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DIGITALISATION AS A CHALLENGE FOR ENTERPRISES IN 21ST CENTURY[3]

The paper is devoted to digitalization of enterprises as a challenge of the 21st century. It is measured on national and cross-border region levels on the case of Bulgaria and Macedonia. The methods applied include a comparison of the state of the art and of trends of digitalization by size of enterprises. Data used for a country level is from national statistical institutions, for the level of their cross-border regions – from a database from a survey of 1941 enterprises, collected in the frame of a European project in 2017.

It is argued digitalization is a contemporary way of innovating, which depends on the size of enterprises. The new stage of digitalization is characterized by the usage of big data. Development of the respective algorithms for using big data is understood as a prerequisite for improving connectivity, networking and complexity of business processes. The latter characterizes preparedness to reap the benefits of emerging technologies and to capitalize opportunities of the digital revolution.

JEL: L00; M00; O00

Economies are complex production systems with many subcomponent production systems. The way of processing of these systems is grounded in technology. When the most shared technologies in an economy change, production systems also change. Nowadays the most important and widely used technologies are digital information and communication technologies[4] that include an array of personal computing devices, back-office servers, IT-

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[3] This paper has presented results of the work undertaken in the frame of the project № CB006.1.31.070 "Innovative cooperation initiatives in cross-border region", co-financed by European Union through INTERREG-IPA CBC CCI Number 2014TC16I5CB006 and of BAS-MASA project "Bulgarian-Macedonian economic and innovation cooperation: ICT impact on the European perspectives", and ERI-BAS – University of telecommunications and posts: "Digitalization of the Bulgarian economy".

[4] Information and communications technology (ICT) is software and hardware for communications and data interchange, such as: radio, TV, fax, satellite dish, fixed phone, mobile phone, personal computer, Internet, e-mail.

embedded machines, and cloud-based services that are connected or dynamically provisioned to users over private networks or the Internet. Recent years' production system is beginning to transform into a new kind of digital system, one that will not only build on existing devices and systems, but also increasingly will incorporate emerging technologies such as sensors, robotics, and artificial intelligence as they improve in price and performance.

The process of penetration of these technologies in the economy is understood as the first stage of digitalization of the economy. The main characteristics of the next stage is increase of the connectivity (with many more things, and many more types of things networked, including in more advanced wireless and wireline networks), more automation (as devices and systems enable more work to be done by machines), and intelligence (as algorithms play increasingly important roles in sensing—and making sense of—all this)[5]. Developing such characteristics is a contemporary challenge to define new perspectives.

1. New perspectives for digitalization in Europe

Digitalizing businesses today is of big importance as countries' competitive advantage in the global economy will increasingly be based on the extent to which they are home both to the industries that are developing these new technologies and to the industries that are adopting them, particularly in globally traded sectors (e.g., agriculture, business services, and manufacturing).

The new stage of digitalization of enterprises concerns big data sets and algorithms. Big data sets - the big data - and the algorithms are the new engines of companies, assisting them in analyses and decision making. Digital platforms allow the aggregation and sharing the data. The new challenges develop new partnerships[6] aimed the both – big data and digital platforms to bring enormous opportunities and benefits for European industry and enterprises.

When properly processed the big data presents significant *new opportunities* for improving business performance becoming a driver for innovation. Big data allows:

- Using resources more efficiently
- Supporting decision making
- Responding to changing demand toward mass customization

[5] Atkinson R. 2019, The Task Ahead of Us: Transforming the Global Economy With Connectivity, Automation, and Intelligence, Washington,ITIF

[6] The Strategic policy forum on digital entrepreneurship was set up in 2014 to outline what would be the short and long term strategy for digital entrepreneurship in Europe, to implement this strategy and advice and advice European Commission on key priorities. The objectives of this Forum were to inforce dialogue between industry, and the scientific and political communities, with the aim of shaping an ambitious EU vision and a European roadmap that will fuel digital entrepreneurship in Europe.

- Creating competitive value chains
- Taking the lead to stay ahead of the competition.

Challenges to overcome to capture the full potential from big data and digital platforms could be summarized as follow:

- A complex and fragmented regulatory environment
- Investment gap in infrastructure
- Developing quickly and at a large scale

Recommendations for new partnership development include:

- appoint Chief data officer (CDO) in each member state to take full advantage of big data based on non-personal or anonymized data, promote data quality and standards, champion effective data curation; and, maximize the social and economic value of public sector open data.
- invitee CDOs to work collaboratively and develop European guideline for enterprises on how to harness the benefit of big data in the public and private sectors, in the light of European values and sensibilities.
- develop an EU – wide action plan for the deployment of 5G that involves stakeholders from industry, the public sector and funding providers, as well as exploiting innovating financing models
- develop multivendor test beds for new generation digital solutions
- promote European digital identity management solutions for objects and people
- carry out sector by sector analysis of opportunities for the development of European business to business platforms

2. Digitalization of enterprises – how to measure

According to the Eurostat standards the digitalisation of enterprises is characterised by computers and Internet usage by enterprises through following indicators – Enterprises having access to the Internet, Enterprises having access to the Internet by type of connection, Persons employed using computers/Internet, Persons employed using Internet, Enterprises having Website or Home Page, Enterprises using the Internet for interacting with public authorities, E – enterprises sending and/or receiving e-invoices, Enterprises using social media, Enterprises using cloud computing services. On the other hand, the paper characterizes E-commerce, through Enterprises having received orders online, Enterprises having purchased online, Use of Automated Data Exchange (ADE), Enterprises using ERP software package, Enterprises using software application for managing information about clients (CRM), Enterprises having a formally defined ICT security policy, Enterprises sharing electronically information on the supply chain management

enterprises. These indicators characterize first level of digitalization. The indicators for enterprises, using big data analysis concern the second level of their digitalization.

3. Digitalization of enterprises on a country level

The first level of digitalization of the economy is characterized by ICT penetration and usage by enterprises. The indicators applied concern enterprises using the Internet to interact with public institutions, enterprises that have a website/web page, enterprises using social media, enterprises using the Internet to interact with public institutions.

