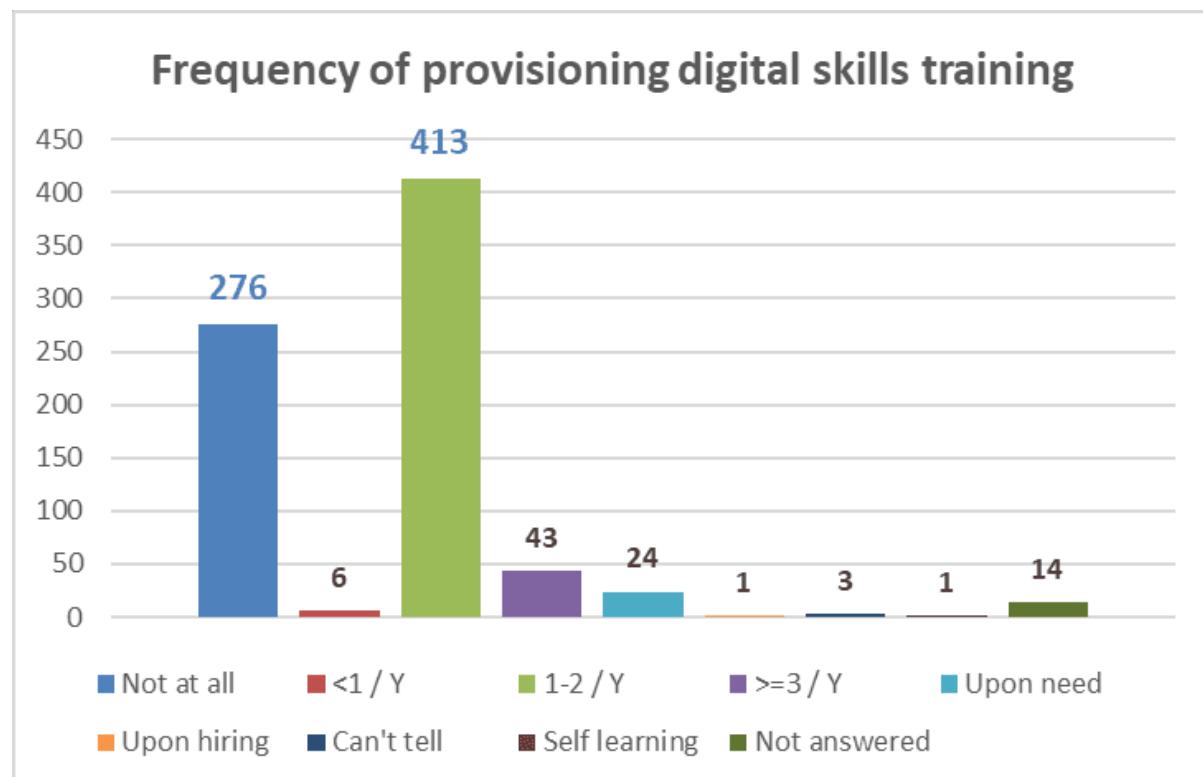
5.2.2. Findings from the Technology questions

The **technology** segment of the Questionnaire provides data on the types of digital devices used by the respondents and the frequency of their use, the level of knowledge and skills in utilizing individual digital devices, as well as on the Internet connectivity at their homes.

Almost all of the respondents have reported using digital devices on a regular, daily basis; 480 of the respondents (61.5%) regularly use two or three devices, while 174 (22.3%) are using more than four digital devices on a daily level (Figure 5).

Figure 5: Number of devices used on a regular basis
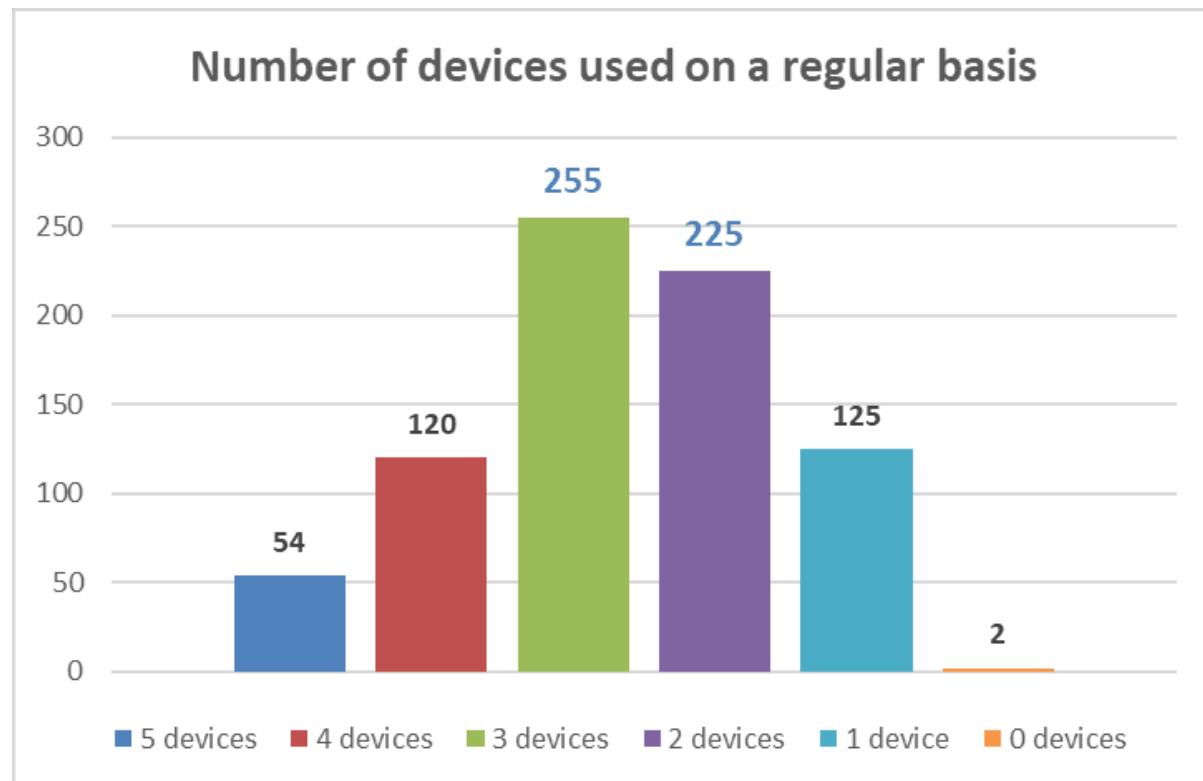
Smartphones are the most frequently used digital devices (81.0%), followed by desktop computers (77.0%), laptops (70.3%) and tablets (25.2%). There are 111 respondents (14.2%) that have reported using other, not mentioned in the Questionnaire ICT devices, which might be of interest to investigate further, in some future digital skills-related surveys (Figure 6).

Figure 6: Devices used on a regular basis
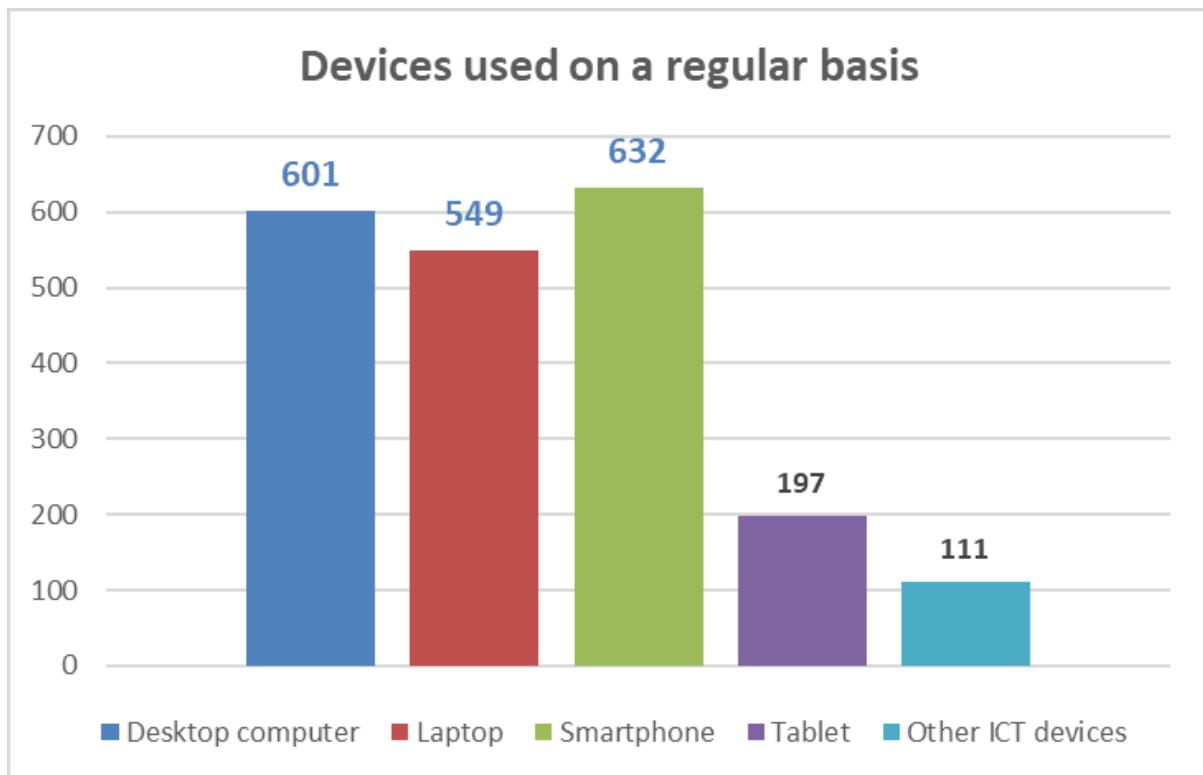
Almost all of the respondents (99.0%) reported having Internet access at home, either cable or optic (Figure 7), and 98.0% are using mobile Internet (Figure 8).

