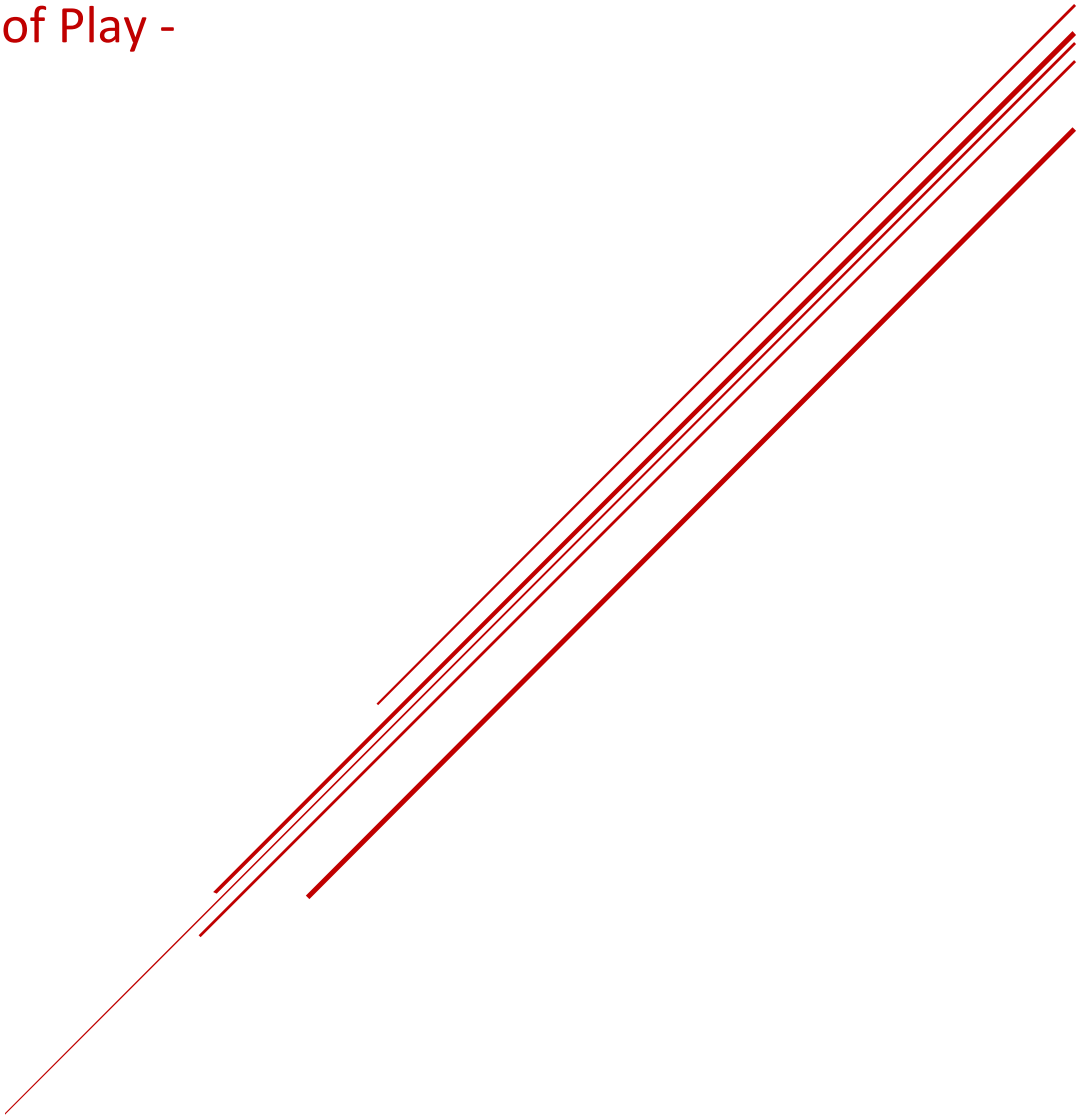
MACEDONIA
2025
Helping Build a Stronger Nation

DIGITALIZATION AND DIGITAL SKILLS OF CITIZENS AND BUSINESSES

- State of Play -



Digitalization and digital skills of citizens and businesses

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Executive Summary

The future is in digitization and digital skills. Any country that aims to be a major player in the global economy or aspires to catch up with the leading countries must focus on digitalization. The perks of a fully functional digitalized society are endless. The literal meaning of digitalization gives an apparent idea of development and a technology-dependent world. Digitalization offers developing countries the opportunity to make a big leap and catch up more quickly with developed economies. Not only that but by reducing the human factor to a minimum, digitalization has a great potential of reducing clientelism, bribery and corruption. Digitalization of public services and the use of ICT can support the democratization, transparency, and accountability of governments. These, together with the expansion of broadband access and implementation of 5G networks, can lead to increased digitalization of the society which "leaves no one behind".

Macedonia has a long way to go in terms of being fully digitalized. The government's latest ICT strategy (pending adoption) is focused on supporting and investing in the digitalization and digital skills of government (public services), companies, and citizens. Digital society is founded on digitally competent citizens (including the workforce) and digitally mature companies. The present study provides a background analysis of the state of play of digitalization and digital skills of Macedonian citizens and businesses. It covers the topics of computer/internet use, use of digital tools, the use of e-government services by population and households, as well as the digital readiness and use of digital technologies by companies, based on the available data. The main aim is that the analysis serves as the basis for designing policies and promotion of measures for speeding up digitalization. In addition, the analysis offers recommendations and gives directions for the advancement of digital skills for companies and the general population.

The findings of this analysis show that Macedonia lags behind the EU, and the world, in digitalization in all three segments: citizens, businesses and government. Macedonian citizens significantly lag behind their EU peers in terms of digital skills, as well as the use of digital skills in everyday life and work. The supply of e-government services is still comparatively low, but also the use of those services by citizens is low, which is related to the low level of digital skills and some other factors such as lack of trust, security issues, etc. In 2021, only 28% of Macedonian citizens used the Internet for interaction with public authorities, less than half of the EU average (57%). The use of ICT by companies is strongly related to the size of the company, with micro and small companies largely lagging behind the large and medium-sized ones. The latter is also related to the low use of digital skills by the population. In 2021, only 10% of Macedonian enterprises made sales[1] online, compared to the EU-27 average of 22% (and 27% in Serbia, for 2021).

[1] https://ec.europa.eu/eurostat/databrowser/view/isoc_ec_eseln2/default/table?lang=en

Macedonian businesses feel pressure to be innovative and competitive, but their full understanding of the potential of digital transformation is still low.

Based on the findings, the study suggests specific measures and activities for the advancement of the digitalization and digital skills of Macedonian businesses and the population. For citizens, we propose measures such as the acquisition of a mandatory minimum level of digital skills for students, establishing a national framework for digital skills, and training unemployed people in digital skills to support their (re)employment. For companies, we suggest subsidies for annual subscriptions for free broadband, 6-12 months of free digital services, the establishment of a government fund for co-financing training in digital skills, tax breaks and incentives that would encourage employees to be upskilled or reskilled, and some tax breaks, etc. For the recommendations to be successfully implemented, many actors in the government, civic and private sectors need to be engaged.

I. Introduction

The purpose of this analysis is to provide a snapshot of the situation in Macedonia in the area of digital skills and digitalization, as a basis for designing appropriate measures and policies as to foster digitalization. The analysis is based on data available in this area from national statistical sources (mainly the State Statistical Office), the EU statistical system - Eurostat, as well as additional surveys conducted by other actors, but conducted on large, representative samples. This is the first analysis of this type prepared for Macedonia, analyzing the data from all available sources according to solid and comparable methodologies, and offering detailed data based on different characteristics of citizens and companies. The Covid-19 pandemic made a positive distribution in terms of speeding up digitalization. In particular, the degree of digitalization of services (especially in companies) has increased, and thus has the use of the Internet, the development of citizens' digital skills (especially online payments and purchases), as well as the use of digital skills for learning and professional development. This trend continued in the post-Pandemic period.

Digitalization and digital skills are the basis for progress of modern societies. Any country that aims to be a major player in the global economy or strives to reach the leading countries must focus on digitalization. Digitalization is the basis for progress, growth and increase of the competitiveness of individuals and companies that are participants in the Macedonian economy, and consequently in the global economic trends that become even more accessible if the individual/company possesses digital skills and knowledge of digital tools. Digitalization creates space for social inclusion on a broad basis, but on the other hand, it can also be a basis for social exclusion if certain categories of citizens and/or companies do not acquire digital skills and do not engage in digitalization.

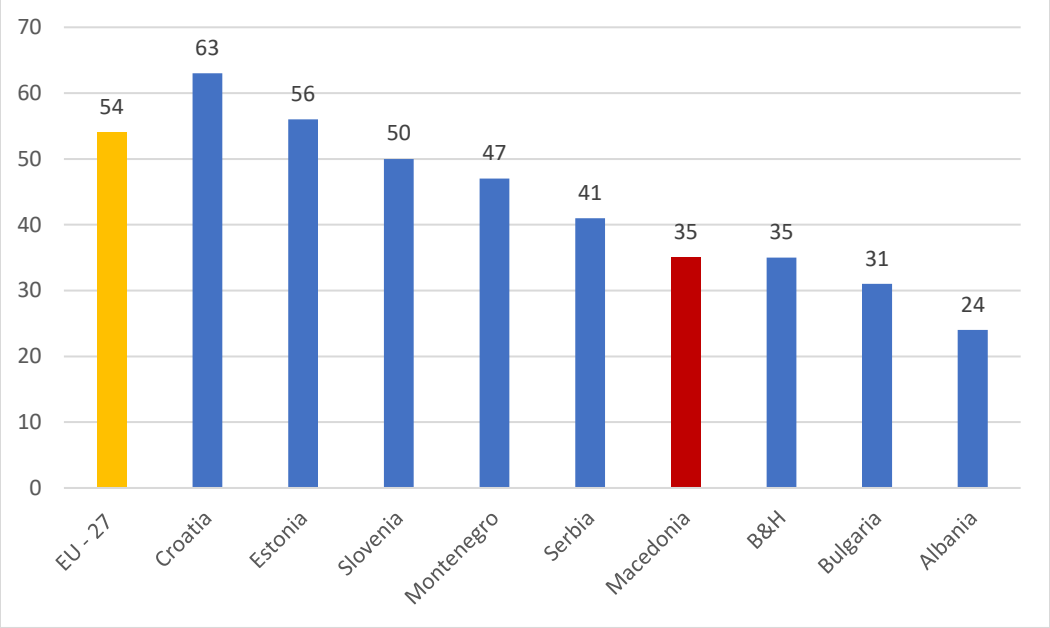
The adoption of the National Strategy for ICT 2021-2025 is still pending. The draft Strategy is strongly focused on supporting and investing in the development of digitalization and digital skills of government (public services), companies, and citizens. This analysis offers evidence particularly for designing effective measures in that direction, especially in the segment of citizens (based on characteristics, such as age, education, labor market status, etc.), as well as companies.