3.1. Bulgaria

Generally, the official data[7] for these indicators has shown Bulgaria is lagging comparing to EU – average. But over a period of five years, there has been a steady tendency to increase the share of businesses using the Internet to communicate with public institutions. In addition to downloading and sending completed forms, businesses use the Internet and receive information. The share of businesses using the Internet to bid for an auction system is the lowest. The biggest companies are the most active, followed by the medium ones. Although the relative share of small enterprises (up to 50 people) is the least represented, their relative share has also increased by over 20%. This upward trend is due to the ease of work with state institutions and the shortening of time for document processing.

Enterprises that have a website/web page. Over the six-year period considered, a general increase in the proportion of enterprises that have a web site / web page is measured – from 42.7% in 2012 to 50.8% in 2017. During this period, small businesses have made relatively little progress 1% per year, while the average increases by nearly 2% per year. Large companies report the highest rate between 2 and 4 per year, with the highest figure being 2016 – 86.3%. This can be explained by their ability to have departments whose sole job is to support and update the web page.

[7] Source and scope of further data used is from NSI survey, which covers enterprises with 10 or more persons employed, classified in the following categories of NACE Rev. 2: Section C – "Manufacturing"; Section D, E – "Electricity, gas, steam and air conditioning supply", "Water supply, sewerage, waste management and remediation activities"; Section F – "Construction"; Section G – "Wholesale and retail trade; repair of motor vehicles and motorcycles"; Section H – "Transportation and storage"; Section I – "Accommodation and food service activities"; Section J – "Information and communication"; Section L – "Real estate activities"; Division 69 - 74 – "Professional, scientific and technical activities"; Section N – "Administrative and support service activities"; Group 95.1 – "Repair of computers and communication equipment". The data analyses are in the context of the benchmarking framework for the Digital Agenda Scoreboard, Europe's strategy for a flourishing digital economy by 2020, as well as at national level by the Ministry of Transport, Information Technology and Communications for evaluation of the indicators of 'Digital Bulgaria 2015' programme.

The review period starts in 2014, when the total share of enterprises using cloud services is 7.7%, up to 2018 with a rising value to 8.3%. Small businesses have a declining share over the period under review, with the lowest in 2015 – 4.5% over the next two years is rising at a low rate, reaching 6.7% in 2017, and 6.6% in 2018 which is lower than the start of the period considered. Medium enterprises have a relatively uniform rate of increase of the share – by almost 2% per year, reaching 14.8% in the last year under review. Large enterprises have steadily rising values over the years, close to 4% per year, with the highest value for 2018 year – 29.7%.

Table 1

Enterprises using cloud computing services in Bulgaria (per cent)

	2018
Total	8.3
By size class	
10 – 49 employed	6.6
50 – 249 employed	14.8
250+ employed	29.7

Note: The percentage is calculated on the basis of total population of enterprises with 10 or more persons employed.
Source: NSI, www.nsi.bg, 07.12.2018.

Table 2

Enterprises using social media in Bulgaria (Percent)

	2017
Total	34.4
By size class	
10 – 49 employed	33.1
50 – 249 employed	39.1
250+ employed	49.4

Note: The percentage is calculated on the basis of total population of enterprises with 10 or more persons employed.
Source: NSI, www.nsi.bg, 08.12.2018.

In the case of enterprises using social media big enterprises account for the largest share of 49.4%. Next are the medium-sized enterprises with a relative share of 39.1%. The lowest share – 33.1% has small enterprises. Of all registered businesses, 34.4% use social media. After 2014 there is a steady trend of increasing the share of social networking enterprises. It can be concluded that social networks are increasingly being used as a channel for business communication. The opinion of the experts in the sector is that their importance will increase in the future.

The total share of enterprises using cloud services is 7.7%, up to 2017 with a rising value to 8%. Small businesses have a declining share over the period under review, with the lowest in 2015 – 4.5% over the next two years is rising at a low rate, reaching 6.7% in 2017, which is lower than the start of the period considered. Medium enterprises have a relatively

uniform rate of increase of the share – by almost 2% per year, reaching 11.7% in the last year under review. Large enterprises have steadily rising values over the years, close to 4% per year, with the highest value for 2017 – 28.6%.

For businesses having purchase online in 2018, a larger share occupied 28.5% of enterprises with 250+ employees. It is 10 percent points up, comparing to the data for 2017. A smaller share in the same year with 14.5% occupied 50 – 249 employees, the smallest share with 9.5% occupying 10 – 49 employees. Total businesses having purchase online in 2018 occupy 17% relative share. Large businesses will therefore receive the most online orders (sales). Small businesses will have fewer and fewer orders.

The most of big enterprises in Bulgaria use automated data exchange in 2017. About 60% of them use an enterprise resource planning (ERP). A third of the big enterprises are using software application for managing information about clients (CRM). More than half of the big companies in the market have an information security policy. SMEs are lagging, because of several reasons, the most important of which is the volume of investment needed to implement automated data exchange software applications.

The second stage of digitalization is characterized with using big data analysis and respective algorithms**.** The usage of big data analysis in Bulgaria is monitored since 2016. The comparison of data between 2016 and 2018 indicates a decrease of the percentage in 0.5 percent points of the total enterprises using big data analysis. The reason for this trend could be found in the usage of this instrument by enterprises by size class. The share of small and medium enterprises using big data analysis decreases, while of big enterprises increases with 1.7 per cent points.

Table 3

Enterprises using big data analysis in Bulgaria (Per cent)

	2016	2018
Total	7.2	6.7
By size class		
10 - 49 employed	5.8	5.4
50 - 249 employed	12.5	10.8
250 + employed	23.1	24.8

Note: The percentage is calculated on the basis of total population of enterprises with 10 or more persons employed.
Source: NSI, www.nsi.bg, 08.12.2018.

In summary, the results of the analysis of the National Statistical Institute's data on the ICT used in the enterprises show that in recent years' Bulgarian enterprises have invested more resources and resources in ICT.

The trend is positive and rising with each passing year. The fastest and most successful is the introduction of technology in large enterprises, as they are more solvent and more needs for IT.

They are followed by medium-sized enterprises, which moderately implement new information and communication technologies into their work processes. The lowest

percentage of implemented information and communication technologies are the small enterprises, dictated by their low solvency and the lower number of employees. Information and communication technologies are a convenience to business and administration. In the future, the trend of increasing the number of enterprises using new technologies is expected to continue.