Figure 7: Internet access at home (cable/optic)
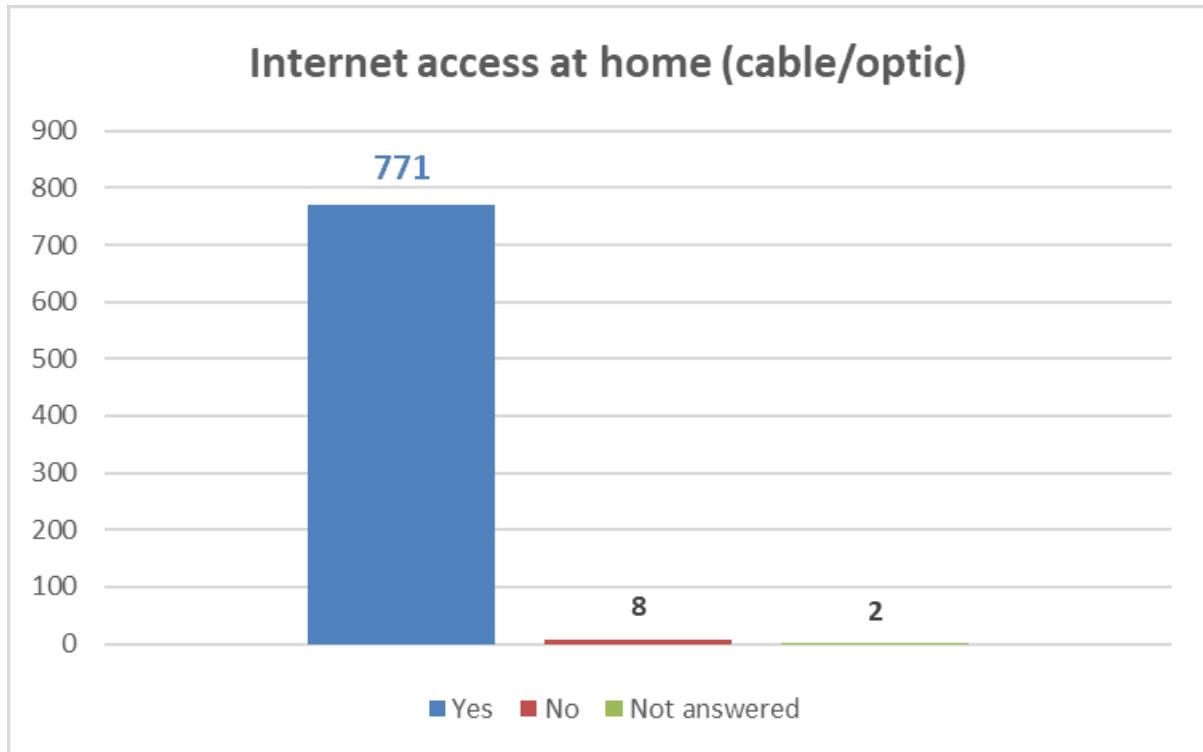
Figure 8: Using mobile Internet (2G, 3G, 4G)

Using mobile internet (2G, 3G, 4G)
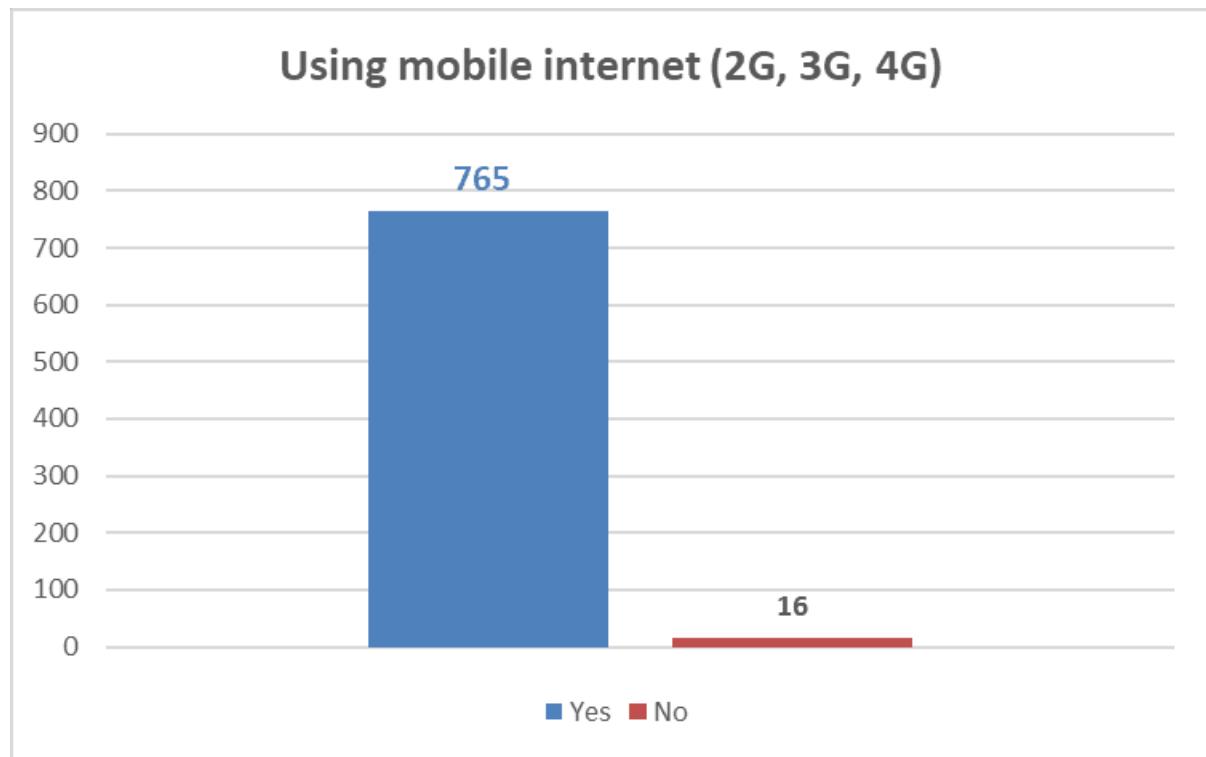
5.2.3. Findings from the digital skills-related questions

The **digital skills-related** segment of the Questionnaire provides data on the overall level of digital skills of the respondents, as well as on their level of skills within each of the 5 digital competence areas of *Information and Data literacy, Communication, Content creation, Safety*, and *Problem solving*.

The assessed level of digital skills overall, as well as within each of the competence areas, is being translated into one of the four proficiency levels, namely "No skills", "Low", "Basic", and "Above-basic".

5.2.3.1. Overall scores

The overall score, across all the 5 digital competence areas, shows that the majority of the respondents possess a **basic** level of digital skills (55.4%), followed by 38.6% that possess **above-basic** skills. Only 6.0% of the respondents have a lower level of digital skills, namely **low** (4.5%) or **have no skills** at all (1.5%) in the digital domain (Table 12).

Table 12: Overall level of digital skills across all 5 competence areas

Proficiency Level *Competence areas*	Above basic	Basic	Low	No skills
Information and Data literacy	29	**732**	18	2
Communication and collaboration	332	**409**	35	5

Content creation	208	**419**	121	33
Safety	**641**	110	11	19
Problem solving	**612**	112	30	27
OVERALL SCORE*	**301**	**433**	**35**	**12**

*The number of respondents in the final row (Overall score) is not a sum of the number of respondents from the previous rows, but is calculated on the basis of the applied Methodology, elaborated in more detail in Section 4.4.

Figure 9: Overall level of digital skills
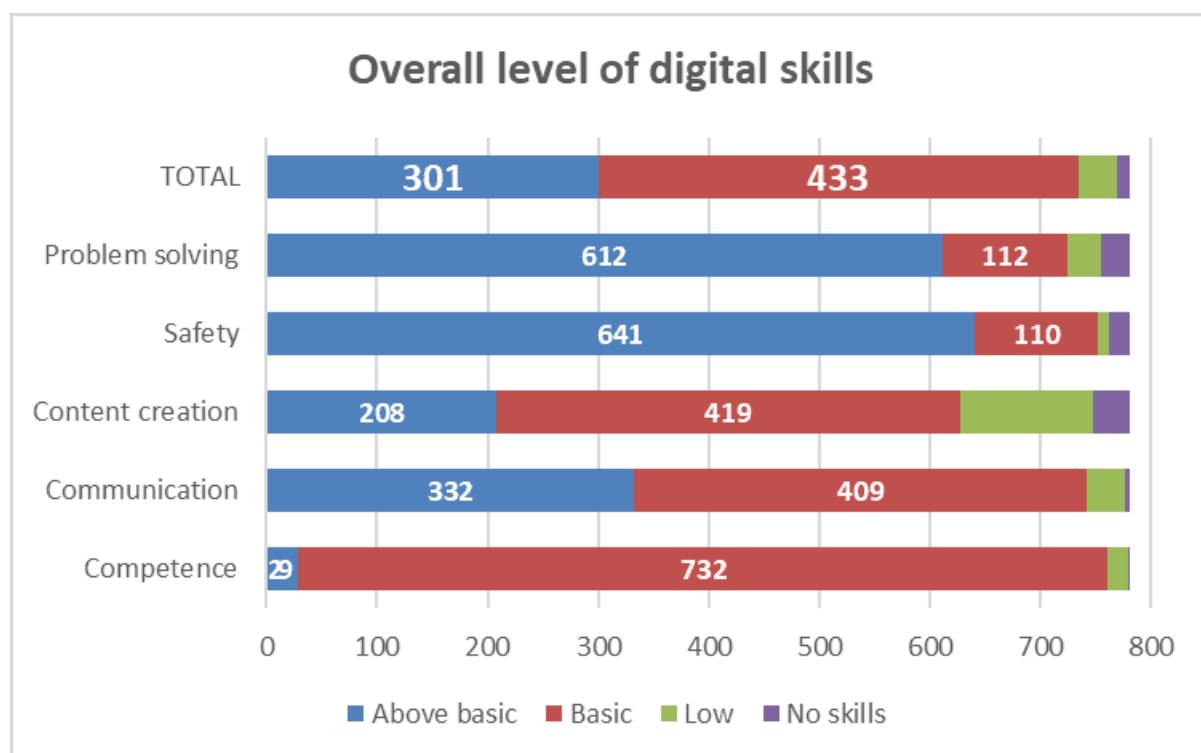
5.2.3.2. Scores per Digital competence area

Information and Data literacy

The analysis of the responses to the questions belonging to the ***Information and Data literacy*** competence area (Figure 10), show that the majority of the respondents (93.7%) possess a **basic** level of digital skills, while only 3.7% have **above-basic** skills. 2.6% of the respondents have self-assessed their skills in this competence area as either **low**, or have reported possessing **no skills** at all.