The structure of this study is as follows. In the following sections we focus on presenting the data in two segments, households and companies where we present different aspects of the digital skills, digital readiness and the use of digital tools.

II. Households: Access to the internet and digital skills

Comparative data show that the level of digital skills of the Macedonian population is relatively low. In particular, Eurostat data show that 35% of the population in 2021 held only a basic level or above the basic level of digital skills relative to 54% of the population in the EU-27 (latest available data). Estonia is the country with the highest level of digitalization, whereas the countries from the region (the so-called aspiring and structural peers of Macedonia) are all having a lower level of digital skills compared to the EU average.

Graph 1: Individuals who have basic or above basic overall digital skills per country in 2021, (in %)



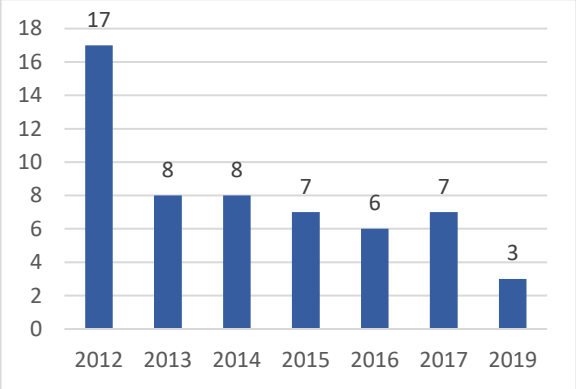
Source: Eurostat database.

The low level of digital skills can be partly related to a lack of access or affordability (high prices) of Internet or equipment. Indeed, Graph 2 presents the reasons why households in Macedonia do not have internet access. Data show that neither the access nor the affordability of Internet and equipment can explain the low level of digital skills. In particular, in 2019 (latest available data), only 3% of households did not have internet access because the access costs were too high, whereas for 4% of households the equipment costs were too high (Graph2).[2]

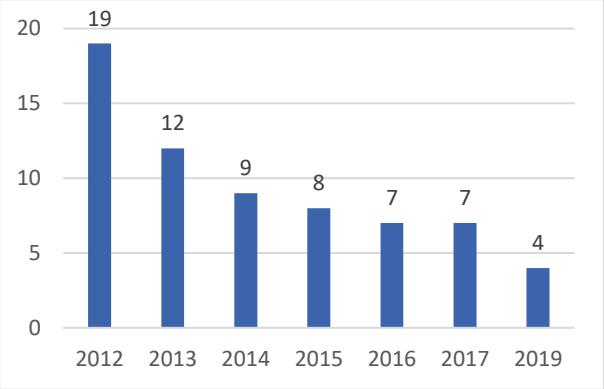
[2] In 2018 there is an interruption in the time series.

Graph 2: Households without access to the Internet at home because:

a) the access costs are too high (in %)[3]



b) the equipment costs are too high (in %)

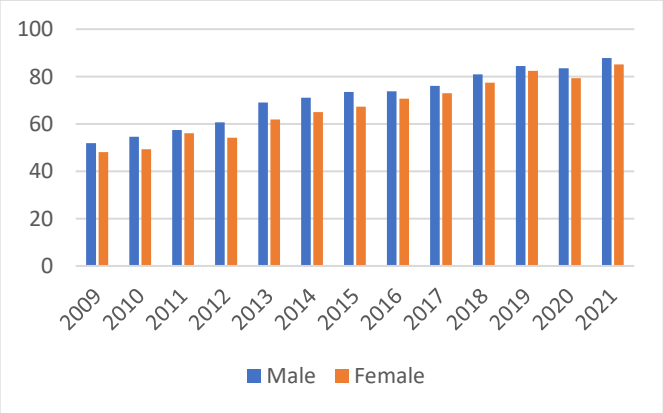


Source: Eurostat database.

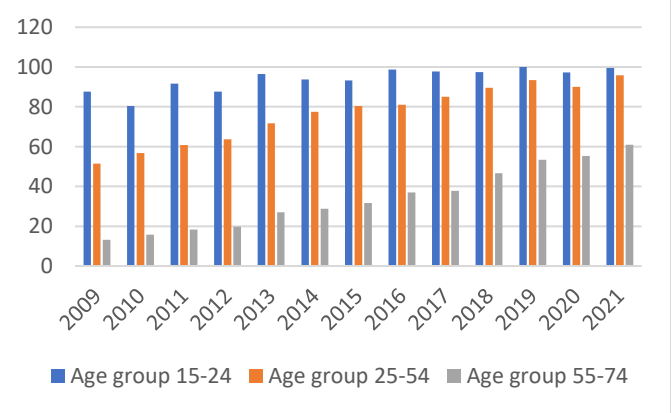
Graph 3 analyzes the data on Internet users segregated by gender, education, age and employment status. There is an improvement of the indicator over the years across all segments of the population, but with some differences between the age groups and the level of education. In 2021, 86.4% of the population in Macedonia used the Internet in the last 3 months, which is a large increase compared to 2009 (50%). The gender gap in terms of Internet users is relatively low: in 2021, 87.8% of males used the Internet compared to 85.1% of females. As expected, there are major differences in Internet use among different age groups (Graph 3b). In 2021, young people used the Internet universally, whereas 95.9% of the age group 25-54 and 61% of individuals aged 55-74 used the Internet. Progress has been made in all age groups compared to 2009.

Graph 3: Internet users in the last 3 months, by years – by gender, age, education, employment status

a) By gender



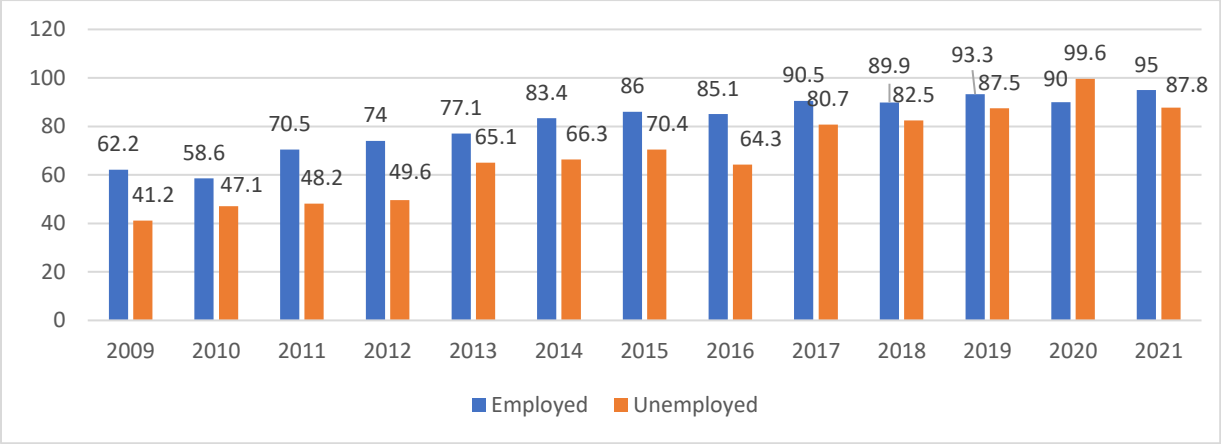
b) By age



Source: Makstat database.

Internet use is more prevalent among employed persons, which is likely related to the fulfillment of certain job tasks online, and/or a higher level of digital skills of those individuals compared to the unemployed ones (Graph 4).

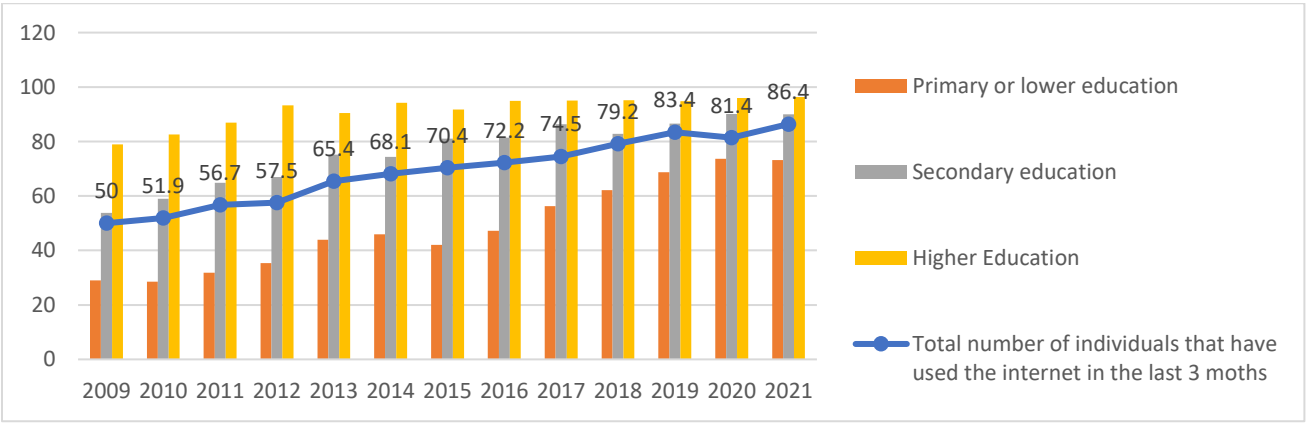
Graph 4: Internet use by labor market status



Source: Makstat database.