3.2.Macedonia

According to the data of the State Statistical Office of the Republic of Macedonia, as of January 2017[8], 91.2% of the enterprises with 10 or more employees had broadband connection to the Internet (via fixed or mobile broadband connection). Access to the Internet via a portable device using mobile telephone network (3G/4G) was used by 63.0% of the enterprises. This type of mobile Internet connection (via portable devices: notebook, laptop, smartphone, PDA phone, etc.), for business purposes, was used by 14.5% of the persons employed.

More than half 54.2% of the enterprises used social media (e.g. Facebook, LinkedIn, Twitter, Present.ly, YouTube, Flickr, Picassa, Wiki-tools, etc.), i.e. had a user profile, an account or a user license for using certain social media.

Around 49% of the enterprises had website/homepage, of which 80% provided on their website descriptions of goods or services, price lists, 59% had links or references to their social media profiles, and 21% provided online ordering or reservation or booking. During 2016, 10.3% of enterprises with 10 or more employees had e-commerce, i.e. buying or selling goods or services over computer networks (via websites or EDI-type systems), 6.0% of enterprises had e-sales, and 5.8% of enterprises had e-purchases.

Implementation of the new stage of digitalization is lacking from the regular statistical surveys in Macedonia, which could be a base for assumption that it is not enough implemented and is on a lower level in comparison to Bulgaria.

4. Preparedness to reap the benefits of emerging technologies and to capitalize opportunities of the digital revolution

This section aims to address the impact of the ICT industry on the economy using two indexes: the network readiness index and the index of economic complexity.

The Networked Readiness Index assesses the factors, policies and institutions that enable a country to fully leverage information and communication technologies (ICTs) for increased competitiveness and well-being.

Under the theme *Innovating in the Digital Economy*, the Report also examines the role of information and communication technologies (ICTs) in driving innovation.

[8] SOURCE http://www.stat.gov.mk/PrikaziSoopstenie_en.aspx?rbrtxt=76

Networked readiness is a key indicator of how countries are doing in the digital world.

The World Economic Forum's Networked Readiness Index 2016 measures how well an economy is using information and communications technologies to boost competitiveness and well-being. The world is at the dawn of the Fourth Industrial Revolution, which represents a transition to a new set of systems, bringing together digital, biological and physical technologies in new and powerful combinations.

Networked readiness shows how ready each country is to reap the benefits of that transition. Networked readiness depends on whether a country possesses the drivers necessary for digital technologies to meet their potential, and on whether these technologies are actually having an impact on the economy and society. To get an accurate picture of all the drivers and the full effects, the study breaks down the information into different subsections. The drivers are grouped within three sub-indexes: the overall environment, readiness (which includes infrastructure, affordability and skills) and usage (which is made up of individuals, business and government). The impact is measured in terms of both economic and social impact.

Table 4 shows the values of the NRI for emerging and developing countries in Europe (EDE – Emerging and Developing Europe). It shows Macedonia is better performed in achieving economic and social impact from ICT penetration.

Table 4

Network readiness index for emerging and developing countries in Europe out of 139 counties in 2016

Rank	Country	Value		
42	Poland	4.5	HI-OECD	EDE
46	Macedonia	4.4	UM	EDE
48	Turkey	4.4	UM	EDE
50	Hungary	4.4	HI-OECD	EDE
51	Monte Negro	4.3	UM	EDE
54	Croatia	4.3	HI	EDE
66	Romania	4.1	UM	EDE
69	Bulgaria	4.1	UM	EDE
75	Serbia	4.0	UM	EDE
84	Albania	3.9	UM	EDE
97	Bosna and Hercegovina	3.6	UM	EDE

* HI: high-income economies that are not members of the OECD; HI-OECD: high-income OECD members; UM: upper-middle-income economies.
Source: Baller, S., Dutta, S. and Lanvin, B. (Eds.) (2016). Global Information Technology Report 2016. Innovating in the Digital Economy. Geneva: World Economic Forum and INSEAD. Retrieved July 07, 2016, p.16

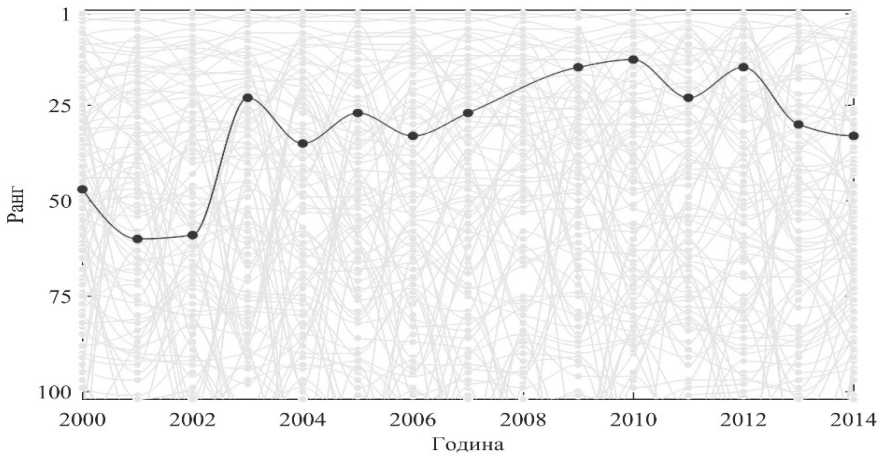
Kristoski and Kostoska (2018) have recently developed an alternative approach for studying the ICT impact on the economy by proposing and applying a two-stage methodology. First, they use a hierarchical cluster analysis to allow clustering of countries of interest (Macedonia and EU-28) in line with the values of 53 individual indicators

distributed across the various pillars of the composite NRI. Then, the authors suggest a simulation model based on System Dynamics to simulate the evolution of the values of the indicators contained in the index, in order to explore the potentials of the country to improve its ranking globally, and in this context, yes increased its capacity to utilize ICT to increase competitiveness. By focusing on those attributes needed to move the country to the next higher cluster and to improve its position vis-à-vis other countries, this methodology can serve as a useful tool for policymakers in those areas where interventions can stimulate the ICT impact on productivity and growth.