Table 13: Number of responses per question within the Information and Data literacy competence area

Question	Yes	No*	Advanced	Well	Little	Not at all*
Can you **look for information** online using a **search engine**	**778**	**3** **(1)**				
Do you know that not all online **information is reliable**	**767**	**14** **(0)**				
Can you **save or store files** or content and **retrieve** them once saved or stored (a text, **photo, music, video**, or website)			**340**	**388**	**37**	**16** **(2)**
Can you **save or store files** or content and **retrieve** them once saved or stored (files - **documents, tables**, presentations)			**14**	**394**	**38**	**333** **(2)**

*The number of responses in these two columns include the number of not answered questions (given in brackets).

Figure 10: Information & Data literacy – Total score

Information & Data literacy - Total score

```
800
700          732
600
500
400
300
200
100    29              18        2
  0
    ■ Above basic  ■ Basic  ■ Low  ■ No skills
```
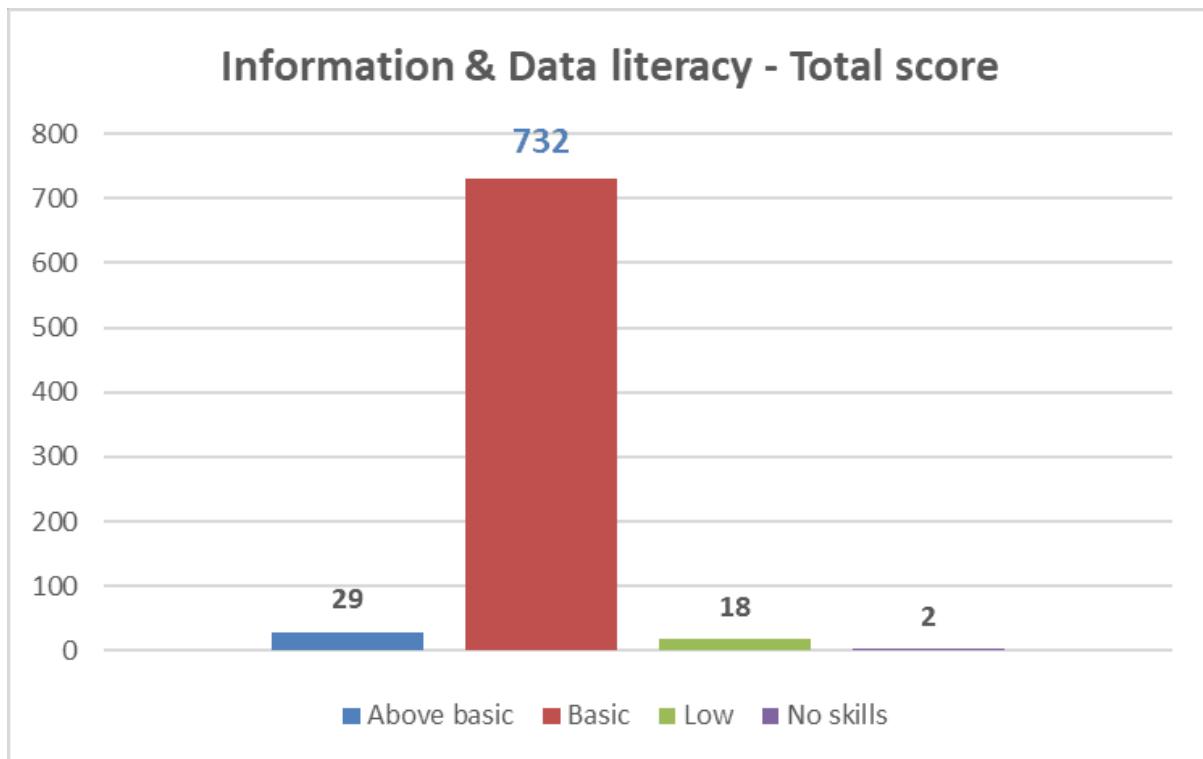
Communication and collaboration

The analysis of the responses gathered on the questions within the **Communication and collaboration** competence area (Figure 11), show that more than half of the respondents (52.4%) possess **basic** level of digital skills, followed by respondents who have reported **above-basic** (42.5%) and **low** skills (4.5%). An insignificant number of respondents (0.6%) have either reported possessing **no skills** at all in this competence area, or have not answered some of the questions from this cluster of questions.

Table 14: Number of responses per question within the Communication and collaboration competence area

Question	Yes	No*	Advanced	Well	Little	Not at all*
Do you use your **cell phone to communicate** with text messages (SMS), voice messages (MMS), or phone calls	761	20 (9)				
Can you use **communication services** like Skype, Whatsapp, Viber, etc.			358	382	24	17 (6)

Do you **have an email** address	**769**	**12** **(9)**				
Can you **send emails or reply** to incoming emails	**771**	**10** **(9)**				
Do you know how to **open a new email** address	**755**	**26** **(10)**				
Can you **share files** and content using **digital tools** (Dropbox, Google Drive, OneDrive, etc.)			**215**	**368**	**157**	**41** **(5)**
Do you know how to use digital technologies to **interact with services** (as governments (PRO), banks)			**239**	**454**	**64**	**24** **(4)**
Are you aware of **social networking sites** (e.g Facebook, Instagram)			**235**	**472**	**36**	**38** **(6)**
Are you aware of **online collaboration tools** (Zoom, Microsoft Teams, Google Doc, Skype for Business)			**185**	**454**	**95**	**47** **(8)**
Are you aware about **rules of digital communication** (e.g. when commenting, sharing personal information)	**725**	**56** **(5)**				

*The number of responses in these two columns include the number of not answered questions (given in brackets).

Figure 11: Communication and collaboration – Total score

Communication and collaboration - Total score
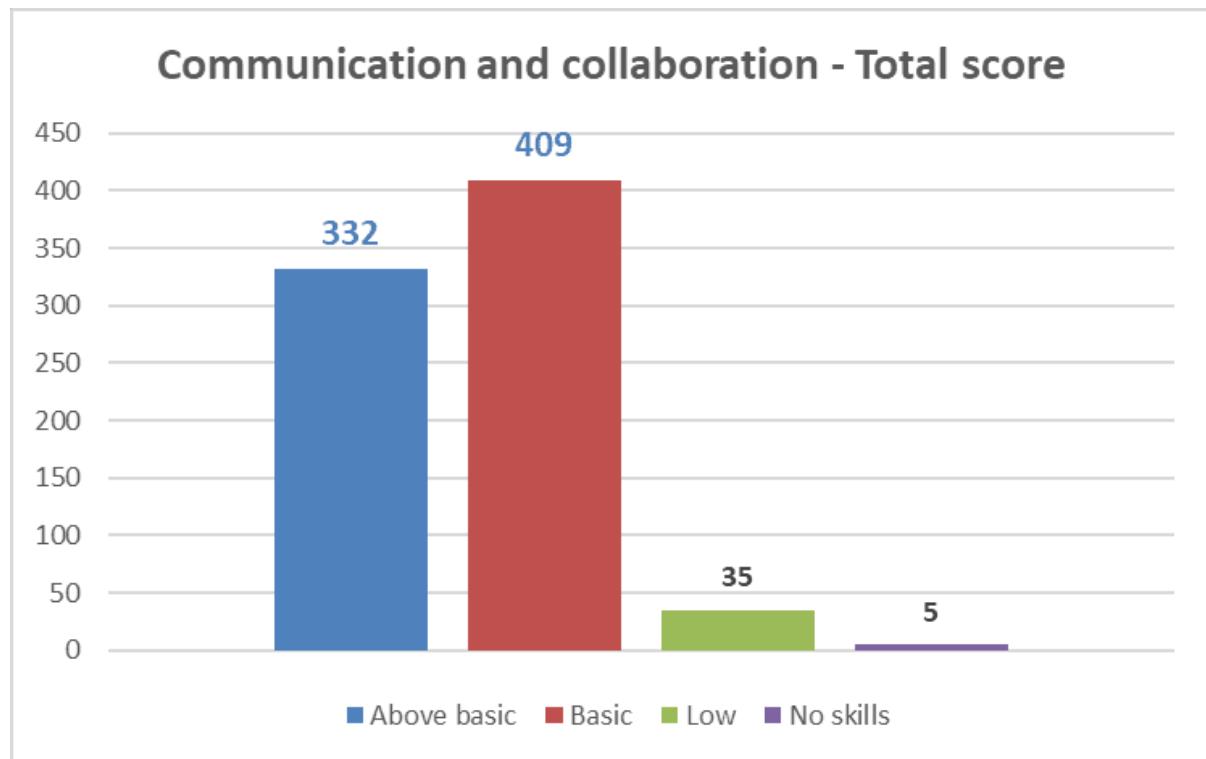
Digital Content creation

The analysis of the responses to the questions belonging to the digital **Content creation** competence area (Figure 12), show that more than half of the respondents (53.7%) possess **basic** level of digital skills, followed by those with **above-basic** skills (26.6%).

Unlike in the previous two competence areas, where only a small number of respondents reported lower than basic level of digital skills, almost 20.0% of the respondents have self-reported having **low** (15.5%) or **no skills** at all (4.2%) in the content creation area. However, it should be noted that there are about 1.2% of not answered questions in this cluster of questions, which negatively influences the results as, in the process of analyzing the data, they are being accounted for as "No" and "Not at all" on the Yes/No and multiple-choice questions, respectively.