Graph 5 presents the data for internet use differentiated by level of education. There is a significant gap among the individuals with different educational attainment, whereby 96.3% of the individuals with completed education are Internet users, whereas only 73.2% of the individuals with completed primary education use the Internet. The gap between individuals with higher education and individuals with primary education who use the Internet has remained relatively the same from the period 2009-2021 which is an alarming signal showing the need for government intervention for closing the gap and preventing this new, modern form of social exclusion related to a lack of digital skills.

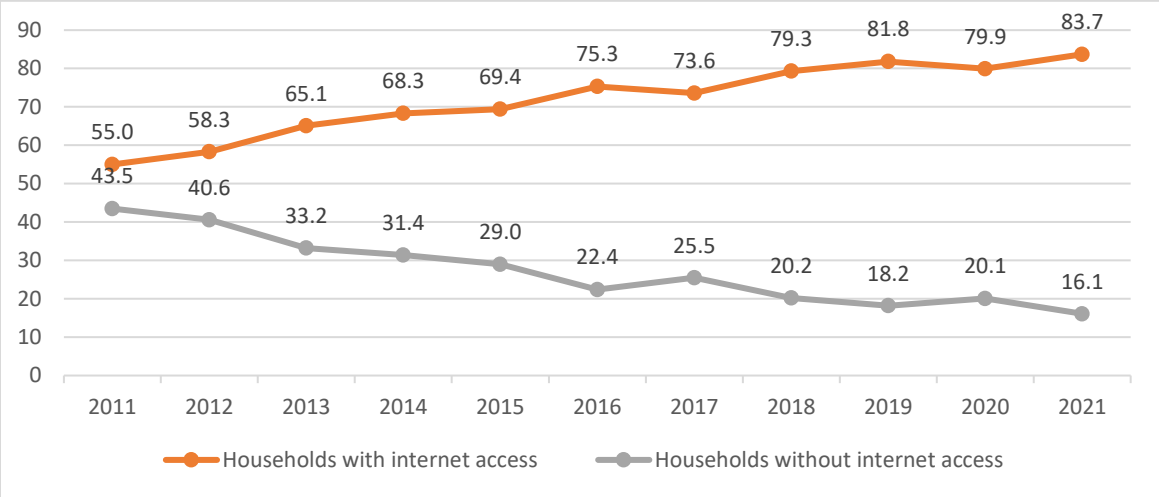
Graph 5: Internet use by level of education



Source: Makstat database

Graph *6* presents data on the use of Information and Communication Technologies (ICT) in households in Macedonia differentiated by the availability of Internet access. As expected, households with Internet access use much more ICT, compared to households without access. The gap in the use of ICT widened over the years and reached 67.6 p.p. in 2021.

Graph 6: ICT use in households with and w/o internet access



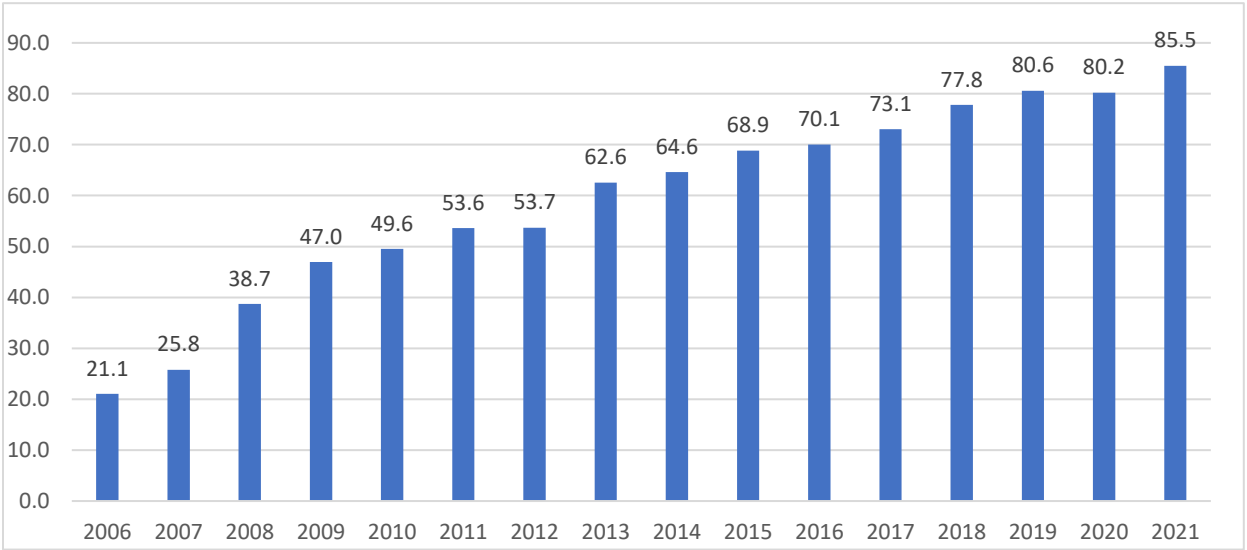
Source: Makstat database.

There are many ways of obtaining ICT skills, one of which is through the available free online courses for those that would like to learn and acquire new skills. Suprisingly, based on Eurostat data about individuals that carried out free online training or self-study to improve skills relating to ICT in 2018, Macedonia holds the highest percentage of 41%, which is around 31 p.p. higher than countries in the EU-27.[4]

Graph 7 presents the data on Internet use on a regular basis, i.e. on a daily basis. Between 2006 and 2021, great progress was made in Internet use on a daily basis among all groups of citizens presented. In 2021, 85.5% of the citizens used the Internet on a daily basis. Though, the same gaps/differences by age groups, education and employment status generally prevail (Graphs 7b and 7c). Thus, in addition to the data on "quantity" or regularity in Internet use, it is also important to know what exactly the Internet is used for on a daily basis, such as whether to deepen the knowledge and perspectives or for more informal activities and entertainment.

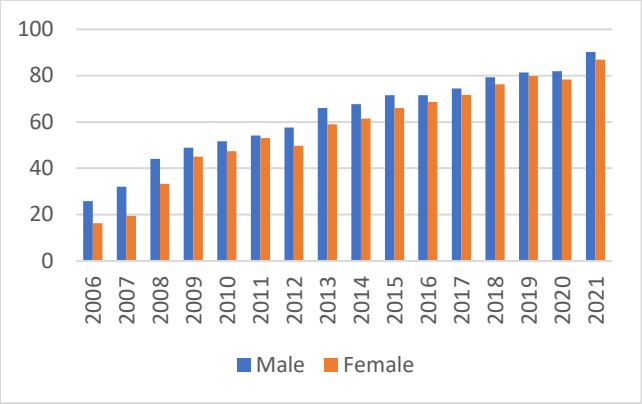
Graph 7: Internet users on daily basis – by gender, age, (in %)

7a) Total number of individuals (15-74) who use the Internet on a daily basis



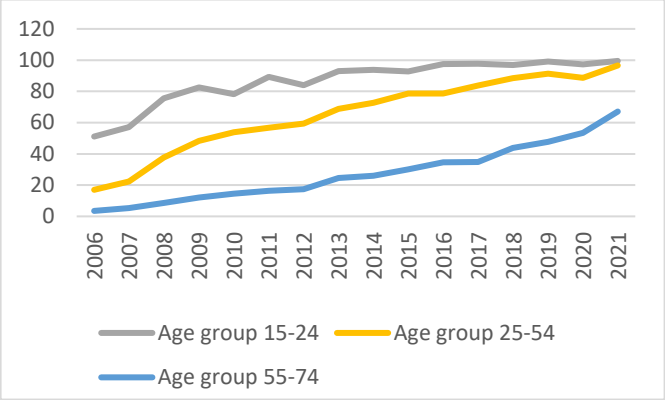
[4] https://ec.europa.eu/eurostat/databrowser/view/isoc_sk_how_i/default/table?lang=en

7b) By gender



Source: Makstat

7c) By age

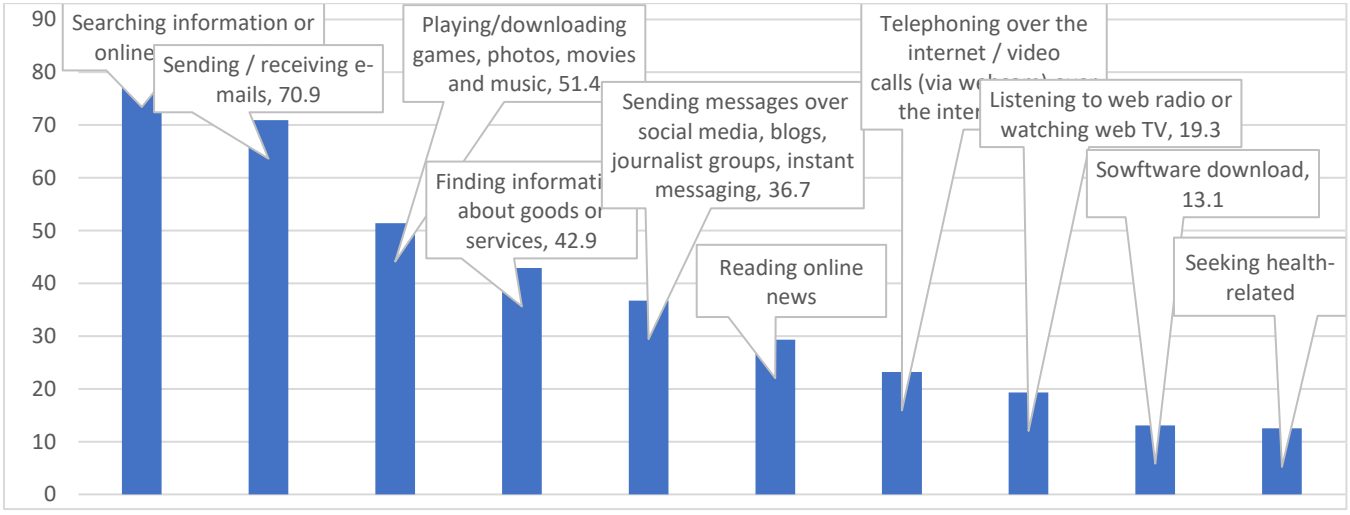


Source: Makstat

Graph 8 presents the comparative data for two time periods, 2006 and 2021, regarding the purpose for which the citizens used the Internet. In 2006, the dominant purpose of the Internet was to search for information/online services as used by 80.7% of the overall Internet users, followed by e-mail communication and activities for entertainment and relaxation.