Next, we analyze the index of economic complexity on the case of Macedonia. The economic complexity index (ECI) was introduced in Hidalgo and Hausmann (2009) as a measure of the productive capabilities of countries. In other words, the ECI provides information of the knowledge accumulated in a population by expressing economic activities presented in the country. In order to reveal the complexity of the ICT sector in the Republic of Macedonia, we consider 102 countries in the period from 2000 to 2014, 10 groups of goods and 12 service groups or a total of 22 products. Classification of goods and services is undertaken by Stojkoski and others (Stojkoski et al., 2016). Figure 1 shows the position of the Republic of Macedonia in the ranking over the years. The color of the Republic of Macedonia is marked with red, while the dynamics of all other countries is grayed out in the background. It is noticeable that by 2002 the Republic of Macedonia is located in the lower half of the ranks. In the next 10 years, the Republic of Macedonia provides a steady increase in the rankings, which culminates in 2012 when the Republic of Macedonia is among the 25 most complex countries in the world. In the last two years covered by the data, the Republic of Macedonia has seen a steady decline in complexity, compared to other countries.

Figure 1

Position of the Republic of Macedonia in the ranking of economic complexity over the years



To reveal the role of the ICT sector in the complexity of a state in Figure 2, the complexity of information and computer services over the years has been shown. The blue color indicates the dynamics of information and computer services, while with gray in the background everything else. It is noted that these services are consistently one of the most complex for production. More precisely, in all the years, the only more complex of them is the production of financial services, copyrights and licenses, and machine products. This means that the advantage developed in the production of information and computer services greatly increases the complexity of a country. In turn, it contributes to an increase in the potential of an economy.

Figure 2

Complexity of information and computer services over the years in Macedonia

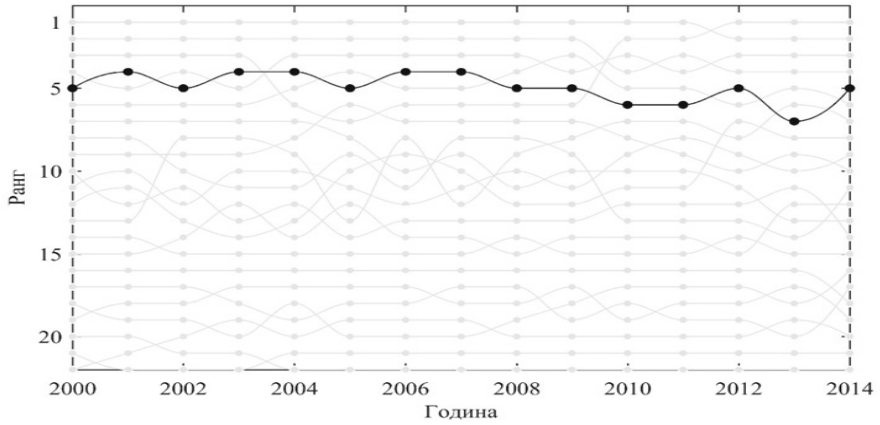
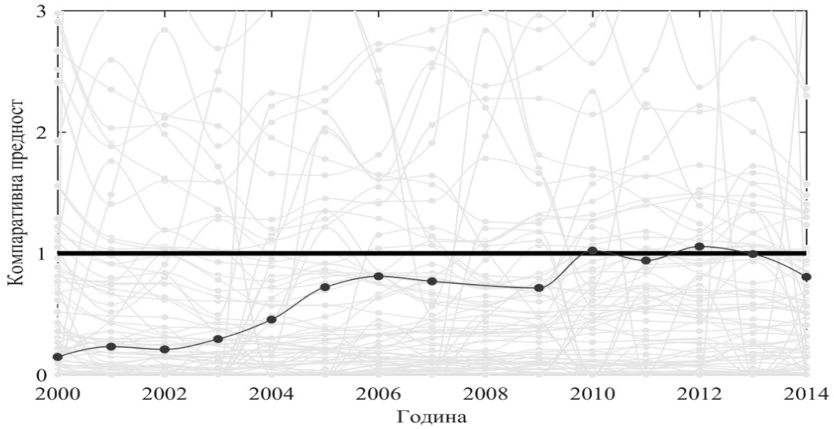


Figure 3 illustrates the change in the comparative advantage of the Republic of Macedonia in relation to information and computer services during the same period.

The comparative advantage is a standardized measure that compares the share of exports to a single product in an economy with the participation of the same product in world exports. A value greater than one signifies that in a given economy, the product is significantly exported, that is, that part of the complexity of the economy is due to the production of that product. In the figure, in red is marked the comparative advantage of the Republic of Macedonia, the gray color in the background is the dynamics of the other countries, while with the black horizontal line the threshold of one is shown. From the picture it can be concluded that by 2012 the comparative advantage of the Republic of Macedonia in the production of information and computer services is constantly increasing. In 2010 and 2012 it is even over one which means that in that period the Republic of Macedonia significantly developed its capabilities in the production of this service. However, after 2012, the comparative advantage is declining.

Figure 3
Comparative advantage of the Republic of Macedonia in information and computer services over the years



5. Digitalization of enterprises in the cross-border region

5.1. Methodological notes

The regional integration is a precondition for sustainable development and competing in the global economy. Innovation characterizes the potential for such integration. In this respect the paper applies the bottom-up approach to analyses of data, resulted from a survey of 1941 enterprises on cross border region between Bulgaria and Macedonia, taking place in 2017 in the frame of the project "Innovative cooperation initiatives in cross border region (ICI)", INTERRREG project CB006.1.31.070. As methodology for collecting and interpriting technology innovation data was used a methodology developed in Economic research institute at the BAS, which meets the general requirements of the OECD and EUROSTAT Oslo manual.

The topics of interest for study are company profile, innovation and digitalization level and policy, R&D and export intensity support.

5.2. Companies profile in the cross border region

The companies observed in Bulgaria were dominated by activities like sawmilling and plating of wood and manufacture of other furniture, while in Macedonia – logging and support services to forestry. The age structure of the enterprises operation was dominated by those, established in the period 2001-2010. 38,4% of the Bulgarian ones have been operating for less than 16 years. The biggest share of companies participating in the study in Bulgaria were started in 2011 or later (43, 4% against 28,8% in Macedonia). All of the

surveyed enterprises in Bulgaria were private ones, while in Macedonia 14,3% of them were public.