Table 15: Number of responses per question within the Content creation competence area

Question	Yes	No*	Advanced	Well	Little	Not at all*
Can you **produce digital content** (e.g. text, tables, images, audio files) in at least one format using digital tools			280	399	76	26 (11)

Can you make **editing to content** produced by others (e.g. documents, text, images, audio, video)			201	440	113	27 (9)	
Do you know that content can be covered by **copyright**	740	41 (10)					
Can you apply and **modify functions and settings** of software and applications that you use (e.g. change default settings)			173	359	198	51 (9)	

*The number of responses in these two columns include the number of not answered questions (given in brackets).

Figure 12: Digital content creation – Total score
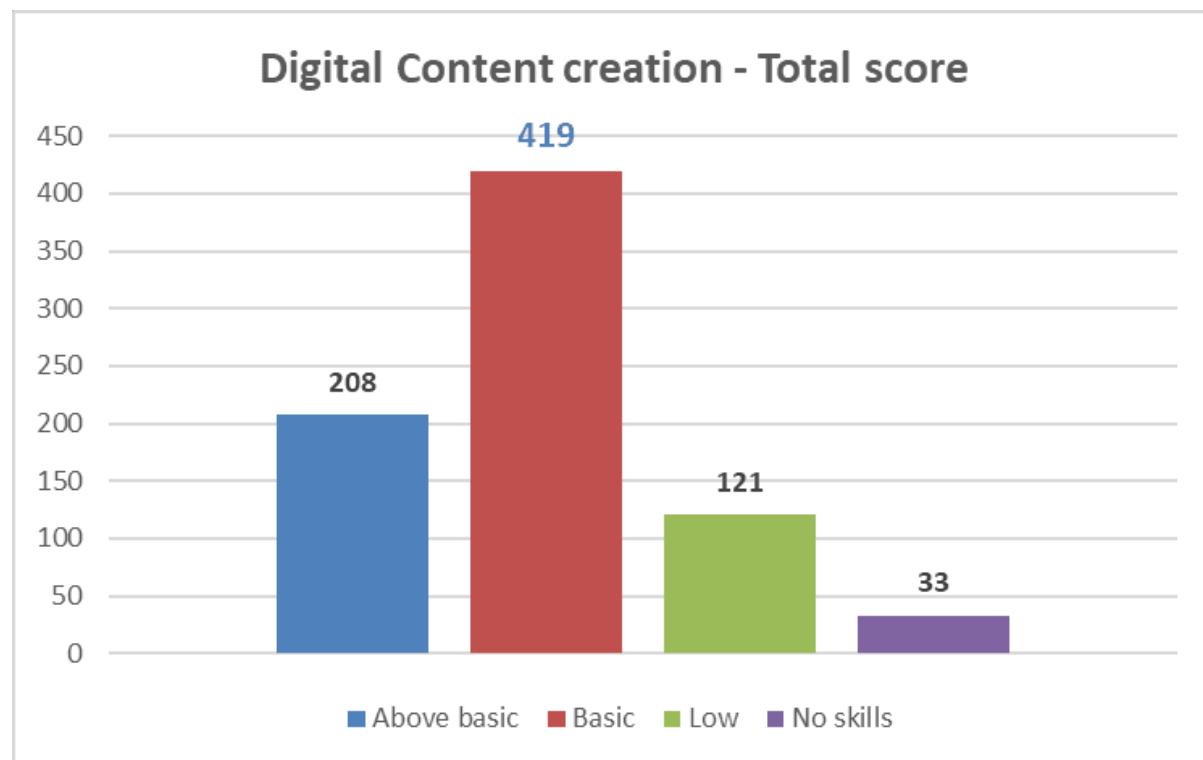
Safety

As far as the **Safety** competence area is concerned, the analysis of the responses presented in Figure 13 show that most of the respondents possess **above-basic** skills (82.0%), followed by 14.0% of respondents reporting **basic** level of skills, and 3.8% with **low** or **no skills** in the subject competence area.

It should be also noted that, compared to the three competence areas analyzed in the previous subsections, there is a relatively large number of not answered questions in this competence area (2.1%), which should be duly taken into consideration when interpreting the findings.

Table 16: Number of responses per question within the Safety competence area

Question	Yes	No*	Advanced	Well	Little	Not at all
Can you take basic steps to **protect your devices** (e.g. using antiviruses and passwords)	704	77 (16)				
Are you aware that your **credentials** (username and password) **can be stolen**	758	23 (17)				
Do you know that you **should not reveal private information** online	755	26 (17)				
Are you aware that **using digital technology more than 6 hours** a day can negatively affect your health	701	80 (15)				

*The number of responses in this column includes the number of not answered questions (given in brackets).

Figure 13: Safety – Total score
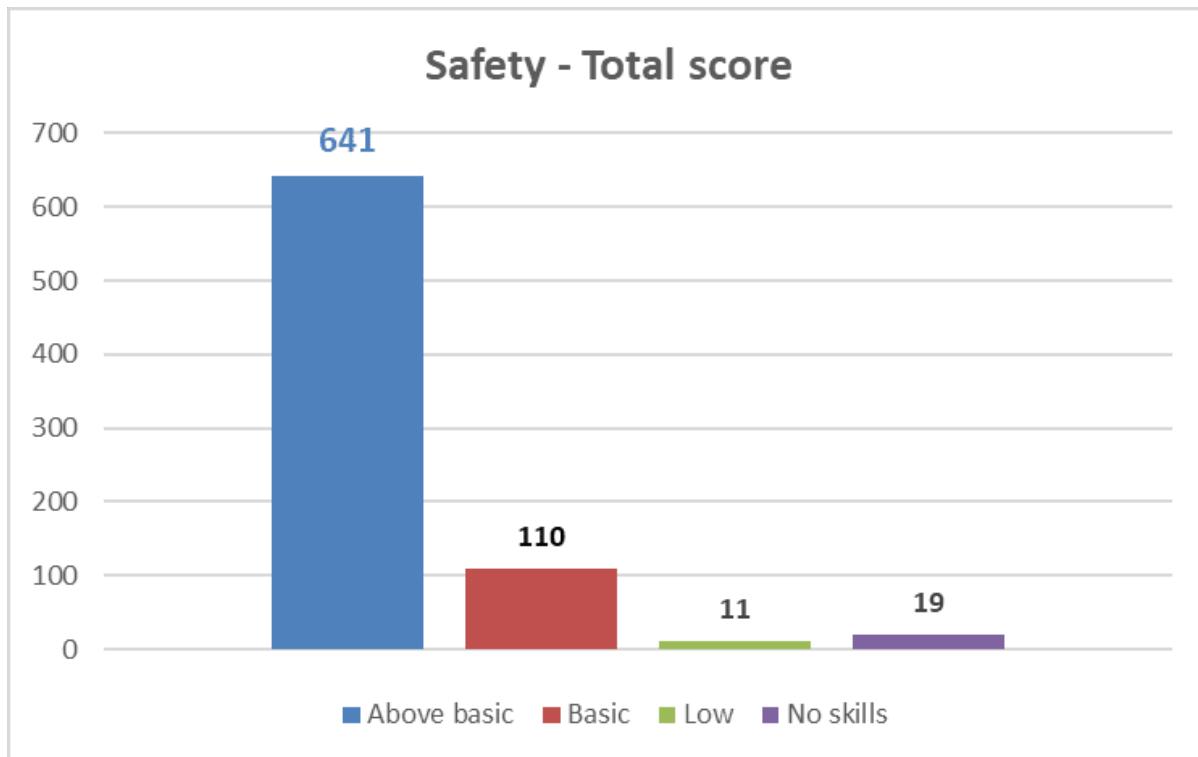
Problem solving

The analysis of the collected responses on the questions within the **Problem solving** competence area, show that more than 78.4% of the respondents possess **above-basic** level of skills, followed by 14.3% of respondents with **basic** skills, 3.8% with **low** level of skills, while 3.5% have self-reported possessing **no skills** in this competence area (Figure 14).

However, similar to the discussion in the former subsection, there has been a rather large number of not answered questions (3.0%) recorded in this competence area, which should be taken into account when interpreting the results in the problem solving area of digital skills.

Table 17: Number of responses per question within the Problem solving competence area

Question	Yes	No*	Advanced	Well	Little	Not at all*
Do you know **where to find support and assistance** when a technical problem occurs or when using a new device, program or application	702	79 (23)				

Do you know **how to solve some routine problems** (e.g. close program, restart computer, re-install/update program, check internet connection)			248	426	74	33 (20)
Do you think **digital tools**, with certain limitations, can **help you in solving problems**	725	56 (28)				
When confronted with a technological or non-technological **problem, do you use digital tools to solve it**	659	122 (22)				

*The number of responses in these two columns includes the number of not answered questions (given in brackets).