Graph 8: Internet use for private purposes, 2006 vs. 2021, (in %)

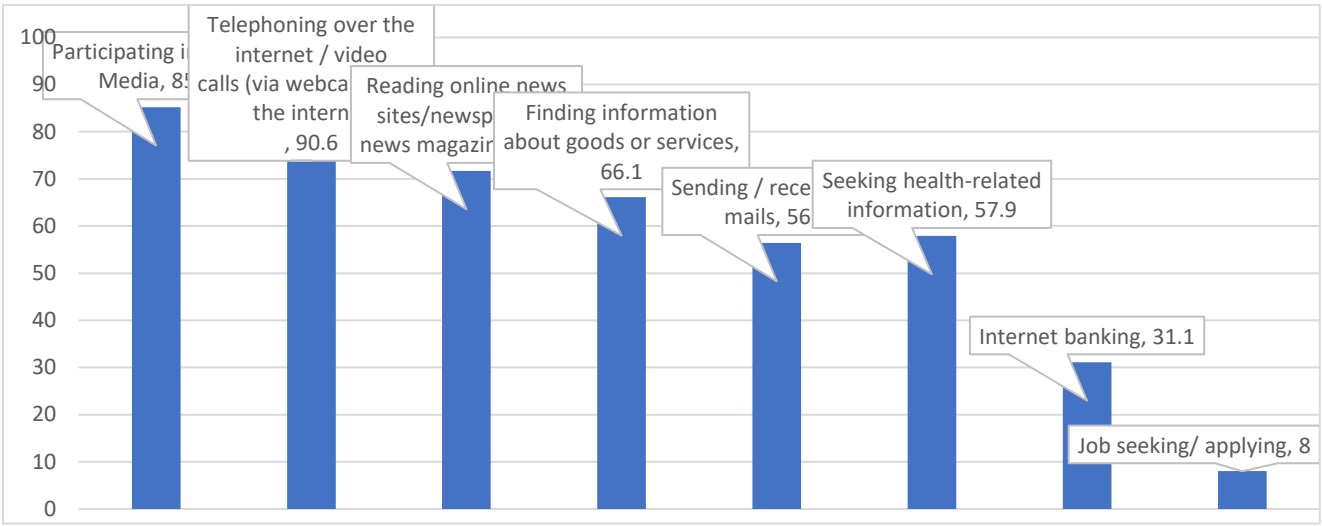
8a) Internet use in 2006, by purpose (in %)



Source: Makstat

The purpose of the Internet in 2021 is quite different. It is dominated by the Internet use for communication (telephoning) over Internet /video call (used by 90.6% of all users), participation in social media (85.2%), reading online news (71.7%), finding information about goods and services, etc.

8b) Internet use in 2021, by purpose (in %)



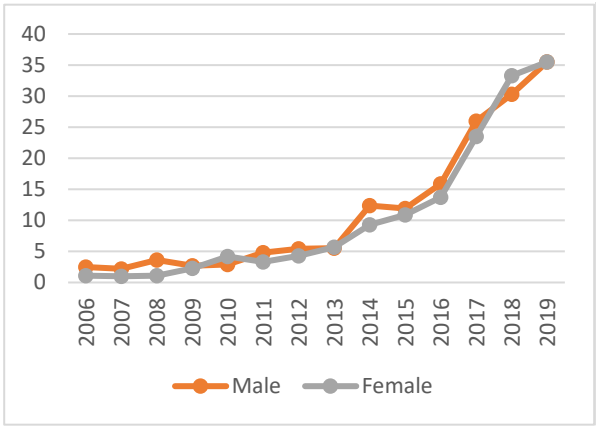
Source: Makstat

The practical use of digital tools and ICT can significantly improve the quality of life and save time for the citizens when interacting with the government or obtaining some government services. Unfortunately, Macedonian citizens very rarely use digital channels for interaction with the government/public institutions. In 2021, less than 30% of the citizens used some type of e-service provided by the government (Graph 9a). The use of e-services provided by the state depends on both parties, i.e.: the supply (whether the government offers certain public services online) and the demand (whether the citizens want to use e-services from the government, whether they know how to use them and whether they have trust in government to use the e-services).

Almost identical number of males and females in 2019 used the Internet to order/purchase a product or service (Graph 9a). Data differentiated by age show that the youngest age group has the leading position in this segment as well (Graph 9b).

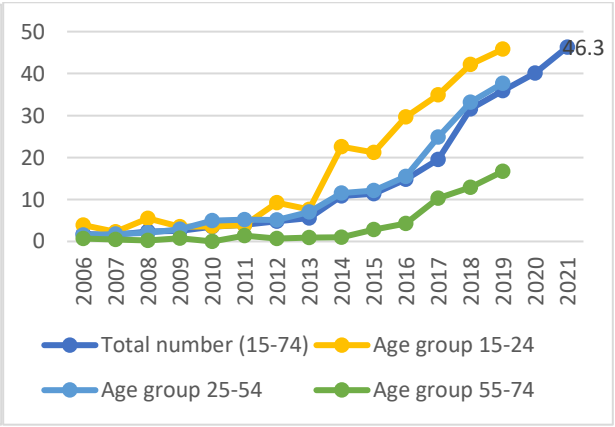
Graph 9: Individuals (15-74) in Macedonia who ordered or purchased products or services online, in the last 12 months, by years – by gender, age (in thousands)

9a) By gender



Source: Makstat

9b) By age



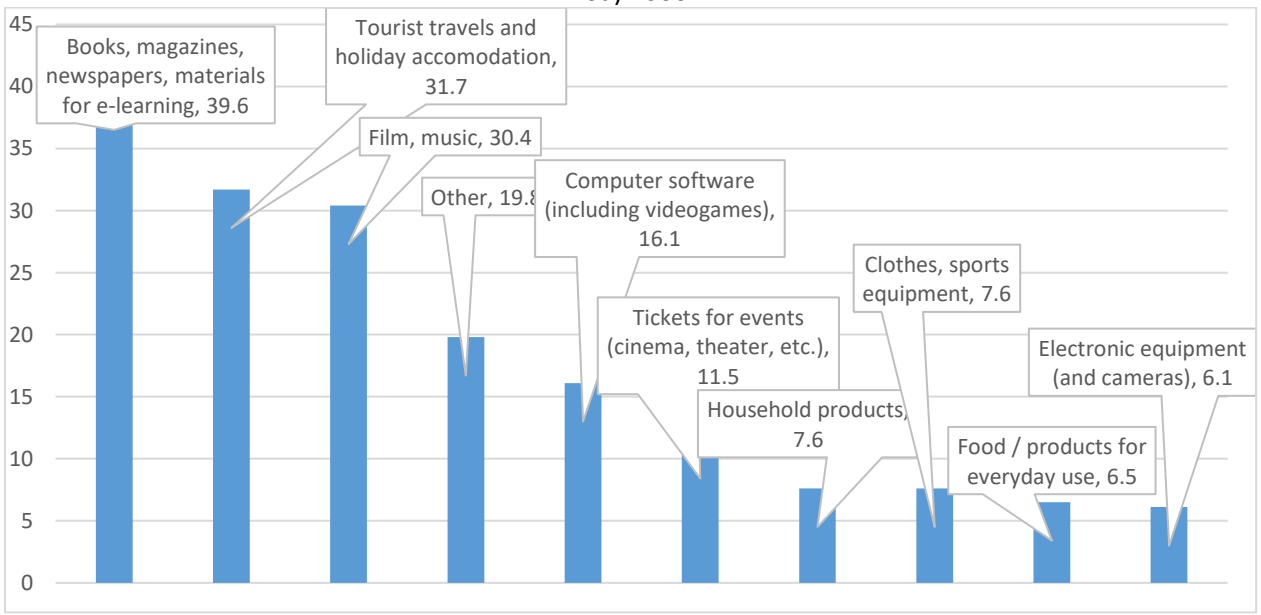
Source: Makstat

Macedonia lags behind the EU-27 in online shopping. In 2020, 7 out of 10 Internet users (from the 12 months prior to the survey) in Macedonia made online purchases in the same period, which is close to the EU-27 average of 73%. Overall, the share of e-shoppers among Internet users is growing, with the highest proportions found in the age group 25-54 (79%), followed by the youngest age group 16-24 (78%).[5]

In the analyzed period (2006 and 2021), the Internet use for ordering and purchasing products has significantly increased. Graph 11 analyzes the structure of products ordered through digital channels in two time periods, in 2006 and 2021. Different types of products dominate the online ordering segment in these two years. Whereas in 2006 it was magazines, newspapers, e-learning methods, booking accommodation and music/film; in 2021 the e-purchase segment is dominated by clothes, household necessities and electronic equipment. However, some categories such as tourist travel and holiday accommodation, as well as tickets for events have experienced a declining share in e-purchases mainly because of the travel and other restrictions related to Covid-19.