The observed companies were predominantly local (with either Bulgarians or Macedonians being the owners). In Macedonia, there were some cases of foreign or mixed ownership. The legal status of firms observed the organization's in Bulgaria are predominantly sole-member limited liability companies (60%), and in Macedonia, where 51,5% of the surveyed enterprises were limited liability companies. Since in Macedonia there were public companies, they answered "other" when asked this question. The connectivity of firms in the observed regions is not well performed as the majority of the organizations in the survey in both countries are independent. In Macedonia, very few companies are part of anther enterprises. The majority of the businesses in the observed sectors were operating in the years 2014, 2015 and 2016. In Macedonia, those that were not operating were between 2 and 4% of the responding companies and in Bulgaria that percentage varies between 5,3% and 12.2%.

Predominantly the monitored enterprises were micro, small and medium. The following data provides arguments for such conclusion: a) Companies that took part in the study in both of the regions typically have assets whose book value is no more than EUR 3.5 mln. (72.3% and 94.7% in Macedonia and Bulgaria respectively). In Macedonia, 18.1% of the interviewed enterprises have a book value of the assets that is between EUR 3.5 to 4 mln.

According to the next indicator of the size of the firms the survey says the net sales revenue of the majority (84,3% in Macedonia and 94,6% in Bulgaria) of the companies are micro and small and have revenue which does not exceed EUR 7 mln. 6.7% and 5.4% of the interviewed companies in Macedonia and Bulgaria respectively have net sales revenue between EUR 7mln. and EUR 8 mln. The majority of organizations which participated in the study were micro – about 61 and 65 % of all firms, and small with between 50 and 249 employees were 12.5% in Macedonia and 2.6% in Bulgaria.

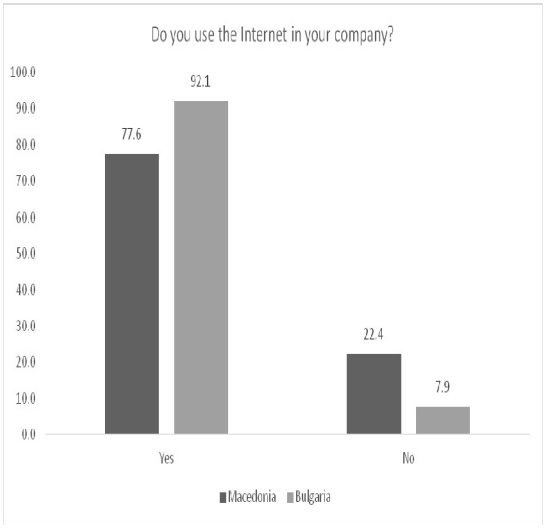
In conclusion, the observed enterprises in the cross border region in the frame of the ICI project were predominantly micro, and private, operating for less than 16 years. There are few small and medium-size enterprises which operate in the last 3 years in wood-related sectors according to NACE Rev.2. The majority of the companies that took part in the survey in both Bulgaria and Macedonia have been micro – with between 1 and 9 employees (61.5% and 64.6% respectively). 19.8% of the respondents in Macedonia work in medium-sized companies with 10 to 49 workers (against 35.9% in Bulgaria). Dominated observed firms' activity in Bulgaria were sawmilling and plating of wood and manufacture of other furniture, while in Macedonia – logging and support services to forestry, predominantly sole-member limited liability companies.

5.3. Digitalization of companies in the cross-border region

Predominantly the companies in the observed sectors use computers both in Bulgaria and in Macedonia. In the latter, 17.3% of the enterprises answered that they do not use a computer and in Bulgaria that percent was 7.9%

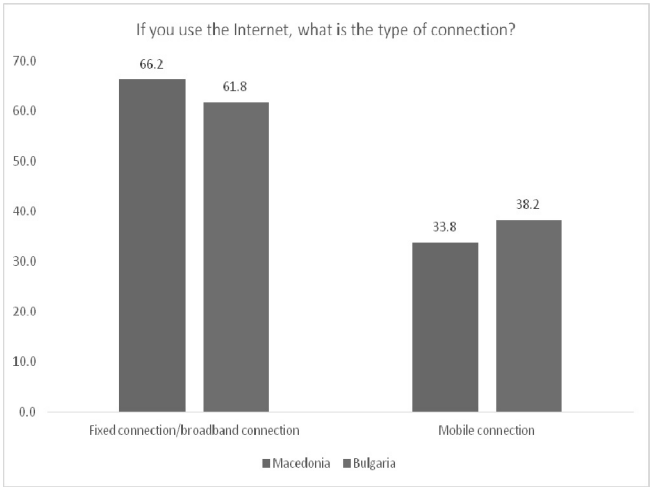
The majority of the surveyed businesses in both of the observed regions use the Internet. In Bulgaria, 7.9% of the interviewed companies do not use it, while in Macedonia that percentage is 22.4. Consequently, there is room for improvement: connecting as much of the firms as possible to the Internet might prove to be efficient (when it comes to maintaining the relationships with customers and suppliers) and eventually profitable for the organizations in the observed sectors (Figure 4).

Figure 4



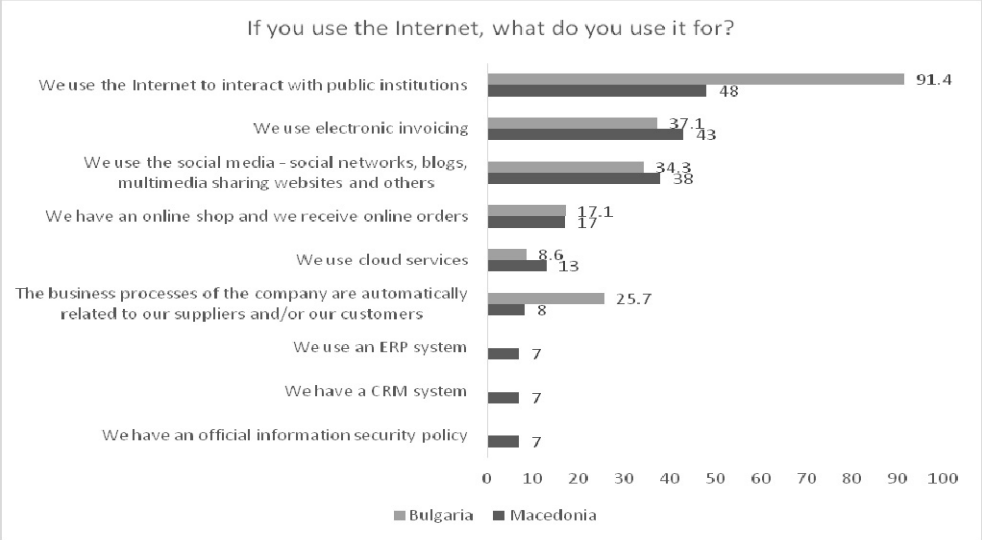
The companies which use the Internet in Macedonia and Bulgaria mostly have a fixed or broadband connection – 66.2% and 61.8% respectively (Figure 5).