Figure 14: Problem solving – Total score
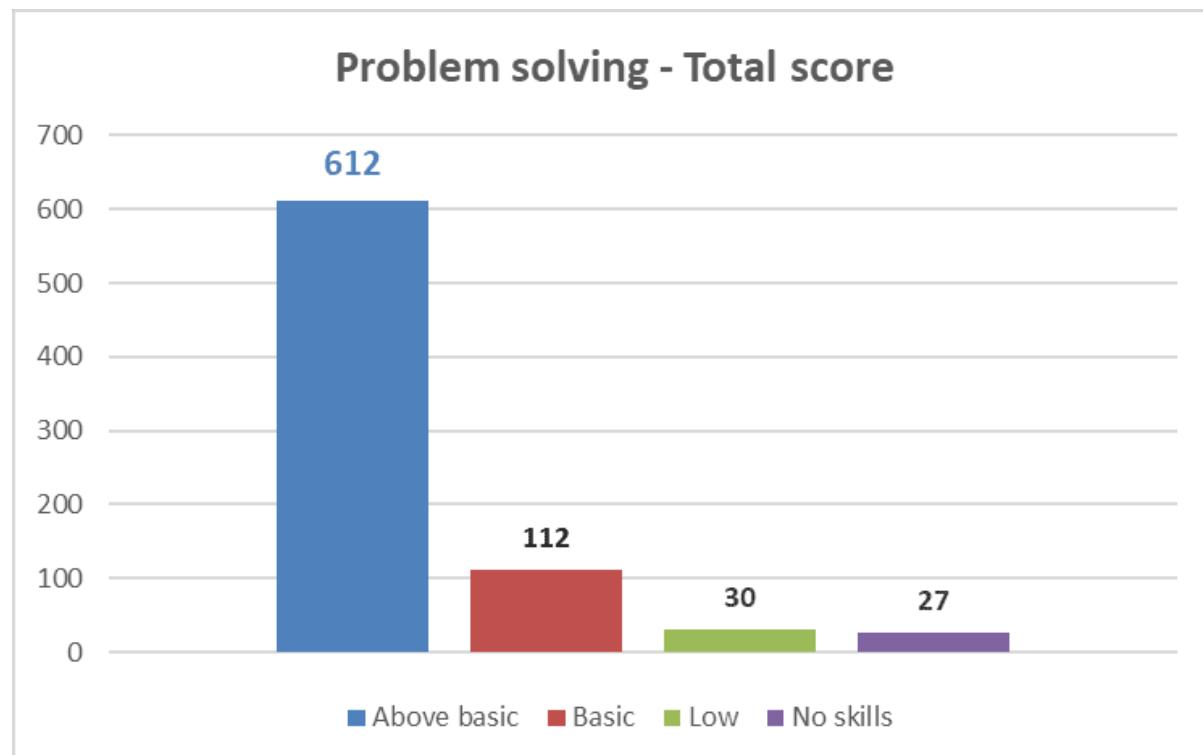
5.2.4. Two dimensional analysis of data

This section presents the findings from the two-dimensional analysis of the data gathered within the 5 competence areas of digital skills, per the respondents':

- sector of employment;
- age, and
- academic degree.

5.2.4.1 Digital skills per Sector of employment of the respondents

The analysis of the data presented in Table 18 shows that there are differences in the levels of digital skills and competences possessed by the employees in the three sectors subject of this assessment.

Expectedly, the highest level of digital skills has been reported by the employees in the **Start-ups** sector. At the overall level, across all the 5 competence areas, 87.5% of the respondents in this group have reported possessing **above-basic** level of digital skills, and the remaining 12.5% possess **basic** level of skills**.** Start-ups' employees have self-reported highest levels of skills in the *Problem solving* competence area, and somewhat lower levels of skills in the *Information and data literacy* and in the *Communication and collaboration* areas, followed by the area of *Safety.* Although the majority of respondents (68.8%) have also reported above-basic level of skills in the *Content creation* area, it is an area in which weakest results are observed compared to the other 4 competence areas of digital skills.

Significantly lower levels of digital skills are reported by the respondents employed in the **companies.** Overall, across all the 5 competence areas, majority of the respondents (53.0%) have reported having **basic** level of digital skills, followed by **above-basic** (41.5%) and **low** (3.5%), while 2.0% have reported **no skills** in the digital domain. Highest results are present in the areas of *Safety* and *Problem solving,* with 82.4% and 80.3% of the respondents reporting above-basic level of skills in these two competence areas, respectively. Good results are also displayed in the *Communication and collaboration* area, with 48.6% and 46.1% of the respondents reporting basic and above-basic levels of skills, respectively. In the *Content creation* area, most of the respondents (53.3%) have reported basic level of skills, followed by 28.7% of respondents with above-basic skills, while there is a relatively high percentage of respondents who reported possessing low level of skills (13.9%). Significantly weaker scores compared to the start-ups' employees are registered in the *Information and data literacy* competence area, where the majority of the companies' employees (95.2%) possess basic level of skills, followed by an equal distribution of respondents (2.3%) with above-basic and with low level of skills.

Teachers have reported lowest levels of overall digital skills compared to the respondents coming from the other two sectors of employment. Overall, across all the 5 competence areas, most of the teachers (66.0%) posses **basic** level of skills**,** followed by **above-basic** (25.9%), whereas the remaining 7.6% of the teachers have reported having **low** level of digital skills**.** Similarly to the employees in the private companies, teachers' strongest competence areas of digital skills are *Safety* and *Problem solving,* with 81.7% and 72.1% of them reporting above-basic level of skills in these two areas, respectively. In the *Communication and collaboration* area*,* 66.0% of the teachers have reported basic level of digital skills, followed by 28.9% with above-basic skills, which is notably lower compared to the skills of the employees in the other two employment sectors. On a comparative basis with the respondents from the companies and the start-ups, teachers have displayed weaker results in the

Content creation area. Namely, the majority of the teachers (57.4%) have reported basic, and only 17.3% above-basic level of skills in the content creation competence area, while quite a high number have reported possessing low level of digital skills (21.3%) and no skills at all (4.1%). In the *Information and data literacy* area, teachers demonstrate comparable levels of skills to the ones of the employees in the companies (95.4% of the teachers possess basic skills), but still significantly lower than of the start-ups' employees.

Table 18: Level of digital skills within the 5 clusters of questions, per sector of employment

Proficiency level *Sector of employment*	Above Basic	Basic	Low	No skills	Total
Overall Scores*					
Companies	236	301	20	11	568
Start-ups	14	2	/	/	16
Teachers	51	130	15	1	197
Total - Total (*)	**301**	**433**	**35**	**12**	**781**
Information and Data literacy					
Companies	13	541	13	1	568
Start-ups	13	3	/	/	16
Teachers	3	188	5	1	197
Total – Information and Data literacy	**29**	**732**	**18**	**2**	**781**
Communication and collaboration					
Companies	262	276	25	5	568
Start-ups	13	3	/	/	16
Teachers	57	130	10	/	197
Total – Communication and collaboration	**332**	**409**	**35**	**5**	**781**
Digital Content creation					

Companies	163	303	79	23	568
Start-ups	11	3	/	2	16
Teachers	34	113	42	8	197
Total – Digital Content creation	208	**419**	121	33	781
Safety					
Companies	468	77	6	17	568
Start-ups	12	3	1	/	16
Teachers	161	30	4	2	197
Total - Safety	**641**	**110**	**11**	**19**	**781**
Problem solving					
Companies	456	77	19	16	568
Start-ups	14	2	/	/	16
Teachers	142	33	11	11	197
Total - Problem solving	**612**	**112**	**30**	**27**	**781**

*The numbers in this segment of the Table (Overall scores) do not represent a sum of the scores in the 5 areas of digital skills, but are calculated on the basis of the applied Methodology, elaborated in more detail in Section 4.4.

5.2.4.2 Digital skills per age of the respondents

The two-dimensional analysis of the data presented in Table 19 indicates rather sharp differences in the level of digital skills among respondents from different age groups. Overall, across the 5 competence areas of digital skills, **highest levels of skills** have been reported by the **youngest** respondents (18-24 years of age), majority of which possess above-basic (61.5%) and basic level of digital skills (34.6%). At the opposite end of the spectrum are the **most senior** respondents (55-64 years of age), who mainly possess basic level of skills (73.1%), followed by low level of skills (13.5%), while only 11.5% of respondents from this age group have reported possessing above-basic level of skills.

The analyzed datasets indicate a negative correlation between the self-reported level of overall digital skills and the age of the respondents. Most striking is the 21.8% decline in the number of respondents

with above-basic skills between the 4th (45-54 years of age) and the 5th age group (55-64 years of age), followed by the 15.8% decline between the 1st (18-24 years of age) and 2nd age group (25-34 years of age). Moving up the age groups, within the middle three age categories, shows a decrease in the number of respondents with above-basic skills of about 5-7%.

Highest levels of digital skills, across all age groups, are reported in the competence areas of *Safety* and *Problem solving*. Regardless of the age group, all respondents demonstrate above-basic skills of at least 78.8% and of at least 69.2% in these two areas, respectively.

In the *Communication and collaboration* competence area, the majority of the respondents from the first two age groups have reported possessing above-basic skills (69.2% and 53.9% of respondents in 1st and in 2nd age group, respectively), while the majority from the remaining three age groups have reported basic level of skills (54.2%, 60.0% and 71.2% of respondents in the 3rd, 4th and 5th age group, respectively).

In the *Content creation* area, only the respondents from the 1st age group have reported above-basic skills (46.2% with above-basic skills, followed by 38.5% with basic skills), while the highest level of skills reported by respondents from the remaining age groups is the basic level (58.2%, 54.2%, 52.7% and 40.4% of respondents in the 1st, 2nd, 3rd and 4th age group, respectively). Moreover, compared to the other four competence areas, quite a high number of respondents across all age groups possess a low level of skills in this area (15.5%), which is particularly pronounced in the 4th and the 5th age group (20.0% and 30.8% of respondents in these two age groups, respectively).

The least favorable results are present in the *Information and data literacy* competence area, in which no age group possesses above-basic skills. Majority of respondents of all ages possess a basic level of skills in this competence area (the distribution of respondents is between 91.8% - 96.2% across all age groups).