Graph 10: Most frequently ordered/purchased products or services online by individuals aged 15-74, in the last 12 months, 2006 vs. 2021 (in %)

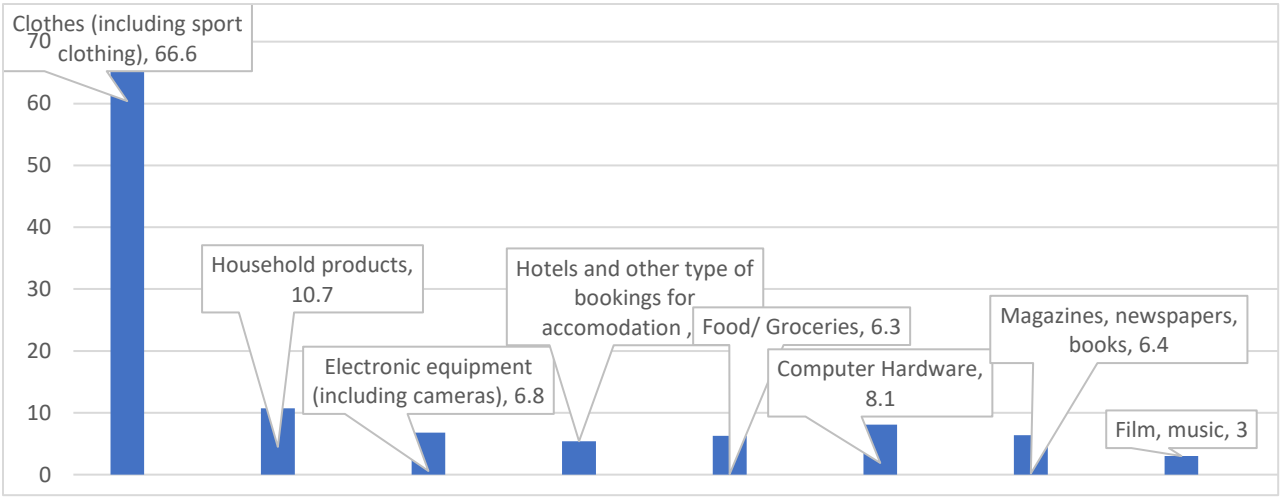
10a) 2006



Source:Makstat

[5] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=E-commerce_statistics_for_individuals

10b) 2021

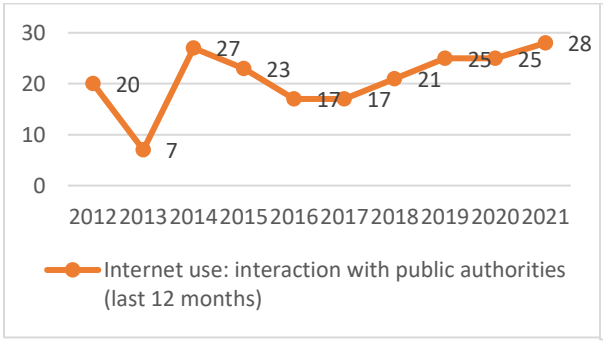


Source: Makstat

Citizens use e-government services the least for submitting forms, as only 11.6% of the citizens say they use the services. The situation is similar with downloading forms. On the other hand, the citizens mostly use e-government services to obtain information from websites of government institutions (24% of the citizens).

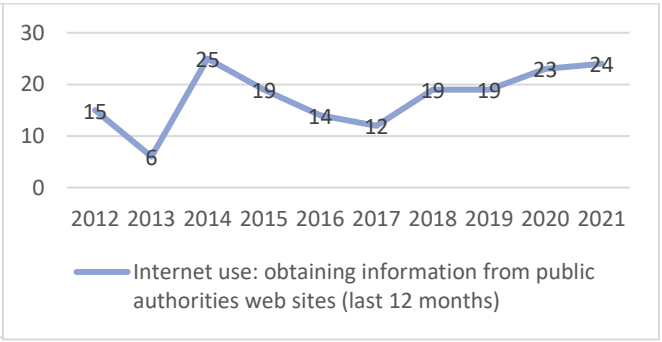
Graph 11: Use of e-government services for private purposes for the individuals aged 15-74, in the last 12 months, by years, (in %)

11a) Interaction with public authorities/service



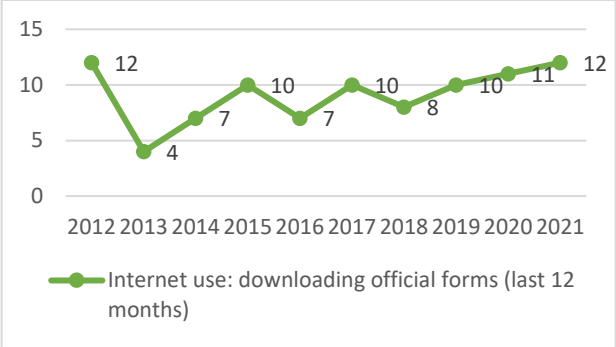
Source: Eurostat

11b) Internet use to receive information from the Government



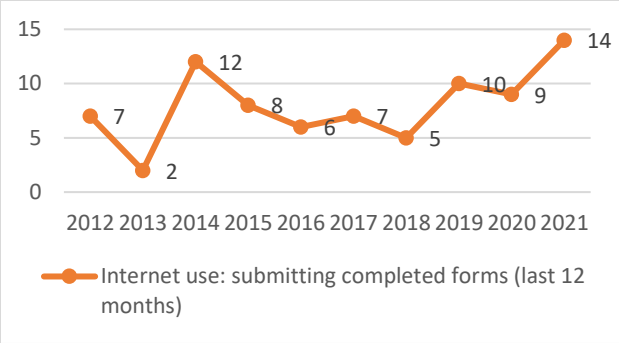
Source: Eurostat

11c) Downloading official forms



Source: Eurostat

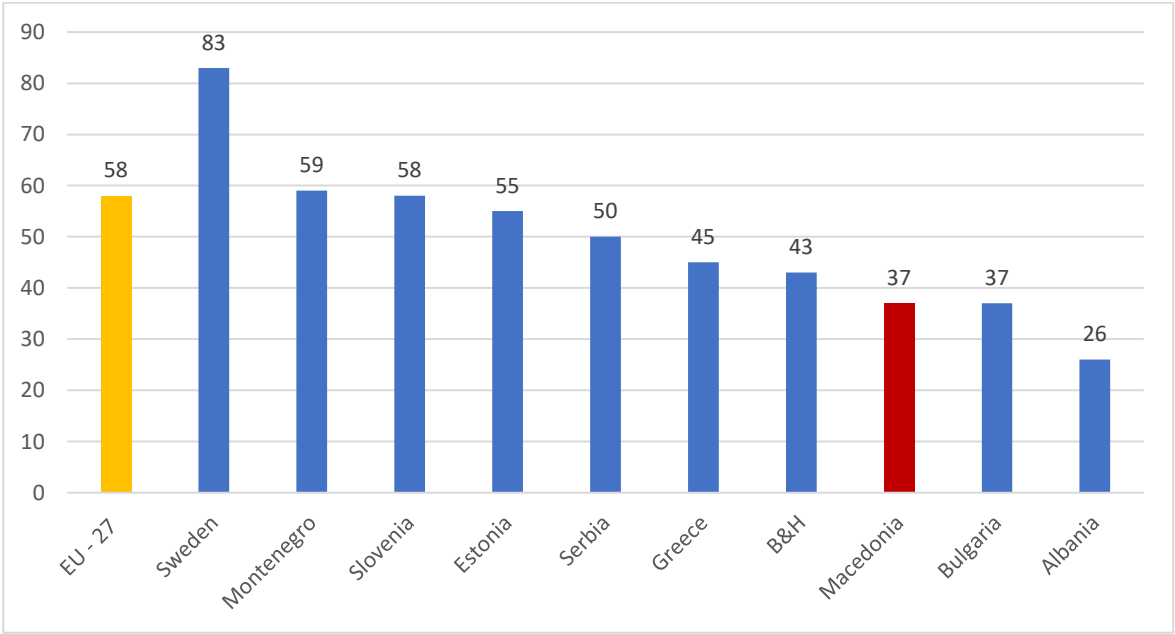
11d) Submission of forms



Source: Eurostat

Graph 12 presents data on the use of computers and Internet by employees in Macedonia. Evidently, few of Macedonian employees, just above one third, use computers and internet at work, which is 21 p.p. lower than the EU-27 average. This indicator is related to the structure of the economy, i.t. the dominant industries and occupaitons in a country. In particular, strong service sector would imply greater use of computers/internet compared to a (more tradiitonal) manufacturing industry, such as textile industry.

Graph 12. The use of computers and the internet by employees in 2021

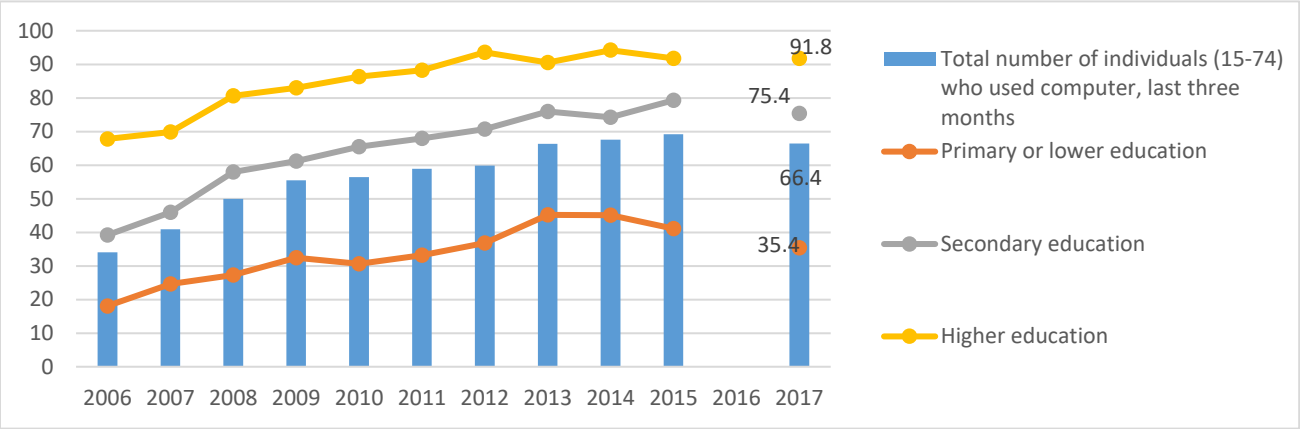


Source: Eurostat

Computer use is also closely related to an individual's education (Graph 13). There is a big difference of 56.4 p.p. between individuals with higher education who use a computer (91.8%) and individuals with primary education (35.4%). This difference can be related to several reasons. For example, digital skills are acquired through the formal education process and/or the individuals with higher education have a

better job (higher level occupation, such as professionals, technicians, etc.) or better financial situation due to which they use a computer more often.