Figure 5



The most widespread use of the Internet amongst the surveyed companies is for interaction with public institutions. This is valid for 91.4% of the enterprises in Bulgaria and 48% of those in Macedonia. Electronic invoicing is another widely used advantage of the Internet, followed by social media and automated relations to the customers or suppliers of the firms. Some of the companies have online shops or use cloud services. ERP or CRM systems and information security policies are not popular (Figure 6).

Figure 6



Apart from Internet connection and R&D activities, another problem which the study indicates is that more than half of the interviewed companies, both in Bulgaria and Macedonia, do not have websites. 76.9% of Bulgarian enterprises and 59.8% of Macedonian ones do not have their own website. This could be a major drawback in a digitalized and automated world, where online presence is of crucial importance. Consequently, it could be beneficial for the firms to create their own websites and attract their customers through it (Figure 7).

The majority of the surveyed businesses in both of the observed regions use the Internet. In Bulgaria, 7.9% of the interviewed companies do not use it, while in Macedonia that percentage is 22.4. Consequently, there is room for improvement: connecting as much of the firms as possible to the Internet might prove to be efficient (when it comes to maintaining the relationships with customers and suppliers) and eventually profitable for the organizations in the observed sectors (Figure 9).

Figure 7

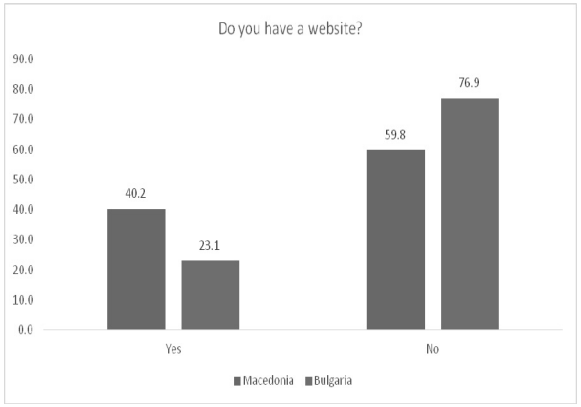


Figure 8

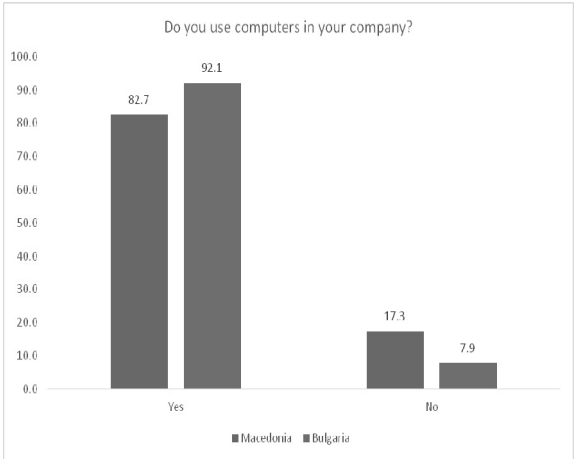
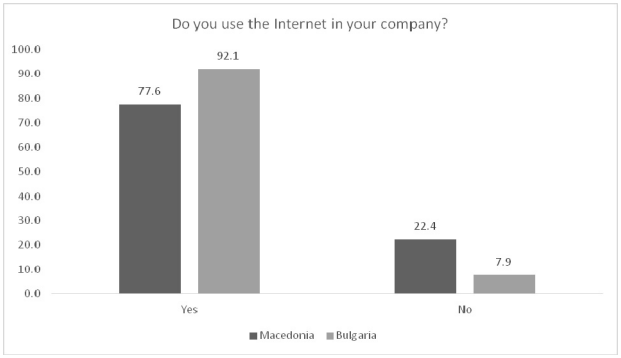
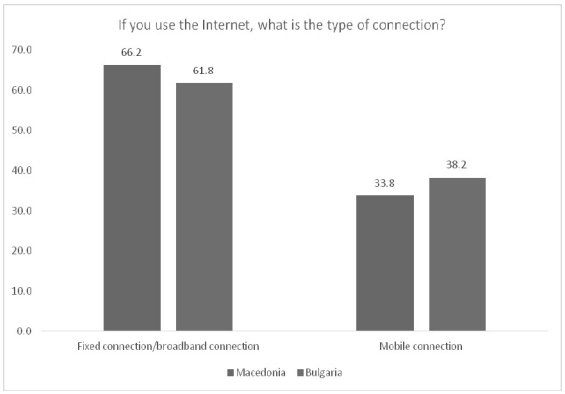


Figure 9



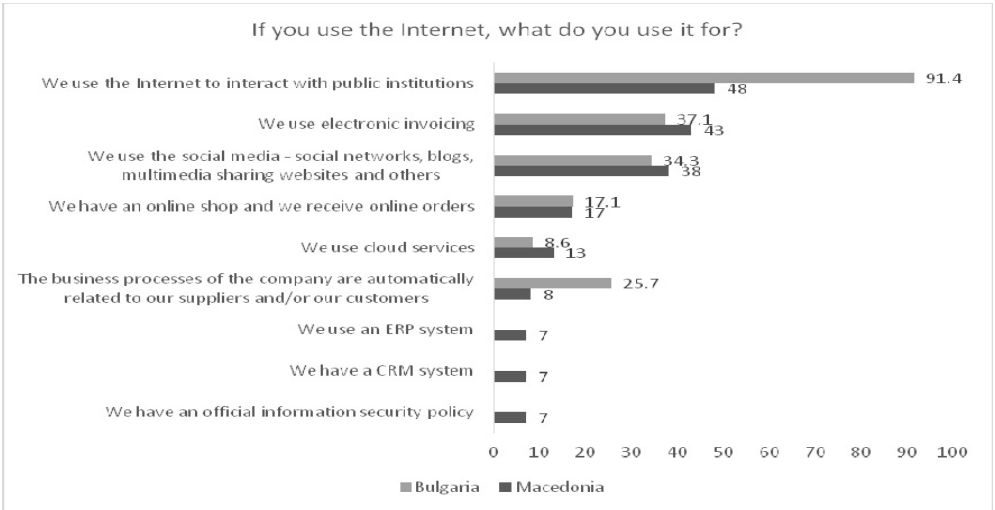
The companies which use the Internet in Macedonia and Bulgaria mostly have a fixed or broadband connection (66.2% and 61.8% respectively) (Figure 10).