Table 19: Level of digital skills within the 5 clusters of questions, per age of the respondents

Proficiency level / Age groups	Above basic	Basic	Low	No skills	Grand Total
Overall Scores*					
18-24	16	9	/	1	26
25-34	106	115	6	5	232
35-44	118	169	14	5	306
45-54	55	102	8	/	165
55-64	6	38	7	1	52
Total - Total (*)	**301**	**433**	**35**	**12**	**781**

Information and Data literacy				
18-24	/	25	1	/	26
25-34	7	220	4	1	232
35-44	18	281	7	/	306
45-54	3	158	4	/	165
55-64	1	48	2	1	52
Total - Information and Data literacy	**29**	**732**	**18**	**2**	**781**
Communication and collaboration				
18-24	18	7	1	/	26
25-34	125	100	4	3	232
35-44	126	166	12	2	306
45-54	56	99	10	/	165
55-64	7	37	8	/	52
Total – Communication and collaboration	**332**	**409**	**35**	**5**	**781**
Digital Content creation				
18-24	12	10	4	/	26
25-34	70	135	19	8	232
35-44	82	166	49	9	306
45-54	37	87	33	8	165
55-64	7	21	16	8	52
Total – Digital Content Creation	**208**	**419**	**121**	**33**	**781**
Safety				

18-24	22	3		1	26
25-34	188	31	4	9	232
35-44	252	43	2	9	306
45-54	138	25	2	/	165
55-64	41	8	3	/	52
Total - Safety	**641**	**110**	**11**	**19**	**781**
Problem solving					
18-24	22	3	1	/	26
25-34	188	26	6	12	232
35-44	239	44	13	10	306
45-54	127	29	6	3	165
55-64	36	10	4	2	52
Total - Problem solving	612	112	30	27	781

*The numbers in this segment of the Table (Overall scores) do not represent a sum of the scores in the 5 areas of digital skills but are calculated on the basis of the applied Methodology, elaborated in more detail in Section 4.4.

5.2.4.3 Digital skills per academic degree of the respondents

As presented in Table 20, there are notable differences in the levels of digital skills of respondents based on their academic degree. In general, there is a positive correlation between the level of education of the respondents and the self-assessed level of digital skills. An exception is present with respondents with a Bachelor degree, who have reported somewhat lower levels of digital skills than the respondents with a General secondary education degree.

Across all the 5 competence areas of digital skills, respondents with a **Doctoral degree** possess the **highest level of skills** (66.7% with above-basic skills, 22.2% with basic skills and 5.6% with low level of skills), whereas the ones with a **Vocational education** degree have the **lowest** level of skills (70.0% with basic skills, 26.7% with above-basic skills, and 3.3% with low level of skills). The majority of respondents with a Master, Bachelor or a General secondary education degree possess a basic level of skills (between 50.7%-57.2% of respondents), while between 36.1% to 46.4% of them have above-basic level of skills.

Highest results are reported in the areas of *Safety* and in *Problem solving*, where, regardless of the academic degree group, the majority of the respondents possess above-basic skills (between 76.9% and 88.9% of respondents in *Safety* and between 75% and 90% in *Problem solving)*.

In the *Communication and collaboration* area, the only respondents reporting above-basic level of skills are the ones with a doctoral degree (66.7%). Second best results in this competence area are reported by the respondents with a General secondary education, majority of which possess basic level of skills (48.1%), followed by above-basic level of skills (46.2%). The remaining three academic degree groups have reported possessing more basic than above-basic level of skills, particularly the respondents with Vocational training (56.7% with above-basic skills, 33.3% with basic skills, and 10% with a low level of skills).

In the *Content creation* area, the only academic group that stands out with the results is the PhD group, with 50.0% of the respondents reporting above-basic level of skills and 27.8% reporting basic level of skills, whereas all the respondents from the remaining academic degree groups mostly possess basic level of skills. Compared to the other four competence areas, respondents from across all academic degree groups have reported a low level of skills in this competence area, namely the General secondary education group (21.2%), Bachelor (17.0%), Vocational training (16.7%), and the PhD group (11.1%).

The majority of respondents, regardless of educational level, possess basic skills in the *Information and data literacy* competence area, with a distribution ranging between 83.3% (PhDs) and 96.7% (respondents with Vocational training degree).

Table 20: Level of digital skills within the 5 clusters of questions, per academic degree

Proficiency level / Academic degree	Above Basic	Basic	Low	No skills	Total
*Overall Scores**					
Doctorat	12	4	1	1	18
Master	65	71	2	2	140
Bachelor	195	309	29	7	540
General secondary education	21	27	2	2	52
Vocational education	8	21	1	/	30
Not answered	/	1	/	/	1
Total - Total (*)	**301**	**433**	**35**	**12**	**781**

Information and Data literacy				
Doctorat	1	15	2		18
Master	7	131	1	1	140
Bachelor	20	507	12	1	540
General secondary education	1	49	2	/	52
Vocational education	/	29	1	/	30
Not answered	/	1	/	/	1
Total - Information and Data literacy	29	732	18	2	781
Communication and collaboration				
Doctorat	12	4	1	1	18
Master	61	73	4	2	140
Bachelor	225	289	24	2	540
General secondary education	24	25	3		52
Vocational education	10	17	3		30
Not answered		1			1
Total – Communication and collaboration	332	409	35	5	781
Digital Content Creation				
Doctorat	9	5	2	2	18
Master	41	82	11	6	140
Bachelor	137	291	92	20	540
General secondary education	14	25	11	2	52

Vocational education	7	15	5	3	30
Not answered		1			1
Total - Digital Content Creation	**208**	**419**	**121**	**33**	**781**
Safety					
Doctorat	16	1		1	18
Master	123	12	3	2	140
Bachelor	436	83	7	14	540
General secondary education	40	9	1	2	52
Vocational education	26	4			30
Not answered		1			1
Total - Safety	**641**	**110**	**11**	**19**	**781**
Problem solving					
Doctorat	15	2		1	18
Master	119	12	6	3	140
Bachelor	412	84	22	22	540
General secondary education	39	10	2	1	52
Vocational education	27	3			30
Not answered		1			1
Total - Problem solving	**612**	**112**	**30**	**27**	**781**

*The numbers in this segment of the Table (Overall scores) do not represent a sum of the scores in the 5 areas of digital skills, but are calculated on the basis of the applied Methodology, elaborated in more detail in Section 4.4.

5.3. Conclusions

- Overall, across all the 5 competence areas of digital skills, the majority of respondents possess a basic level of skills (55.5%), followed by 38.5% with above-basic skills. Only 4.5% of the respondents possess a low level of skills, while 1.5% have self-reported no skills at all in the digital domain.

- Highest levels of skills are demonstrated in the competence areas of *Safety* and *Problem solving*, in which areas the majority of respondents possess above-basic skills (82.1% and 78.4% of respondents in the two areas, respectively), whereas least respondents possess above-basic level of skills in the *Information and data literacy* area (3.7%). However, the later competence area registers least respondents with low or no skills (2.6.% for the two proficiency levels, combined) and highest concentration of respondents with basic proficiency level of skills (93.7%). Highest number of respondents with a low level of skills (15.5%) or no skills at all (4.2%) is registered in the area of *Content creation*, while there is a comparable number of respondents with above-basic skills (42.5%) and basic skills (52.4%) in the area of *Communication and collaboration*.

- The two-dimensional analysis of the collected data show significant differences in the level of digital skills of respondents depending on the sector of their employment, with employees in the start-up sector demonstrating highest, and the teachers lowest levels of skills observed overall, across all the 5 competence areas. While 87.5% of the start-up employees possess above-basic level of skills, this proficiency level is attained by 41.5% and 25.9% of the companies' employees and the teachers, respectively. On the opposite end of the proficiency spectrum, the highest number of respondents with low level, or no skills at all, come from the education sector (8.1%), followed by companies (5.5%), while no employees from the start-up sector have reported level of skills within these two proficiency levels.

- Largest difference in the above-basic skills proficiency level among respondents in the three sectors is evident in the *Information and data literacy* competence area, in which the highest proficiency level of skills is reported by 81.3% of the start-up employees, and only by 2.3% of the employees in companies and 1.5% of teachers. Teachers are also lagging behind the employees in the other two sectors in the area of *Communication and collaboration,* with 28.9% possessing above-basic level of skills, versus 46.1% and 81.3% of the respondents in the companies and start-ups, respectively. This is also the case in the area of *Problem solving*, where a much higher number of teachers have low, or no skills at all (11.2%) compared to the employees in the companies (6.2%), while the lowest two proficiency levels have not been reported by the employees in the start-ups. The only competence area in which teachers outperform employees from the other two sectors is the area of *Safety.* Namely, 97% of teachers have above-basic and basic skills in this area combined, versus 96% of the employees in companies and 93.8% in start-ups. Worst results across all three employment sectors are identified in the *Content creation* area, in which 25.4% of teachers, 18.0% of companies' employees and 12.5% of employees in the start-up sector have low, or no skills at all.

- At an overall level, across all 5 competence areas, the above-basic proficiency level of digital skills is negatively correlated with the age of the respondents. While the majority of youngest respondents (18-24 years of age) possess above-basic digital skills (61.5%), at the opposite end of the age spectrum, more of the senior respondents (55-64 years of age) possess low and no skills (15.4% combined) than above-basic level of skills (11.5%). Decline in above-basic level of skills with age is particularly evident when progressing from the 1st to the 2nd age group, and from the 4th to the 5th - most senior one, with the number of respondents that possess above-basic digital skills dropping for 15.8% and for 21.8%, respectively.

- Observed at a competence area level, negative correlation between levels of skills and age is present in 3 out of the 5 competence areas, namely in *Communication and collaboration*, *Content creation*, and in *Problem solving*. In the *Information and data literacy* area, comparable levels of above-basic and basic levels of skills, combined, are observable across all age groups, whereas in the *Safety* area, skills are dropping with moving from 1st to 2nd, and from 4th to 5th age groups, while are increasing from lower to upper age group in the middle three age groups.

- At an overall level, across all 5 competence areas, there is a positive correlation between the above-basic level of digital skills and the academic degree of the respondents, with respondents with a Doctoral degree possessing most, and the ones with a Vocational training least skills at above-basic level. Namely, while 66.7% of PhDs possess above-basic level of skills, this proficiency level is attained only by 26.7% of respondents with Vocational training. The only exception to this correlation are the respondents with a Bachelor degree, who have somewhat lower above-basic levels of digital skills relative to the respondents with a General secondary education degree.

- At a competence area level, positive correlation between above-basic level of skills and academic degree (except for the Bachelor degree), is observable in all the 5 competence areas, with the exception of *Safety* and *Problem solving*, where respondents with a Vocational training degree outperform those from the higher academic groups.

- Majority of respondents (64.7%) work for employers who provide them with regular digital skills training, of which 52.9% are provided training once or twice per year, and 8.6% are trained more than 3 times per year, or their employer provides training on employees' demand.