Graph 13: Computer users in the last 3 months, by year – by education



Source: Makstat[6]

The analysis presented in this section shows that significant progress has been made in regular use of the Internet and practical use of computers and the Internet for activities that are an integral part of citizens' lives (e.g., online shopping and ordering, making telephone calls through Internet, reading magazines) and the like. Access to and costs of the Internet do not seem to be a large challenge in the country. Still, a small share of Macedonian citizens possesses digital skills, meaning that there is a lack of pathways that supports individuals to gain digital skills. Digital skills are closely linked to the level of education implying that education or educational policy can be an important pathway to the development and enhancement of digital skills. Large differences exist in computer and Internet and digital skills between the age groups, such that a much higher share of the young population holds digital skills. About a third of employees in the country use computers and the Internet in their work. A small segment of the population (under 30%) used some e-government services in 2021 While there is a need for greater digitalization of government services, on the other hand, there is a need for improving the digital skills of citizens, Internet access, trust in government institutions, and the like.

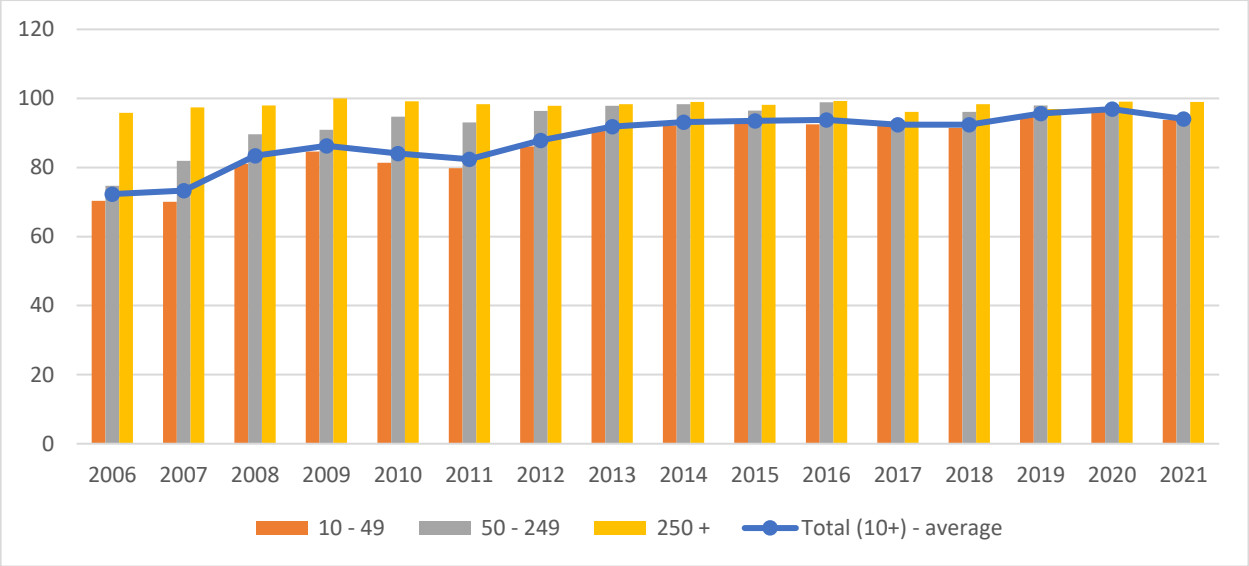
III. Companies

Graph 14 presents the data on companies in Macedonia that have access to the Internet.[7][8] According to these data, 94.1% of companies in Macedonia with over 10 employees had access to the Internet in 2021. While Internet access is high for all sizes of companies, small companies (10-49 employees) are slightly lagging behind the medium and large companies in 2021. The time series shows that in the past period large progress has been made in this segment in the case of small and medium companies. Makstat database of the State Statistical Office does not include data on micro-companies. However, a separate

[6] In 2016 there is an interruption in the time series. Last available data for this series is from 2017.
[7] The analysis presented in this section is based on data available in the State Statistical Office. Still, these data are not sufficiently rich, and also exclude micro companies (0-9 employees), as a result of which we use data from the survey conducted by one company done on a representative sample of companies in Macedonia. The data source is precisely mentioned everywhere.
[8] Small companies with 10-49 employees, medium (20-249) and large (250+).

analysis[9] that includes the segment of micro companies shows that these companies have almost universal access to the Internet.

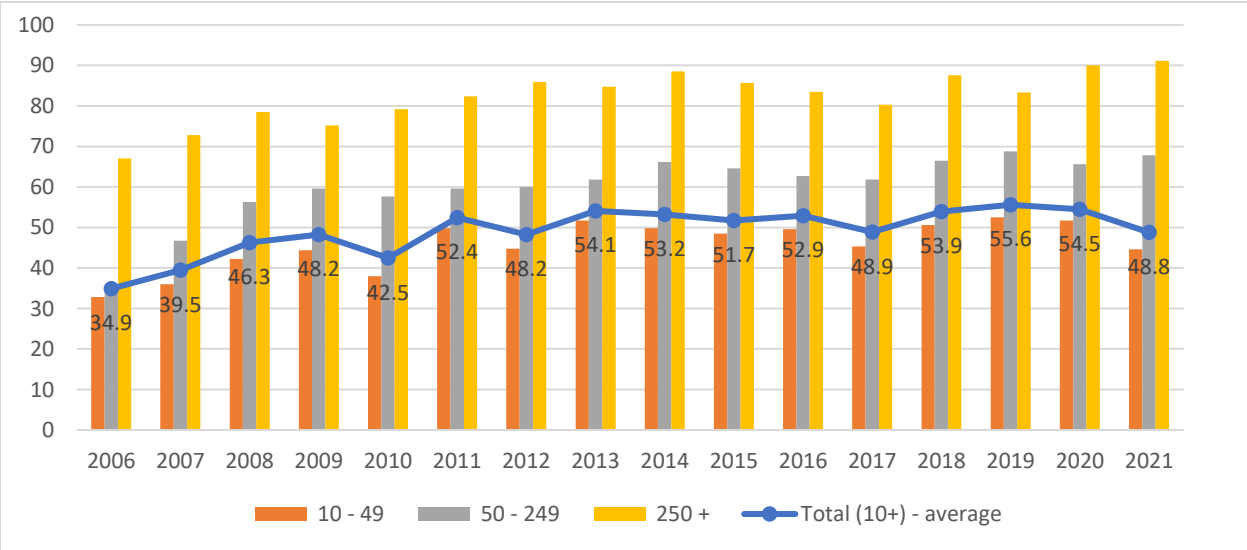
Graph 14: Business entities that have access to the Internet (%)



Source: Makstat

Graph 15 presents the data on the companies that have their own website where visitors (clients) can be informed about the company and company products and/or perform some transaction. There are large differences related to company size in this segment. In particular, in 2021, 44,6% of the small companies compared to 91,9% of the large companies had their own website. Over time, there was a slight reduction of the gap between the companies of different size, though some reverse trend occurred in 2021.

Graph 15: Business entities that have websites and/or home (start) pages, (in %)

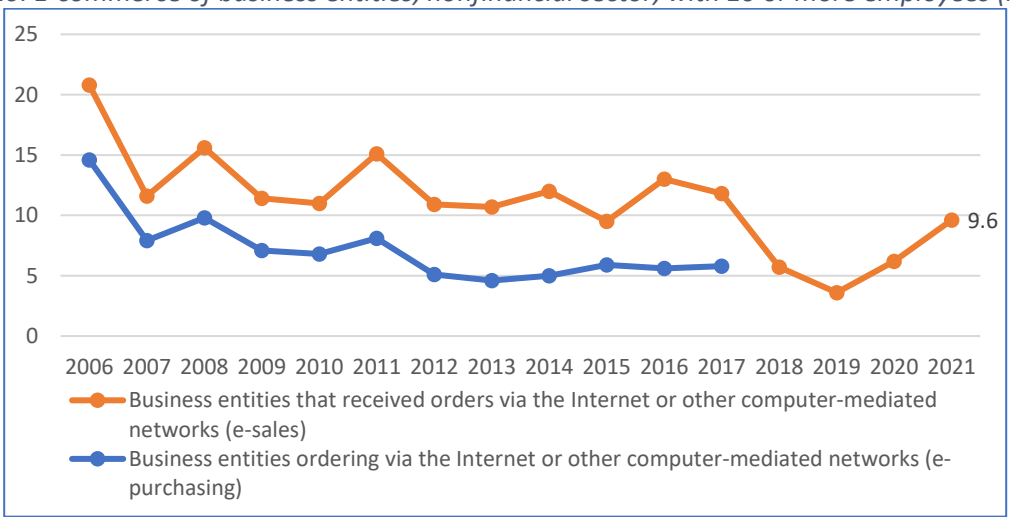


Source: Makstat

[9] https://www.telekom.mk/content/pdf/Digitalna-zrelost.pdf

The data presented in Graph 16 refer to the share of e-commerce in the total turnover made by companies. In this segment, the data show a downward trend which is surprising. In 2006, 6.2% of companies performed e-sales of their products, whereas in 2020 that percentage is identical (after a dip in 2019), which is contrary to the expectations that companies are modernizing through introduction of e-commerce.[10]

Graph 16: E-commerce of business entities, nonfinancial sector, with 10 or more employees (in %)