Figure 10



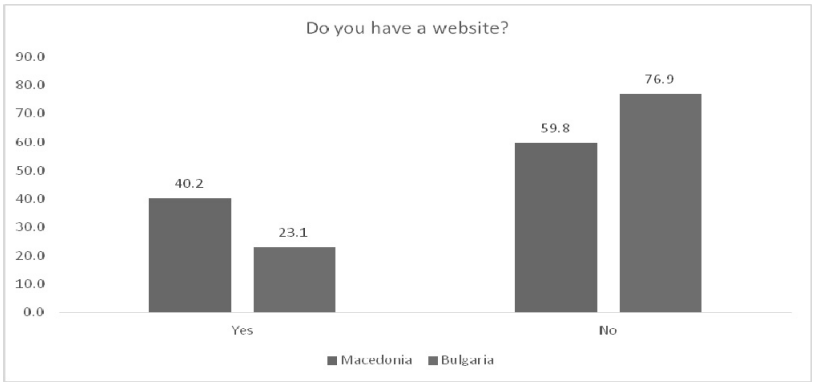
The most widespread use of the Internet amongst the surveyed companies is for interaction with public institutions. This is valid for 91,4% of the enterprises in Bulgaria and 48% of those in Macedonia. Electronic invoicing is another widely used advantage of the Internet, followed by social media and automated relations to the customers or suppliers of the firms. Some of the companies have online shops or use cloud services. ERP or CRM systems and information security policies are less popular (no respondent answered that they use such in Bulgaria) (Figure 11).

Figure 11



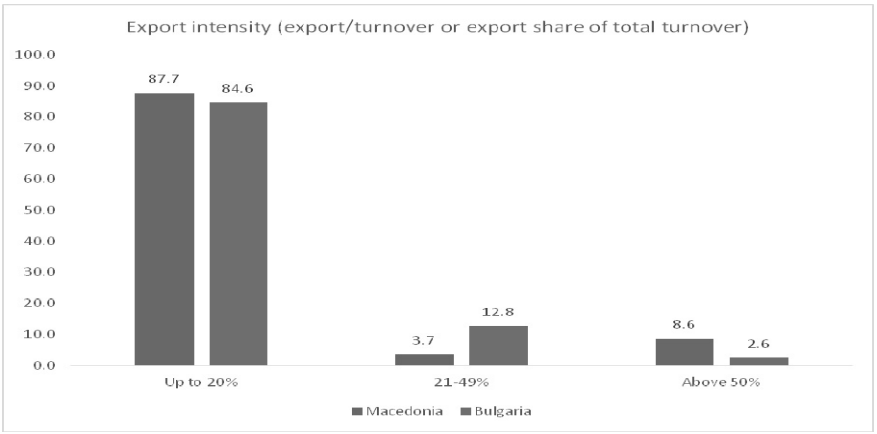
Apart from the Internet connection and R&D activities, another problem which the study indicates is that more than half of the interviewed companies, both in Bulgaria and Macedonia, do not have websites. 76.9% of Bulgarian enterprises and 59.8% of Macedonian ones do not have their own website. This could be a major drawback in a digitalized and automated world, where online presence is of crucial importance. Consequently, it could be beneficial for the firms to create their own websites and attract their customers through it (Figure 12).

Figure 12



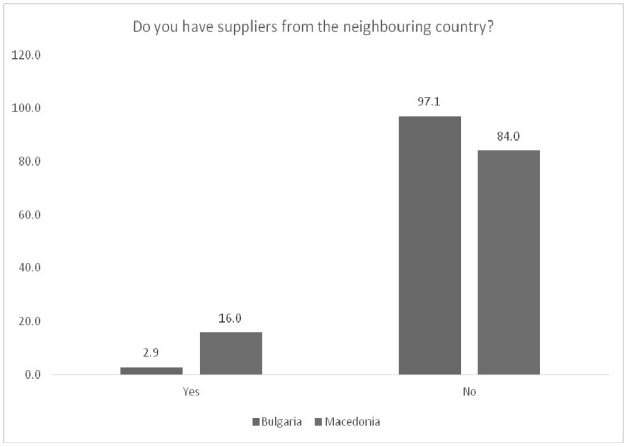
Here the **cross-border export intensity** is understood as an indicator for the cross-border connectivity. The majority of the interviewed enterprises (87.7% in Macedonia and 84.6% in Bulgaria) export goods or services with a value which equals up to 20% of their turnover. The export of 12.8% of the Bulgarian companies which participated in the survey equals a value which is between 21 and 49% of their turnover. The export of 8.6% of the companies from Macedonia that took part in the study equals more than 50% of their turnover (Figure 13).

Figure 14



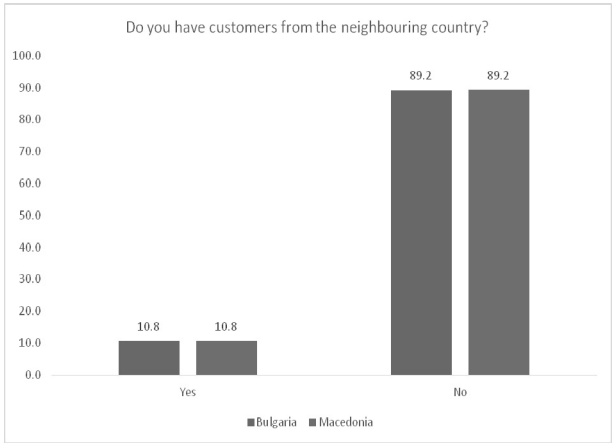
The firms in the survey answered that they do not have suppliers from the neighboring country: 97.1% of Bulgarian companies do not have suppliers from Macedonia and 84% of Macedonian businesses are not supplied by Bulgarian partners (Figure 14).