- All respondents use at least one smart device on a daily basis. The majority of the respondents (32.7%) regularly use 3 smart devices, 16.0% use only one, while 6.9% use 5 or more devices on a regular, daily level. The most frequently used devices are smartphones (81.0%), followed by desktop computers (77.0%), laptops (70.3%) and tablets (25.2%). Majority of the respondents (99.0%) have internet access at home, as well as are using 2G, 3G, or 4G.

6. Recommendations and next steps

These recommendations result from the assessment of the basic digital skills of the employees in the targeted sectors in North Macedonia, as well as from the assessment of the current needs of different types and levels of digital skills across various industries. The assessments were conducted through desk research, individual interviews, self-assessment survey, and additional primary research. The recommendations focus on the role of the central government in designing policy and programs in the digital domain, as well as on the role of employers, educators, and local agencies in providing practical solutions for advancing citizens' digital skills and closing the digital skills gap in the country.

Recommendation 1: The interview findings indicate a high market demand for digitally skilled workforce in North Macedonia. At the same time, the desk research shows that the government is moving towards full digitalization of all public services. Therefore, **it is of high importance to regularly assess the level of digital skills of citizens, ensuring that they possess the required skills to effectively utilize public services and to actively participate in the labor market and in community life**. **Such assessments should inform the process of developing policies and designing programs for digital up-skilling of citizens, ensuring that no one is left behind.** To this end, it is strongly recommended for the government to conduct digital skills assessments in annual cycles, through self-assessment surveys that target different sectors and age groups.

Recommendation 2: Upon completion of this assessment of the basic digital skills of employees in the targeted sectors, the next step is for the government to conduct an assessment of intermediate and advanced digital skills of citizens. Intermediate skills refer to the generic skills that enable users to participate in community life as engaged citizens and productive workers. The group of intermediate skills continuously evolves with the advances in technology, it is therefore important to assess them regularly and to ensure they keep up with the pace of technological development. Advanced digital skills are job-related skills required in professions such as computer programming, software development, data science and network management, and include database management, system administration, cybersecurity, artificial intelligence (AI), Internet of Things (IoT), virtual reality (VR), etc. According to the findings from the interviews, the assessment of intermediate and advanced digital skills should focus on the private sector digital skills needs, primarily of the banking and insurance industries, as well as of the IT sector.

Recommendation 3: To address current digital skills mismatch, including over-qualification and job mismatches by sector and field of education, it is important for the government to establish a platform for dialogue between the private and the education sector. Conducted interviews with companies indicate that one of the underlying reasons for digital skills mismatch is outdated curricula and insufficient level of practical training integrated into the formal education. Therefore, **the business sector and the academia, including secondary education, should work closely together to align the formal education to the market needs by ensuring that the labor-force digital skills requirements are translated into the educational programs and curricula, thereby eliminating digital skills mismatches and reducing digital skills gaps**.

Recommendation 4: Recognizing the challenge associated with the brain drain of ICT professionals from the country, **the government should consider developing policies for retaining the ICT professionals and motivate them to contribute to the work and development of the domestic**

economy. This process should be supported by a close dialogue established among national authorities, business sector, ICT companies, and ICT professionals, thereby ensuring that the enacted policies reflect the needs and interests of all stakeholders in the ICT ecosystem.

Recommendation 5: Recognizing the vital role of educators in producing digitally skilled workforce and citizenry, **education authorities should continuously invest in digital up-skilling of teachers, thereby empowering them to professionally implement updated ICT-related curricula and to confidently apply digital technologies in the teaching processes, across all teaching subjects**. Focus should be put on regularly updating the curricula and programs for the Initial teachers training - to ensure that future teachers possess the necessary level of digital skills before entering the profession, as well as updating the curricula for the Continuing professional development of current teachers - to enable their continuous digital up-skilling and acquisition of skills required for delivering the ICT-related curricula.

Recommendation 6: The education sector should enhance and tailor its product offerings to meet the evolving needs of the digital economy, by actively partaking in the government's digital agenda and regularly engaging with stakeholders. **Education and training providers should develop up-skilling and re-skilling training programs for adults that correspond to, and are aligned with the needs of the fast-developing digital economy**. This should include efforts for promoting the benefits of digital literacy to the most vulnerable segments of the population.

7. Good practices from the region

7.1 Albania

Albania has made significant progress in implementing the digital agenda and enhancing the regulatory and policy framework. The government plays an important role in promoting and building demand in the existing ICT ecosystem and is committed to fostering an enabling ICT environment.

In 2021, the government began consultations on a new digital strategy for 2021-2025, which is based on the draft outline of the Albanian Digital Agenda (2021-2025). [28] The strategy points to the importance of developing digital skills among the general population and preparing people for employment in the ICT sector. Since the new digital agenda has a separate chapter dedicated to digital skills, it demonstrates the value the Albanian government attaches to this critical topic.

Digital Agenda 2021-2025 is focused on the four pillars:

I. Development of the information society and promotion of the economy, culture and digital tourism

- Development of e-Government
- Promoting and enabling the digital economy, culture and tourism
- Improving cybersecurity and trusted services

---

[28] https://www.infrastruktura.gov.al/wp-content/uploads/2020/07/National-Plan-BBand-EN.pdf

II. Development of national electronic communications infrastructure and regulations in the field of audiovisual media

III. Developing and enabling basic and advanced digital skills in order to involve citizens in ICT services and increase ICT professionals

IV. Developing policies and exploring new ICT fields

7.1.1. Digital Skills Tools

Recognizing the importance of developing digital skills among the new generation and vulnerable groups, the government is working to build a diverse set of digital skills tools (Table 21).

Table 21: Digital skills available in Albania

Techspace	● Start-up friendly environment. ● Incubation programmes include step-by-step follow-up and free of charge professional consultations from different experts. ● Information sessions on digital transformation. ● Focus on the introduction of new technologies. ● Events for members: Information Sessions, Trainings, Job Fairs, Workshops and Hackathons focused on coding, Start-up development, etc.
Multifunctional centre "Pyramid"	● Regional Digital Innovation Hub. ● Digital skills training for high school students.
Digital skills training for women and girls	● Digital skills training with focus on entrepreneurial digital skills.
Digital Jobs Albania	● Access to online work opportunities for provide young Albanian women and connect them to the Global Economy. ● Main focus: digital marketing, graphic design, web development.

7.1.2. e-Albania Service Platform

Electronic services in Albania are available through e-Albania, the one-stop-shop for online public administration services.[29] It is an online platform providing public services 24 hours a day, 7 days a week. Every citizen can get detailed information about public services, including licences, permits, authorizations, digitally stamped documents, certificates or other similar services of a similar nature. This platform is fully compliant with the government's ICT policy and the cross-sectoral strategy.

---

[29] https://e-albania.al

To get access to electronic services developed and maintained by various public or private institutions, participants need to obtain basic digital skills. Since the e-Albania platform is accessible to citizens, service delivery has improved and service delivery times have decreased. It also helps to reduce bureaucracy and corruption.

7.1.2. e-learning Services

Albania strongly supports the development of digital skills in the education sector by identifying and promoting e-learning best practises. Due to the need to shift to distance learning, the curricula have been updated to reflect the new circumstances. To ensure equal access to education during the COVID-19 pandemic, students from rural areas received digital tablets and Internet sticks. [30] In addition, easy-to-use guides on how to use online learning platforms were distributed to teachers and students.

7.2 Serbia

In 2020, the Government of the Republic of Serbia adopted the Digital Skills Development Strategy 2020-2024.[31] The Strategy is focused on improving the digital knowledge and skills of all citizens, including vulnerable groups, to enable development of ITC technologies in all fields. The main goals are:

- Improving basic and advanced digital skills of all citizens.
- Improving digital competencies in the education system.
- Developing and improving digital skills according to the labour market needs.
- Lifelong learning of ICT professionals.

7.2.1. e-Government

The e-government portal was established as a step forward to building a digital society in the Republic of Serbia. It is the hub of e-services for all citizens, businesses, and public administration employees.[32] It allows citizens to easily communicate with government agencies, receive information and relevant forms, and facilitate making requests and obtaining other documents.

7.2.2. Education

The government has taken significant steps to incorporate digital skills into the existing curriculum, including the addition of compulsory IT subjects in junior high school and the introduction of Digital World as a subject in elementary school.[33] In 2021, the government adopted the 2030 Education Development Strategy. One of its key goals is to create a framework for the development of digital education at the pre-university level. It includes a focus on improving the digital competence of

---

[30] https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2021/Digital%20skills/1_Florensa_Haxhi_Albania.pdf

[31] https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2021/Digital%20skills/4_Nevena%20Praizovic_Serbia.pdf

[32] https://euprava.gov.rs

[33] https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-CONN_EDUC-2021-PDF-E.pdf

students and the digital competence of educators by introducing and promoting innovative approaches that embrace the integration of ICT into teaching and learning.

Furthermore, Serbia developed specific frameworks for the digital competencies of teachers, emphasising on the educational uses of technology. It ensures enhancing teaching and learning processes both online and offline.