Source: Makstat

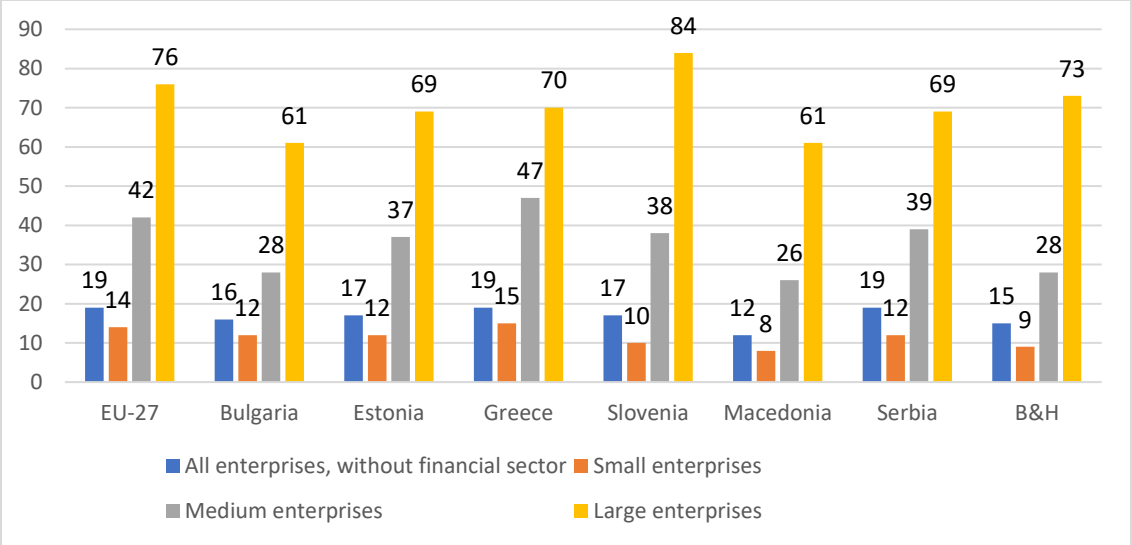
One crucial segment for the company to operate digitally is for the company to employ ICT specialists. Graph 17 presents the data on EU countries and Western Balkan countries in terms of employing ICT specialists. Compared to all countries, Macedonia is at the bottom of the list, both in total and according to the different size of companies. In 2020 only 12% of companies in Macedonia were employing an IT specialist, compared to 19% in the EU-27 and in Serbia. Sixty one percent of large companies in Macedonia had ICT specialists, which was the case for 42% of the medium-size companies and 8% of small companies.

The ICT sector in Macedonia

According to the general mapping report titled 'ICT Industry in North Macedonia' (2020), there were 1,957 economically active companies in the ICT Industry in 2019, which generate a total of 118.65 million in net-profit. Most of the companies or 56% of the total are concentrated within the "Software and IT Services" subsegment and 27% in "ICT Trade and Manufacturing". The Macedonian Chamber of Commerce for Information and Communication Technologies (MASIT) projected that the total number of economically active companies will reach 2,390 or growth of nearly 15% in 2020 compared to 2019. The industry is employing a total of 15,093 individuals, and it is expected that in the next several years the number of employees to grow up to 17,676. The average number of employees per company is 7.46. Companies in this industry are already experiencing a shortage of workforce.

[10] The analysis conducted by the company Makedonski Telekom, where the use of digital services by companies based on a representative sample of companies surveyed was analyzed, found that e-commerce is a segment that is least used by the companies. More details available at: https://www.telekom.mk/content/pdf/Digitalna-zrelost.pdf, p.6

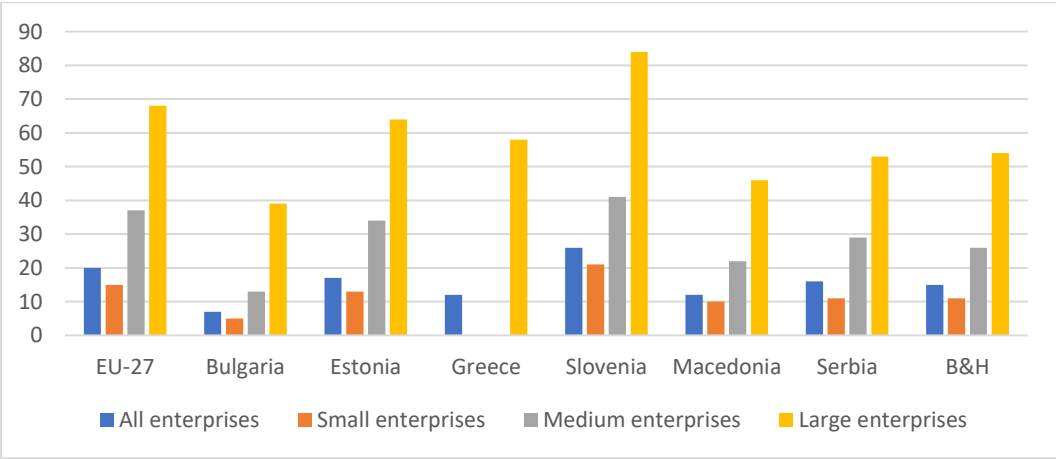
Graph 17: Companies that employ ICT specialists in 2020, (in %)



Source: Eurostat
Note: Companies from financial sector are excluded from the analysis.

Graph 18 presents the data on the percentage of companies that provided training/courses to improve the ICT skills of their employees, for the purpose of improving the operational processes. Macedonia, again, is positioned at the European bottom. In 2020, 12% of Macedonian companies provided ICT training for their employees, which is much lower than the EU average of 20%. There are large differences among companies in Macedonia depending on their size. While 46% of the large companies in 2020 provided ICT training for their employees, it was the case with only 22% of the micro companies and 10% of the small companies.

Graph 18: Companies that provided training for the development/improvement of ICT skills to their employees in 2020, (in %)

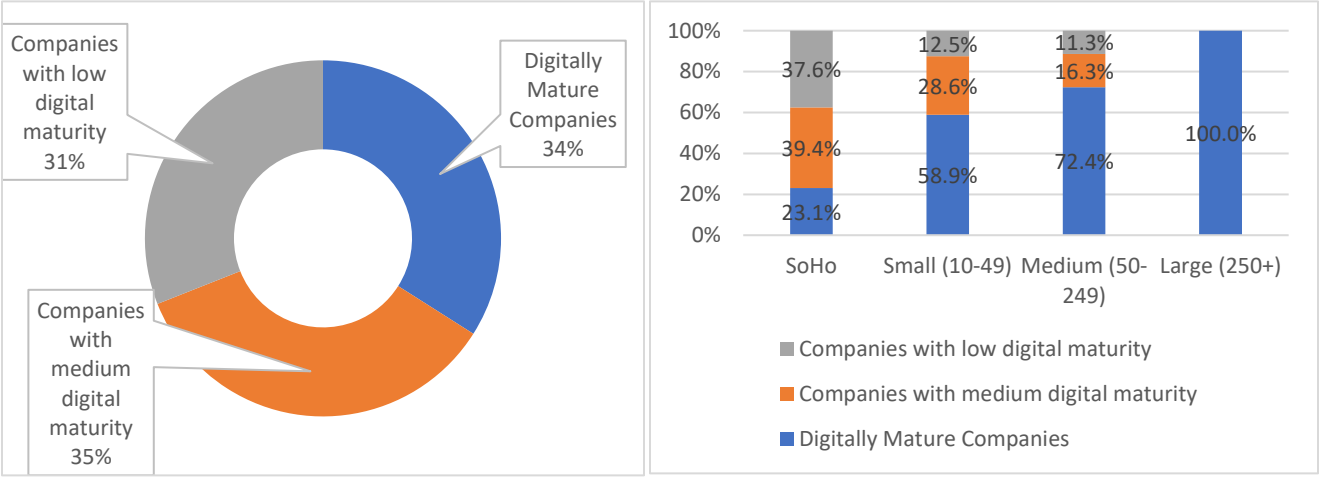


Source: Eurostat

Data in Graph 19 shows the data derived from the analysis conducted by Makedonski Telekom for research on the digital maturity of Macedonian companies. Only 28% of the companies in Macedonia are

digitally mature companies, i.e. they possess the technological and human capacity to improve business processes (digitize operations) and meet market demands. The differences in the digital maturity of companies become even more apparent when the data are observed by company size. A high percentage (95%) of the large companies are digitally mature, whereas that is the case for only 14% of the micro companies (small office/home office-SoHo).

Graph 19: Companies ranked according to the level of digitalization implemented in 2022

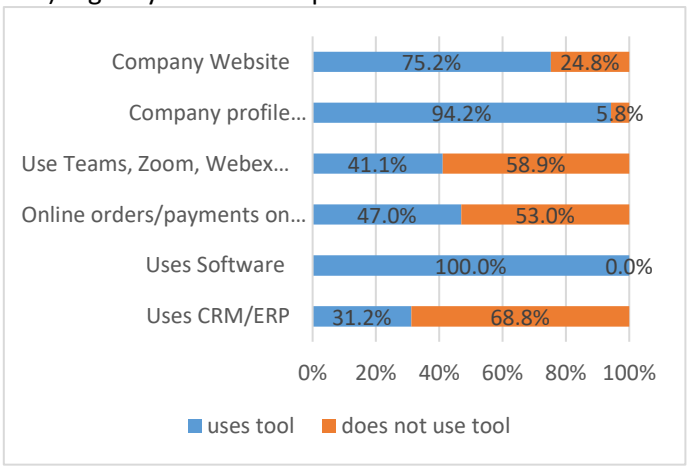


Source: https://www.telekom.mk/digitalen-indeks.nspx

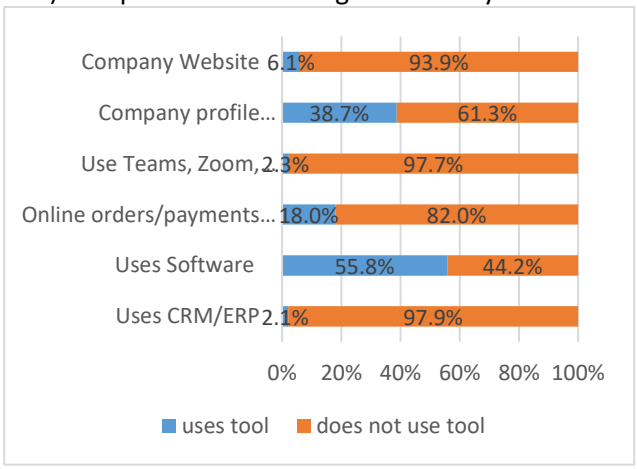
The most frequently used services by digitally mature companies are: Facebook/Twitter profile that all digitally mature companies have – 94%, company website (which is the case of 75% of these companies), software and the like (Graph 20). The least used services by digitally mature companies are online meetings and event platforms (Zoom/Webex/Teams), Customer Relationship Management (CRM) software and Enterprise Resource Planning (ERM) software. The use of the option of online payments has significantly increased from last year, from only 12% to 47%. The companies with low digital maturity most often use the following digital services: software (56%), online payment of telephone bills (49%) and server services (38%) (Graph 20).