Figure 14



Approximately 90% of the interviewed companies said that they do not have customers from the neighboring country. The local authorities and all the stakeholders in the forestry, logging, wood, paper and furniture production and trade might enhance cooperation between the regions through appropriate policies and initiatives. The good relations between the two neighboring regions might become a great advantage (Figure15).

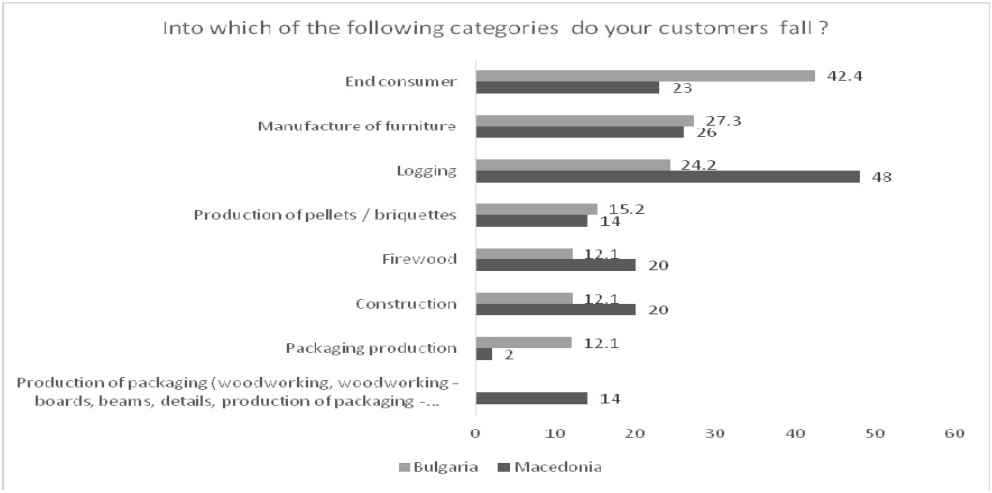
Figure 15



In Bulgaria most of the customers of the interviewed companies are end consumers – 42.4% of the businesses answered that they supply end consumers versus 23% in

Macedonia. In Macedonia the majority of enterprises (48%) sell to the logging division. In Bulgaria, 24.2% of the companies that were surveyed do so. In both countries there are many firms (27.3% in Bulgaria and 26% in Macedonia) that sell out to the manufacturers of furniture.

Figure 16



In Bulgaria, 34,6% of the companies have delivery costs that are equal to 5 to 10% of the total production value. In Macedonia, the delivery costs of more than half of the companies are from 10 to more than 20% of the total production value (Figure 16).

The key findings regarding digitalization of enterprises on a regional level could be summarized as follow:

- The majority of the companies in the sectors observed in the regions of Kyustendil and Blagoevgrad in Bulgaria and Northeastern, Eastern and South-eastern planning regions of Macedonia are micro, small and medium-sized companies. The turnover of those companies is usually less than 700 000 euro and the majority has employees between 1 and 9 persons. In the majority of the cases, the value of the assets is up to 350 000 euro. The legal form of the companies is solo-member limited liability company or limited liability company. Their managers are predominantly male and ageing.
- The prevailing share of enterprises is not innovating. The innovation policy provided shows the most important aims of the enterprises in Bulgaria and in Macedonia when they introduce technological novelties are: the improvement of the quality of the products; the expansion or maintenance of the existing markets and the reduction of environmental pollution. Reducing unit labour costs and energy expenses as well as increasing the flexibility of the production are of high importance in both countries, too.

- The innovations realised are with a low level of novelty, using predominantly in-house sources for innovative ideas. In general, the cooperation levels between enterprises from the forestry sector in the both countries across border region are low. Their representatives would like to increase the cooperation that will contribute in increasing the innovativeness and competitiveness in the region.
- The share of companies in both regions that use computers and Internet is high (above 78% in Macedonia and above 90% in Bulgaria), but still a lot of companies do not have web sites (60% in Macedonia and 77% in Bulgaria). By now the key reason for using Internet is interaction with public administration and electronic invoices. ERP or CRM systems and information security policies are less popular in this sector.
- Usage of new technologies could be a major drawback in a digitalized and automated world, where online presence is of crucial importance. Consequently, it could be beneficial for the firms to create their own websites and attract their customers through them.

To summarize – the European perspective of meeting digitalization challenge concerns the trends that:

- The next frontier for Europe's enterprises digitalization is defined by the large data sets - big data are valuable assets for economic growth and social progress
- European enterprises can grow and create jobs faster through better use of big data and digital platforms
- Digital technologies can deliver additional benefit when used in collaboration across the value chain
- European leadership in business-to-business platforms will support European economic growth and job creation.

Provided analyses, based on official statistical data has shown the level of digitalization in Bulgaria and Macedonia is lagging from EU – average. On another hand, digitalization of the enterprises in both countries is characterized by bettering performance. Bulgaria is better performed among both. About 25% of its enterprises are operating on the second stage of digitalization, i.e. using big data analysis. There is no any statistical evidence some enterprises to perform second stage in digitalization in Macedonia.

According to network readiness – a complex index (NRI) is used to characterize preparedness to reap the benefits of emerging technologies and to capitalize opportunities of digital revolution. The country NRI indexes of both countries Macedonia and Bulgaria are in the first half group of 139, although the index of Macedonia is above the index of Bulgaria. It could be a result of area and level of complexity of the ICT services as research of Macedonian teams has suggested.

In summary, contemporary enterprises are facing increasing pressure to innovate continuously. Implementing the second stage of digitalization is the main challenge for the economy and society development. Bulgaria is performing that stage, although lagging from EU-average, Macedonia is performing the first stage, but with a better level for

network readiness to benefit from the ICT. In both countries, ICT penetration is better performed in bigger size enterprises then in smaller ones. Improving connectivity / networking in both countries require a special policy. This is even more necessary in the cross border region.

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