With the outbreak of COVID-19 pandemic the Government launched a number of initiatives to facilitate the learning process. A website to support students, teachers and parents was introduced to help them address the COVID-19 challenges, and provide up-to-date information about the schedule for broadcasting instructional materials and other relevant information. Additionally, the Serbian Information Technology and e-Government Authority has launched the Digital Solidarity platform, which publishes an overview of free distance learning applications, tips on working from home, free online books, courses, movies, music and TV content.[34] Also, the Ministry of Education launched Moja škola, an e-learning management system, open-source software that enables users to easily access lessons on the video service on demand from the state broadcaster.[35]

---

[34] https://www.digitalnasolidarnost.gov.rs

[35] https://www.itu.int/dms_pub/itu-d/opb/phcb/D-PHCB-CONN_EDUC-2021-PDF-E.pdf

Annex I: Abbreviations and acronyms

57

Abbreviation/ Acronym	Description
AEC	Adult Education Center
BDE	Bureau for Development of Education
CPD	Continuing Professional Development
CVET	Centre for Vocational Education and Training
ESA	Employment Service Agency
GCI	Global Competitiveness Index
GDP	Gross Domestic Product
GNI	Gross National Income
ICT	Information and Communication Technology
MASIT	ICT Chamber of Commerce
MISA	Ministry of Information Society and Administration
MoES	Ministry of Education and Science
MOOC	Massive Open Online Courses
PAR	Public Administration Reform
SEC	State Examination Center
UNDP	United Nations Development Programme
VET	Vocational Education and Training

Annex II: Digital Citizenship Model

Table 22: Digital citizenship model envisaged by Macedonian National ICT Strategy

Digital Citizens	Main characteristics:
	● Have the knowledge and skills for efficient use of digital technologies in order to communicate with other citizens, engage in society, and create and use digital content.
	● Know how to exchange digital content.
	● Know how to protect private information, manage digital footprint and use the Internet safely, respect copyright, balance their time on the Internet and social networks, recognize cyber bullying and respect other digital citizens.
	Digital citizens skillset:
	● Work with keyboard and touch screen.
	● Work with folders, files and web browsers.
	● Basic skills to work with word processing tools and spreadsheets.
	● Basic skills to work with tools for making presentations, create professional profiles (user accounts) on the Internet.
	● Use email for communication.
	● Manage basic settings for securing privacy and data protection.
	● Work on the Internet for access to digital resources and information exchange.
	● Able to safely make online financial transactions.

Digital Users	Main characteristics:
	● Have the knowledge and skills for efficient use of digital technologies in everyday life, professional life, learning or socializing.
	● Know how to recognize the potential for bullying and how to protect themselves, they are safe in the digital world.
	● Know how to use software as a service and understand working in the cloud.
	● Able to store and manage data.
	● Able to work with corporate tools, e.g., scheduling appointments, video conferencing, managing tasks and projects, customer relationships and communicating with other users.
	● Able to use social networks for private and business purposes and can create creative digital content for marketing purposes.
	● Solve problems by applying digital skills and understand the processes that are based on digital technologies.
	● Use the Internet effectively for research and learning new things, recognizing the real and verified sources of information.
	● Open to learning new technologies and easily adapt to the latest innovations in the digital world.
	Digital users skillset:
	● Work with software as a service and work in the cloud.
	● Able to use corporate tools to work with users, lead projects, hold meetings and correspondence between users and clients.
	● Able to organize video conferences.
	● Use content management systems.
	● Advanced skills in working with word processing tools and spreadsheets.
	● Advanced skills for working with presentation tools, managing advanced settings to ensure privacy and data protection.
	● Aware of techniques for achieving digital security and can recognize cyber bullying.
	● Advanced skills for efficient use of the Internet in accessing digital resources in research and learning.
	● Aware of digital marketing through social networks, web content and blogs.
	● Ready to embrace innovative digital tools and technologies.

Digital Creators	Main characteristics:
	● Digital citizens who create hardware and software digital content, in the form of new digital tools, technologies and resources, while taking care of their implementation, management and maintenance, guided by ethical principles.
	● Have prior knowledge and education to perform tasks in a particular recognizable field of the IT industry.
	● Work in areas such as: programming, administration of computer systems and networks, development and administration of databases, data warehouses and big data, cloud computing, web content development and e-commerce, network and systems security, network monitoring, IoT, machine learning, AI, etc.
	● Play an important role in transforming existing businesses through the development of new digital technologies and / or the use of such new technologies in digital entrepreneurship.
	● Provide technical support to businesses and can provide on-the-job training to their employees.
	● Create security policies and solutions and protect systems, networks and data from cyber-attacks.
	Digital creators skillset:
	● Analyse and design IT systems, IT systems architecture.
	● Use programming, mobile technologies, web content development, virtual reality.
	● Work with operating systems, administration of computer systems and networks, cloud computing.
	● Able to model databases, data warehouses, big data.
	● Build computer networks And Internet application services.
	● Use machine learning, AI, data mining.
	● Able to create security solutions and policies for computer communication systems and networks.
	● Implement these innovative digital tools and technologies in digital entrepreneurship.
	● Test and provide the desired level of service quality.
	● Support for management and maintenance of IT systems.
	● Provide training and education of non-technical persons.
	● Creative in research and development of new digital content and resources.

Annex III: Interview Questions

QUESTIONS

PART I: General

1. Which industry does your company belong to?
2. How do technological changes impact your industry?
3. Are you aware of the latest digital technologies introduced in your industry? Can you mention a few?
4. How have these technologies affected your industry? (NA if answered no #2)

PART II: Digital Skills

1. What are the digital skills (basic and advanced) that are required in your company?
2. Do you observe shortage in these skills? Elaborate more on this.
3. Which digital skills do you find are most commonly lacking in candidates? How do you overcome this?
4. When recruiting, which job positions do you find it difficult to find candidates for because of lack of digital skills? How do you overcome this?
5. Which digital skills are required for these jobs?
6. What do you think are the causes of the skills gaps? Do you have any recommendations on how to resolve it? Two top recommendations, please.
7. How does skills gap affect your business?
8. Do you have access to digital skills trainings that are affordable and relevant to the needs of your employees?
9. Do you participate in digital skills trainings? How frequently? Do you find it beneficial to participate in digital skills trainings? If not, how do you improve digital skills?
10. Do you provide digital skills training for your employees? How frequently? Do you find it beneficial? Do you provide it in-house or externally?

Annex IV: Survey Questions

QUESTIONNAIRE

GENERAL DATA

1. How old are you?

    - 18-24 - 25-34   - 35-44   - 45-54   - 55-64 - 65+

2. What level of education have you completed?

    - General secondary education   - Vocational education   - Bachelor

    - Master   - Doctorate

3. What is your occupation? _____

4. Does your employer provide digital skills trainings?

    - Yes   - No

5. If yes, how often?

- Once a year   - Twice a year - Other (please specify) _____

TECHNOLOGY

1. What types of Information & Communication Technologies (ICT) devices do you use on a regular basis? (Check all that apply)

    - Desktop computer   - Laptop computer   - Smartphone device

    - Tablet device   - Other ICT devices

2. How do you appreciate your level of knowledge in using the following devices?

Devices	Very Low	Low	Well	Good	Very good
Desktop					
Laptop					
Smartphone					

Tablet					
Other Device					

3. Do you use any of the following technologies in your daily routine? If yes, please also indicate how often you use it.

Devices	Everyday	Often	At least once a week	At least once a month	Just once or twice	Never
Desktop						
Laptop						
Smartphone						
Tablet						
Other Device						

4. Do you have Internet Access at home (cable or optic)?

   - Yes   - No

5. Do you have Mobile Internet (2G, 3G, 4G)?

   - Yes   - No

DIGITAL COMPETENCE AREAS

INFORMATION AND DATA LITERACY	
1.	Can you look for information online using a search engine?
	Yes No
2.	Do you know that not all online information is reliable?
	Yes No
3.	Can you save or store files or content and retrieve them once saved or stored?
a)	a text, photo, music, video, or website?
	Not at all Little Well Advanced user

b)	files (documents, tables, presentations)

	Not at all	*Little*	*Well*	*Advanced user*

4.	Can you retrieve files after you have saved them?

	Not at all	*Little*	*Well*	*Advanced user*

COMMUNICATION AND COLLABORATION

1.	Do you use your cell phone to communicate with text messages (SMS), voice messages (MMS), or phone calls?

	Yes	*No*

2.	Can you use communication services like Skype, Whatsapp, Viber, etc.?

	Not at all	*Little*	*Well*	*Advanced user*

3.	Do you have an email address?

	Yes	*No*

4.	Can you send emails or reply to incoming emails?

	Yes	*No*

5.	Do you know how to open a new email address?

	Yes	*No*

6.	Can you share files and content using digital tools (Dropbox, Google Drive, OneDrive, etc.)?

	Not at all	*Little*	*Well*	*Advanced user*

7.	Do you know how to use digital technologies to interact with services (as governments (PRO), banks)?

	Not at all	*Little*	*Well*	*Advanced user*

8.	Are you aware of social networking sites (e.g Facebook, Instragram)?

	Not at all	*Little*	*Well*	*Advanced user*

9.	Are you aware of online collaboration tools (Zoom, Microsoft Teams, Google Doc, Skype for Business)?

	Not at all	*Little*	*Well*	*Advanced user*

10.	Are you aware about rules of digital communication (e.g. when commenting, sharing personal information)?

	Yes	*No*	

DIGITAL CONTENT CREATION

1.	Can you produce digital content (e.g. text, tables, images, audio files) in at least one format using digital tools?		
	Not at all	*Little*	*Well*	*Advanced user*

2.	Can you make editing to content produced by others (e.g. documents, text, images, audio, video)?
	Not at all *Little* *Well* *Advanced user*

3.	Do you know that content can be covered by copyright?
	Yes *No*

4.	Can you apply and modify functions and settings of software and applications that you use (e.g. change default settings)?
	Not at all *Little* *Well* *Advanced user*

SAFETY

1.	Can you take basic steps to protect your devices (e.g. using antiviruses and passwords)?
	Yes No

2.	Are you aware that your credentials (username and password) can be stolen?
	Yes No

3.	Do you know that you should not reveal private information online?
	Yes No

4.	Are you aware that using digital technology more than 6 hours a day can negatively affect your health?
	Yes *No*

PROBLEM SOLVING

1.	Do you know where to find support and assistance when a technical problem occurs or when using a new device, program or application?
	Yes *No*

2.	Do you know how to solve some routine problems (e.g. close program, re-start computer, re-install/update program, check internet connection)?

		Not at all	*Little*	*Well*	*Advanced user*
3.	Do you think digital tools, with certain limitations, can help you in solving problems?				
		Yes	*No*		
4.	When confronted with a technological or non-technological problem, do you use digital tools to solve it?				
		Yes	*No*		

List of Tables

List of Figures