Graph 20: Profile of services used by companies (2020), in %

20a) Digitally mature companies



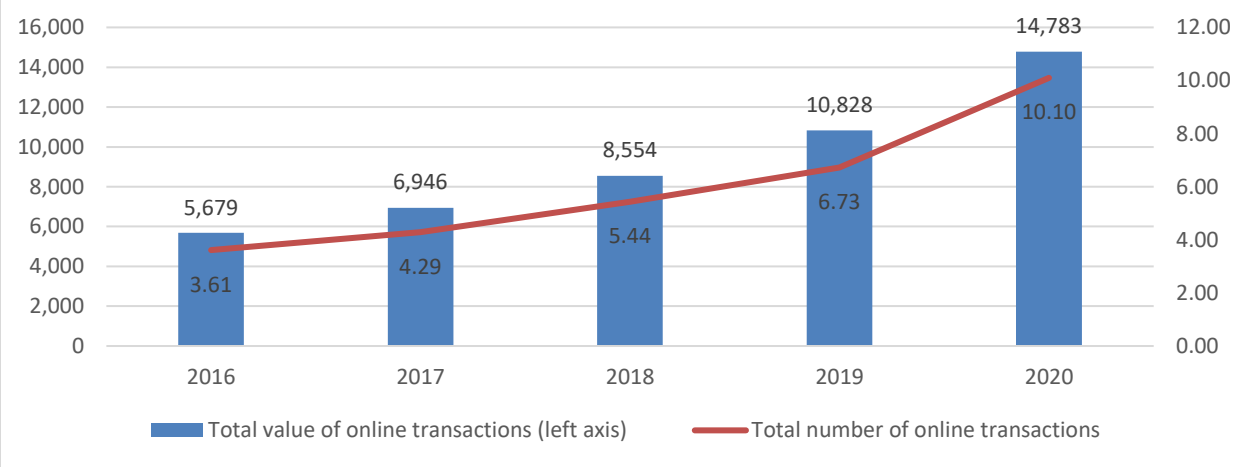
20b) Companies with low digital maturity



Source: https://www.telekom.mk/digitalen-indeks.nspx

Graph 21 presents the data on payment transactions performed through online (electronic) channels. The number of transactions performed and their value shows a large growth in the 5 years for which data are available. The number of transactions has almost tripled, from 3.6 million transactions in 2016 to 10.1 million in 2020. The total value of transactions increased by about 2.6 times, from 5.7 billion to 14.8 billion denars, although the average value of transactions has decreased. There is also a significant increase in the mobile payments. Between 2018 until 2020 the number of mobile payments increased by about 45.5% on an annual basis. On the other hand, there was an annual decrease of about 7% of paper-based payments.[11.]

Graph 21: Number and value of online payment transactions performed (in million denars)



Source: NBRNM

According to this analysis, it can be concluded that companies in Macedonia have almost universal access to the Internet regardless of the size of the companies. But, when examining the data at more granular level, there are large differences in the use of tools in the digital sphere in terms of company size. Whereas only 57.7% of the small companies (10-49) have their own website/internet presence, this is the case of 90% of the large companies (250+). This gap is also evident in companies' access to services provided by public institutions/government where small companies are far behind the larger competitors. Very few Macedonian companies make sales through digital channels. Less than a third (28%) of Macedonian companies are digitally mature, and those are mainly large companies. Macedonia is at the bottom in the region in terms of employment and recruitment of the type of ICT specialists and in providing ICT training to their employees. There is a large growth in the value and number of online payment transactions in the last 5 years, though the average value of the transactions has not changed.

[11] https://www.nbrm.mk/ns-newsarticle-soopstenie-752020-en.nspx

IV. Conclusions and recommendations

Several conclusions can be drawn based on the data presented in this analysis:

- The level of digital skills of Macedonian citizens is comparatively low. Eurostat data show that 35% of Macedonian population in 2021 held only a basic level or above basic level of digital skills relative to 54% of the population in the EU-27, and 36.75% of the citizens in the Western Balkan countries. Some countries in the region, such as Montenegro and Serbia are far more advanced compared to Macedonia. Given that digital society is based on digitally-competent citizens, any plans and activities for advancing the digitalization of Macedonia need actions to increase the digital skills (competency) of the population.
- Available data show that Macedonian individuals are eager to acquire ICT skills and are at the top of the charts on a European level when it comes to obtaining ICT skills through free online courses. Therefore, one might assume that if there are more incentives and opportunities for the acquisition of digital skills in formal or informal education, Macedonia will see significant advancement and more tech-ready individuals.
- The internet use of households in Macedonia is relatively high. Noticeably, more households are using computers and the Internet however the predominant use of the internet is for social networks, electronic communication through applications instead of e-mail, and media monitoring through the newly created digital channels.
- Certain categories of households and individuals are less likely to use the ICT technologies such as unemployed individuals or older citizens. In case of no government intervention, they will end up digitally excluded which is the modern form of poverty.
- The use of e-government services is very low, especially when compared to the EU-27 countries. Such low use can be attributed to challenges on both sides: low digital skills of the population and low supply of e-government services.
- There is a big gap between the large and small companies in a few segments such as the use of e-services, digital tools, their online presence through websites, digital maturity etc.
- Large companies are more likely to use government services compared to small ones which may be related to a lack of digital skills, fewer services needed by the government, etc.
- All companies have access to the Internet, however, not all are digitally mature (are able to digitalize all processes). The gap between the large and small companies is evident in the sphere of digital maturity - 100% of the large companies are digitally mature, which is the case for only 23% of the micro companies (small office/home office-SoHo). However, this is a significant increase in the SoHo segment from last year (from 14% to 23%).
- Macedonian companies very rarely invest in the development of ICT skills of their employees, the percentage is highest in the large companies, however, compared to the EU-27 yet again it is positioned at the European bottom.
- There is room for improvement in terms of data collection and availability of data related to Internet use, digital skills and some related areas.

The above clearly suggests a large need for advancement in the area of digitalization (especially among small and micro companies) and acquisition of digital skills (of citizens in general, but also the workforce). Quick progress and catching up with the EU countries (and some neighboring countries) will require large

interventions from the government, but also a clear commitment of companies for improving their digital readiness which is a large source of domestic and international competitiveness.

Summary recommendations for companies, general population and potential for advancement in digital skills:

Below we provide recommendations that are based on the main findings of this study, differentiated by sector.

I. Recommendations concerning the general population

A) Develop and adopt a framework of digital skills. Such framework exists in the EU countries, called Digital Competence Framework: see https://ec.europa.eu/jrc/en/digcomp/digital-competence-framework. There are 5 dimensions and 8 competence levels (page 13 of the referenced report).

B) Design of a training module for high school students/university students to acquire at least a medium level of digital skills. The module should be incorporated into the curricula, should be mandatory, and lead to a “graduation exam for digital literacy". Set a high target, for instance, that every 18-year-old person should have at least a medium level of digital skills

C) Provision of training for digital skills for unemployed people through existing (licensed) training providers that will increase the employability of individuals and potentially offer possibilities for online work from Macedonia. The target should be set high, say every registered unemployed person to achieve at least basic knowledge of digital skills. Or, 20% of registered unemployed to achieve an advanced level of digital skills.

D) Establish a national certification system for digital competencies that would be used to assess the level of skills of the individual, and that certification then be a valid document in search of a new job, similar to a foreign language proficiency test, A1, A2, B1, B2, etc.

E) Offer each university graduate free of charge training in advanced digital skills (levels 7 and 8 of the Digital Competence Framework). The program should be financed by the government (with small co-financing of the candidates) and provided by licensed private training providers.

II. Recommendations concerning companies

A) Ensure annual subscription vouchers for free broadband / digital services to companies offered by telecom operators, as many micro, small and medium-sized companies cite the price of broadband services as a limiting factor in accepting a "digital way of working". This may be provided in cooperation (co-financing) with the Government

B) Government to subsidize or fully cover the cost for 6-12 months of digital services for companies (with a focus on small and micro-ones) such as: Digital certificates/tokens, cloud services, e-shops hosted by a network operator, etc.

C) Establishment of a government fund for co-financing training in digital and ICT skills (for company employees and/or directly to employees)

D) Reduced VAT for broadband internet to 5% for micro companies - The financial burden of companies is reduced and they are motivated to invest in a fast and stable connection, which is the basis for the adoption of "over-the-top" digital services, such as cloud storage, e-sales and other digital services that exist on cloud platforms.

Note: We suggest having high targets, such as 2,000 companies receiving vouchers for free digital services. Moreover, we suggest the cost is split between government and businesses and some broader partnerships (NGOs, regional players, World Bank, etc.).

III. Other recommendations

A) Digital "one-stop-shop" system for all institutions to download data ONLY ONCE for each citizen and to have the data available for all needs of the client/citizen.

B) Expand the "one-stop-shop" system to the local level.